PROJECT MANUAL

of the Material and Labor Required for Construction of:

Bartos Architecture Project Number
17-005.5

Gault Elementary School

New Classroom Building

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-119989 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 10/11/2022

for

Santa Cruz City Schools

133 Mission Street, Suite 100
Santa Cruz, California 95069



DSA Submittal:
8 March 2023
DSA Approval:

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Gault New Classroom Building

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Sections 00 and 01 will be issued after the Bid Walk on 11/8/2022

Section 02200

General Site Preparation

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• Utility and existing construction identification
Protection	• Utility protection
	• Landscape protection
Marking	• Marking and Notification
Maintenance	• Maintenance of landscaping, protection assemblies

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• n/a
Product Data	• n/a
Samples	• n/a
Shop Drawings	• n/a
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	• n/a
Standard	• n/a

3. After correction, reinstatement of warranty for corrected work to date of original warranty expiration, but not less than half original warranty period.
4. Replacement or restoration of failing warranted items without regard to anticipated useful service lives.

D. Warranty Form shall not detract from or confuse interpretations of Contract Documents.

1. Warranty shall be countersigned by manufacturer.
2. Where specified, warranty shall be countersigned by subcontractor and installer.

2.09 Project Record Documents (As-Builts)

A. The Contractor shall provide a complete set of Record Drawings and Specifications that clearly show all differences between the contract work as drawn and as installed. This includes all work, concealed or unconcealed. All work added to the contract which is not shown on the Contract Drawings shall be included also. Incorporate all clarification sketches into record documents. The Record Specifications shall include all addenda.

B. Concealed Work shall be defined as work installed in the slab or in an area that cannot be readily inspected by use of access panels, inspection plates, or other removable features.

C. Prepare Final Record Drawings for submittal to the Architect.

1. Refer Progress Documentation Section of Division 1.

D. Before a final payment is authorized, the Contractor shall certify that all changes in the work are included in the Record Drawings and Specifications.

E. Architectural consultants shall review all changes in the documents and provide the Owner with a complete set of reproducible drawings before final payment is authorized.

Part 3. Execution

A. Not Used.

End of Section

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation.
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Underground Items	• GENERAL CONTRACTOR is SOLELY responsible for locating and verifying any underground items prior to beginning operations
Special Inspections	• n/a
Mock Ups	• n/a

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	• Per Division 1. • Review utility locations with the District, Architect prior to commencement.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1

Item	Description
Product Manuals	• n/a
System Manuals	• n/a
Record Drawings	• Provide complete record drawings of construction Including all underground utilities

1.09 Warranty

A. Provide written warranty in accordance with Division 1

Item	Description
Warranty Form	• Per Division 1
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Not used

Part 3. Execution

3.01 Identification

A. Contractor shall perform the following tasks prior to commencement of Site Clearing / Excavation operations:

1. Review full scope of work in field with Architect at regular Project Meeting
2. Review Existing Facility documents including original plans and utility drawings and drawings for any previous additions. Contractor shall request documents form Architect if they have not been provided prior to commencement of work.
3. Provide USA for all known utilities.
4. Provide visual observation of local vaults, grade boxes, hand holes, manholes and any other visible appurtenance to assess utility runs that may not be documented.
5. Contractor shall provide a high level of diligence in assessing existing utilities.
6. Contractor shall be responsible for repair and replacement of any damaged utilities that may have been identified with or without the aid of specific documentation.

3.02 Protection of Utilities

A. Protect utilities from damage.

B. Provide barriers to prevent machinery and equipment from damaging vaults, boxes, and other appurtenances.

C. Provide layout and marking as required to avoid damage to underground pipes and conduits.

D. Provide barriers, fencing and markers to protect overhead and surface mounted piping, wiring, conduits.

3.03 Protection of Landscaping

A. Protect all existing landscaping to remain.

B. Mark all landscaping to remain with signs, tags or other means to ensure all construction personnel are aware of protection requirements.

C. Provide barriers and fencing to keep all construction activities, including personnel, out of protected area.

D. Provide temporary irrigation by means of automatic system or manual watering.

3.04 Tree Protection

A. Protect all trees to remain

1. Provide plastic tree fencing at the drip line of all trees listed to remain. Fencing shall be staked or otherwise supported so that it remains vertical and taught.
2. Protect limbs and foliage from damage caused by equipment and material handling. Avoid breakage of branches by forklift and crane operations.
3. Provide irrigation until temporary irrigation is installed or throughout summer for non-irrigated trees, Irrigation shall consist of deep watering on a bi-weekly basis. Contractor may be required to construct berms to contain water for deep irrigation.

B. Trimming and Pruning

1. All trimming and pruning of trees shall be done with permission from the Architect after review of the specific situation.
2. Trimming of limbs over 4” in diameter shall be performed under the supervision of the landscape architect or via the services of a licensed tree service.
3. All trimming shall include sealing of stump to as appropriate to the species and the size of the stump.

3.05 Maintenance of Protection Assemblies

A. All protection assemblies shall be maintained for the duration of the project

B. Protection may be removed from a particular area when the work of that area or phase is complete and no further construction operations will occur that may affect the items requiring protection.

C. Protection assemblies shall be repaired or adjusted such that fencing remains vertical and taught.

D. Damage shall be repaired promptly.

E. Temporary breaches of fence for access shall be restored immediately after access is complete.

3.06 Verification

A. Verify that survey benchmark and intended elevations for the Work are as indicated. If variations occur, consult the Architect for direction.

B. Contractor is responsible for coordination of basic survey information among all trades and personnel.

End of Section

Section 02220

Site Demolition

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (Califronia Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
Site Demolition	• General demolition and clearing and grubbing of site features and appurtences required to prepare site for construction. • Demolition of any related site construction

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Section 01330.

Item	Description
Catalog Cuts	• n/a
Samples	• n/a
Shop Drawings	• n/a
Product Data	• n/a
Schedule	• Written Schedule defining precise date and times for demolition activities for use in managing impacts to adjacent users and public.
Closeout Materials	• Disposal Certification • Recycling Certification

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the District Representative regarding applicable standard.

- Unless otherwise shown or specified, all materials and methods shall conform to Section 15 of the State of California, Department of Transportation, Standard Specifications (DTSS).

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	Description
Qualifications of Workers	• n/a
Product Acceptance	• n/a

1.06 Quality Control

A. The following procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Commissioning Procedures	• n/a
Observation Requirements	• Standard Inspection
Training Requirements	• n/a

Part 2. Products

Not Used

Part 3. Execution

3.01 Identification

A. Contractor shall perform the following tasks prior to commencement of Site Clearing / Excavation operations:

1. Review full scope of work in field with Architect at regular Project Meeting
2. Review Existing Facility documents including original plans and utility drawings and drawings for any previous additions. Contractor shall request documents from District Representative if they have not been provided prior to commencement of work.
3. Provide underground locating for all utilities within the limit of work.
4. Provide visual observation of local vaults, grade boxes, hand holes, manholes and any other visible appurtenance to assess utility runs that may not be documented.
5. Contractor shall provide a high level of diligence in assessing existing utilities.
6. Contractor shall be responsible for repair and replacement of any damaged utilities that may have been identified with or without the aid of specific documentation.

3.02 Demolition Scheduling

A. Contractor acknowledges that Demolition Scheduling shall be coordinated with the District Representative for the beneficial operation of the School Site. Contractor shall place no limitation on the extent of coordination of Demolition activities for this purpose.

B. Contractor acknowledges that Demolition work may occur in multiple and repetitive tasks and may occur at different locations at different times, dependent on the needs of the School Site to maintain access, operation, utilities, systems and safety.

1. Demolition tasks may be restricted to certain work times based on any one of the following:
    a. Occupancy of adjacent areas by District and the need to minimize disruption at particular times.
    b. Need to maintain operation of critical systems and utilities at particular times
2. Demolition tasks may be restricted to certain work areas based on the nature and scope of the task and its potential affect on the users of adjacent occupied spaces.

C. All Demolition Scheduling shall be reviewed with the District Representative prior to commencing operations.
1. Demolition of site walks, drives, ramps that could affect daily operations of the school shall be scheduled with the District Representative to occur and be replaced with new construction when school is not in session.
2. Demolition Operations may be limited to hours before and after school sessions depending on the time of year and the nature of the demolition work.
3. Demolition Operations may be limited to periods in which school is not in session, such as weekends and holidays.

D. Contractor shall provide allowance for multiple demolition exercises as may be required to facilitate school schedule. Coordination of demolition scheduling with District operational needs shall not be allowed as the basis of delay claims.

3.03 Supervision Requirements

A. Provide continuous supervision of all demolition activities. All demolition work shall be done in conjunction with the Contract Documents and shall accommodate provisions of all aspects of the Documents.

B. Conduct demolition to minimize interference with adjacent structures.

C. Conduct operations with minimum interference to public or private accesses.

D. Maintain egress and access at all times. Do not close or obstruct roadways without permits.

3.04 Protection of Utilities

A. Protect utilities from damage.
1. Provide barriers to prevent machinery and equipment from damaging vaults, boxes, and other appurtenances.
2. Provide layout and marking as required to avoid damage to underground pipes and conduits.
3. Provide barriers, fencing and markers to protect overhead and surface mounted piping, wiring, conduits.

3.05 Site Safety During Demolition Operations

A. Contractor shall provide traffic control during disruption of normal traffic flow on site due to temporary alternations in site circulation system.

B. Contractor shall provide pedestrian control during demolition operations to ensure pedestrians are protected from equipment, debris, dust, and other materials.

3.06 Protection of Landscaping

A. Protect all existing landscaping to remain.

1. Mark all landscaping to remain with signs, tags or other means to ensure all construction personnel are aware of protection requirements.

2. Provide barriers and fencing to keep all construction activities, including personnel, out of protected area.

3. Provide temporary irrigation by means of automatic system or manual watering throughout the duration of construction to keep plant materials in a healthy, thriving condition.

3.07 Maintenance Of Protection Assemblies

A. All protection assemblies shall be maintained for the duration of the project

1. Protection may be removed from a particular area when the work of that area or phase is complete and no further construction operations will occur that may affect the items requiring protection.

B. Protection assemblies shall be repaired or adjusted such that fencing remains vertical and taught.

C. Damage shall be repaired promptly.

D. Temporary breaches of fence for access shall be restored immediately after access is complete.

E. Construction fencing shall be a 6-foot tall chain link construction fence installed as shown on the drawings for the duration of construction. The fence shall be in good condition, staked into the ground wherever possible and installed with a top tension wire. The fence posts shall be 2” diameter galvanized steel. The fence fabric shall be 11-gauge with knuckled barbs on the top edges.

3.08 Demolition Equipment

A. Contractor shall provide all equipment and materials as may be necessary to perform the demolition work within the limitations of this section. No claims shall be made for special equipment or processes based on limitations of this section.

B. Contractor shall provide equipment and tools of appropriate size, operation and function to accomplish demolition tasks within the restrictions described herein.

1. Provide equipment of appropriate size to ensure the protection of existing facilities, materials and systems.

3.09 Dust Control

A. All demolition activities shall include adequate measures for dust control. Contractor shall provide any and all means necessary to prevent the circulation of dust into adjacent buildings and site areas.

B. Contractor shall provide the following as needed or at the request of the District Representative:

1. Continuous watering of all excavation, grading, operational and transit areas during site demolition operations. Watering shall include spray over actual excavation areas as well as stockpile areas.

2. Watering shall occur over transit areas including equipment routes, equipment loads and parking areas.
3. Opening protection at all adjacent buildings that may include plastic barriers, fans and other means to prevent dust from entering buildings.
4. Dust removal: Sweep or wash down of adjacent site and building areas that will be used by the public.

3.10 Disposal of Debris

A. Remove from the site and legally dispose of all debris resulting from demolition operations.

B. Provide certification that all materials have been disposed of at appropriate facilities via appropriate methods.

1. Provide dump receipts describing yardage and material content.
2. Provide certification for all hazardous materials.

3.11 Recyling

A. Prepare a recycling plan describing the types and estimated quantities of materials to be removed that can be recycled.

B. Dispose of all recyclable materials at appropriate disposal facilities as required by local regulatory agencies.

C. Provide receipts form all facilities at which material was deposited for recycling purposes.

3.12 Clean-Up

A. Remove demolished materials from site as work progresses.

B. Leave areas of work in clean condition.

1. Provide sweeping and other services as required.

End of Section

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Section 02310

Earthwork and Grading

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
General	• Perform all rough grading work as shown and specified including, but not necessarily limited to, site grading for concrete and decomposed granite paving, landscaped areas, including subgrade compaction.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• n/a
Samples	• Submit one-gallon sample of any proposed fill material for testing and review by the Soils Engineer at least two weeks prior to proposed use on site. No material is to be used unless approved by the Soils Engineer.
Shop Drawings	• n/a
Product Data	• n/a
Schedule	• n/a

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

- Unless otherwise shown or specified, all materials and methods shall conform to Section 19

of the State of California, Department of Transportation, Standard Specifications (DTSS) as they reasonably apply to this work, except for measurement and payment requirements.

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	Description
Qualifications of Workers	• n/a
Product Acceptance	• n/a
Substrate Acceptance	• The District will retain a soils engineer to test compaction of backfill and perform related services. All materials are subject to approval of the Soils Engineer, Architect and Structural Engineer.

1.06 Quality Control

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• District Representative shall be present during all site clearing and grading operations to test and to observe earthwork construction. This representative shall be notified at least 48 hours prior to commencement of any grading operations to allow for discussion and planning with the earthwork, underground and paving contractors.
Observation	• Standard Inspection • The District will retain a soils engineer to test compaction of backfill and perform related services. All materials are subject to approval of the Soils Engineer, Architect and Structural Engineer.
Testing	• Where referred to in these specifications, "compaction" or "relative compaction" shall mean the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material as determined by ASTM D-1557-78. • The Contractor shall provide compaction testing as required to confirm compliance with these specifications and drawings. All costs of such testing will be borne by the District except where re-testing of areas failing to meet compaction requirements occurs. Re-testing costs shall be borne by the Contractor.
Special Inspections	• n/a
Mock-Ups	• n/a
Other	• All excavation, for the construction of benches and keyways, subdrain installation, placement and compaction of fill and preparation of subgrade shall be reviewed by the Soils Engineer retained by the District. Contractor shall schedule work and notify District and Soils Engineer two to three working days in advance of each portion of grading operations for their review, testing and approval. The Contractor shall cooperate with the Soils Engineer in performing these tests. All tests indicating conformance to project requirements shall be paid for by the District. Costs of retesting and reinspection required as the results of inadequate, insufficient, or incomplete work by the Contractor shall be deducted from the contract amount.

Layout and Grading Control	• Grade the site to the tolerances shown. Vertical control is established by the benchmark indicated on the drawings. • The Contractor shall engage the services of a District-approved Land Surveyor licensed in California to lay out the work. This surveyor shall certify that the completed work is done in a manner that the District can check for conformance as the work progresses. • Tolerances: Site grading shall be to the elevations shown on the Drawings, plus or minus 0.1 foot vertically. • Dewatering: No soil shall be compacted during periods of rain or when the ground is not drained of all free water. Soil that has been stockpiled and wetted by rain or by any other cause shall not be compacted until completely drained and until the moisture content is within the limits approved by the District.

1.07 Close Out

A. Provide written warranty in accordance with Division 1.

Item	Description
Commissioning Requirements	• n/a
Closeout Materials	• n/a

Part 2. Products

2.01 Materials

A. Existing material may be used for general fill after removal of all debris, and after being moisture-conditioned, if it meets the criteria in paragraph B below.

B. Soil imported to the site and used for compacted fill shall be free of perishable organic material, and shall meet the following requirements:

1. Physical: 100% passing 4 inch size, 10 to 75% passing the No. 200 sieve Plasticity Index of 12 maximum when tested in accordance with ASTM D 4318-75.

2 Chemical: Salinity Limit (ECe) saturation extract of 4.0 sodium (SAR) limit of less than 8.0.

3. Boron: Saturation extract concentration less than 1.0 ppm.

C. Minor quantities of material not meeting the above gradation may be mixed and blended with other on-site material if the resulting mixture conforms to the specifications. If the quantity of material not in conformance with the specifications becomes excessive in the opinion of the Soils Engineer, it shall be removed from the site.

D. Topsoil: See Landscape Soil Preparation Section for topsoil requirements.

Part 3. Execution

3.01 Stripping and Stockpiling Of Native Topsoil

A. All vegetation including the top one to two inches of roots shall be removed from areas to be graded. The remaining six to twelve inches of topsoil shall be stripped and stockpiled in sufficient quantities as required to provide a 6 inch layer of topsoil in all planting areas.

3.02 Rough Grading

A. Prior to commencement of site grading work the Contractor shall notify the District Representative that the site has been cleared. The District Representative shall have sufficient time to review the site. Site grading shall not commence until the District Representative has completed review of the site and the District has given approval to proceed.

B. Perform all cut and fill required to bring the site to the grades indicated, with proper allowances for finish materials such as paving and base. Prior to placing new fill the exposed ground surface should be scarified to a depth of six inches (or greater as indicated on plans), brought to a near optimum moisture content and compacted. Areas to be planted shall be compacted to 85 percent and areas to be paved shall be compacted to at least 90 percent relative compaction as determined from ASTM Test Method D 1557-78.

C. Placement and Compaction: Approved fill material shall be placed in layers of six to eight inches or less in loose thickness and moisture-conditioned as necessary to achieve a moisture content suitable for recompacting. Fill material shall be compacted with equipment of such weight and design as necessary to obtain the specified compaction. Fill shall be compacted to 85 percent relative compaction in areas to be planted and at least 90 percent relative compaction in areas to be paved unless otherwise directed. In pavement areas, the upper 9 inch of subgrade shall be a minimum relative compaction of 95 percent. The resulting subgrade should be smooth and essentially unyielding. In planting areas, the upper 8 inch shall be a minimum relative compaction of 85 percent. Between successive lifts, the fill surface shall be scarified or otherwise processed to obtain satisfactory bonding between the fill lifts.

D. Recompaction: Where, in the judgment of the Soils Engineer, the moisture content is not suitable or insufficient compaction has been obtained, the fill shall be reconditioned and/or recompacted to the specified density prior to placing any additional fill material. The Contractor shall be responsible for placing and compacting approved fill material in accordance with these specifications. If the Contractor fails to meet the compaction requirements, he shall reduce his rate of haul, furnish additional spreading, provide moisture conditioning and/or compacting equipment or make any other adjustments necessary to produce a satisfactorily compacted fill.

E. All excess material and all material that is unsuitable for paving subbase or finish grading shall be disposed of off site at Contractor’s expense.

F. Where any marked or unmarked utility lines or other underground obstruction or piping may be encountered within the work area, notify the District or the Agencies or service utility companies having jurisdiction thereof, and take necessary measures to prevent interruption of service (if live). Should such lines or service be damaged, broken, or interrupted through the Contractor’s own negligence, those services shall be repaired immediately and restored by him at his own expense. Abandoned lines, meters and boxes, obstructions or piping, shall be removed, plugged or capped in accordance with the requirements and approval of the agencies affected.

G. Rock Removal: All rocks eight cubic inches or larger shall be removed completely from the top 6 inch of subgrade prior to placement of topsoil in all planting areas. (See "Landscape Soil Preparation" for additional requirements.) All rocks not meeting criteria for fill material shall be legally disposed of off-site as the Contractor's own property.

3.03 Erosion Control and Clean-Up

A. Spillage: The Contractor shall prevent spillage when hauling on or adjacent to any public street or highway. In the event that such occurs, the Contractor shall remove all spillage and sweep, wash or otherwise clean such street or highways.

B. Dust Control: The Contractor shall take all precautions needed to prevent a dust nuisance to adjacent public and private properties and to prevent erosion and transportation of soil to adjacent properties due to work under this contract. Any damage so caused by the Contractor's work under this contract shall be corrected or repaired by the Contractor at no cost to the District. In the event the Contractor fails to take such precautions or make such corrections or repairs promptly, the District may take such steps as he may deem necessary and deduct the cost of the same from the monies due to the Contractor.

C. Clean-up: The job site shall be kept neat and clear at all times, with all public walks swept clean at the end of each day, and all materials neatly stored. Upon completion of the work under this Section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such cleanup operations within 48 hours of notice by the District shall be considered adequate grounds for having the work done by others at this subcontractor's expense.

End of Section

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Section 02320

Trenching and Backfill

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
General	• Perform all structural excavation, trenching, and backfilling work as shown and specified including, but not necessarily limited to, utility trenches, footings, foundations, walls, and irrigation lines.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the District Representative regarding applicable standard.

References	• Unless otherwise shown, all materials and methods shall conform to Section 19-3 of the State of California, Department of Transportation, Standard Specifications as they apply to this work, except for measurement and payment requirements.

1.04 Quality Assurance

A. Provide the following per Division 1

Item	Description
Subgrade Acceptance	• The District will retain a soils engineer to test compaction of backfill and perform related services. All materials are subject to approval of the Soils Engineer, Architect and Structural Engineer.

1.05 Quality Control

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site. • The District Representative shall be notified at least 48 hours prior to commencement of trenching operations.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation.
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.
Testing	• Where referred to in these specifications, "compaction" or "relative compaction" shall mean the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material as determined by ASTM D-1557-78. • The Contractor shall provide compaction testing as required to confirm compliance with these specifications and drawings. All costs of such testing will be borne by the District except where re-testing of areas failing to meet compaction requirements occurs. Re-testing costs shall be borne by the Contractor.

1.06 Closeout

A. Provide written warranty in accordance with Division 1.

Part 2. Products

2.01 Materials

A. General Backfill: Backfill material shall be approved by the Inspector prior to its use. Excavated material and excess material from site grading may be re-used for backfilling and grading, provided such fill shall be homogeneous, free from rocks, rubbish, organic material, etc., and shall consist of fragments capable of being thoroughly crushed and consolidated into a dense, uniform compact fill, and shall meet the following requirements:

Sieve Size	Percentage Passing
6”	100
4”	95-100
No. 200	10-75
Plasticity Index:	Maximum

Part 3. Execution

3.01 Excavating and Backfilling for Trenches

A. Perform all necessary excavation, shoring, pumping and dewatering and backfilling required for the proper laying of all underground pipes and conduits.

B. All piping in ground shall have a minimum cover of 1'-6", except as otherwise shown, and shall be laid in ditches dug true to grade and line, avoiding sharp breaks. Piping shall bear equally over its entire length at bottom of ditch. Rock or unstable material encountered at grade shall be replaced with sand fill to a depth of 6 inches below pipe.

C. Backfill (non-drainage trenches): Fill trenches with excavated material in 6 inch to 8 inch in uncompacted thick layer, compacted to 90% relative density. Backfill shall be moisture-conditioned to near-optimum in accordance with ASTM D 1557-78.

D. Backfilling shall be commenced as soon as practical after subsurface work is installed and reviewed by the District’s Representative.

E. No wood or debris shall be buried in any fill. The fill material shall be non-expansive, meeting the criteria described elsewhere in this specification.

F. Provide shoring, excavation pumping and other requirements as necessary at excavations for points of connection.

3.02 Structural Excavation and Backfill

A. Structural Excavation: Make all excavation to the grades and elevations shown on the drawings, or to the subgrades required to obtain the finished grades shown thereon. Accurately cut footing trenches. Where footings are to be cut "neat", the trench or excavation width shall be increased by 2 inches from the dimensions shown on the drawings, so as to permit pouring footings against earth banks. If soil type or weather does not permit such excavations, excavate wide enough to permit full forming of footings. If any excavation is made below proper grade, the District shall be immediately notified, and the grade shall be restored in whatever manner the District directs, at no expense to the District. All excavation shall be kept free of standing water until concrete work, paving or backfilling is complete. Shore and brace excavations when required to prevent cave-ins.

B. Foundations from previous structures, underground utilities or other buried structures shall be removed in their entirety and replaced with compacted engineered fill.

C. When zones of soft or saturated soils are encountered at the overexcavated levels during excavation and compaction, deeper excavation shall be required to expose firm soil. This shall be determined in the field by the District Representative.

3.03 Surplus Material

A. Any excavated material which proves to be unsuitable or which is not required for backfilling shall be removed from the immediate work area and disposed of off-site.

3.04 Cleaning

A. Upon completion of the work under this Section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such cleanup operations within 48 hours shall be considered adequate grounds for having the work done by others at the Contractor's expense.

End of Section

Section 02400

General Demolition

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• General Demolition Requirements
Special Coordination	• Refer to Related Sections for specific project requirements not included herein.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• n/a
Product Data	• n/a
Samples	• n/a
Shop Drawings	• n/a
Schedule	• Include Schedule entry on Gantt Chart for General Demolition

1.04 References/Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	• n/a
Standard	• n/a

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	• Full time supervision and observation by the

Item	Description
	Contractor of all on-site Construction Activities. • Ensure that all items to be retained in good condition and turned over to owner are properly protected.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• n/a
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• n/a
Special Inspections	• n/a
Mock Ups	• n/a

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	• Per Division 1.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Product Manuals	• n/a
System Manuals	• n/a
Maint. Tools/Materials	• n/a
Surplus Materials	• n/a
Training	• n/a

1.09 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Not Used

Part 3. Execution

3.01 Demolition Section of Other Disciplines

A. This section shall apply to all demolition work defined under any other section of this Specification. Conflicts between this section and other sections shall be resolved by the Architect with favor to the most restrictive stipulation.

B. All trades shall review all documents to determine the extent to which their demolition work may require support work from other trades.

C. The Contractor shall be responsible to ensure that all trade work required for demolition tasks is provided regardless of the inclusion of that trade in any Plans or Demolition Sections.

1. Contractor shall provide complete service including specified demolition work as well as collateral requirements for repair, closure, termination or re-routing. No claims shall be made for incidental or peripheral demolition work associated with any specified work.

3.02 Transfer of Responsibility and Disposition of Materials

A. Contractor shall consult with Owner prior to commencing any demolition and determine which existing items and equipment are of value to the Owner. These items shall be carefully removed to avoid damage and shall be delivered to the Owner as directed.

B. Title to all remaining items, equipment and fixtures required to be removed, shall be vested in the Contractor whereupon the Owner will not be responsible for the condition, loss or damage to said property. All such items shall be removed from the Owner's property.

3.03 Supervision Requirements

A. Provide continuous supervision of all demolition activities. All demolition work shall be done in conjunction with the Contract Documents and shall accommodate provisions of all aspects of the Documents.

B. Conduct demolition to minimize interference with adjacent structures.

C. Conduct operations with minimum interference to public or private accesses.

D. Maintain egress and access at all times. Do not close or obstruct roadways without permits.

E. Cease operations immediately if adjacent structures appear to be in danger. Notify Architect.

3.04 Site Safety During Demolition Operations

A. Contractor shall provide fire watch for the site or facility during temporary shutdown of fire alarm or fire suppression systems.

B. Contractor shall provide security services for the site or facility during temporary shutdown of the security systems.

C. Contractor shall provide traffic control during disruption of normal traffic flow on site due to temporary alterations in site circulation system.

D. Contractor shall provide pedestrian control during demolition operations to ensure pedestrians are protected from equipment and materials.

E. Contractor shall provide vision shielding to prevent observation by the public of cutting and welding torches or any other source of bright light that may damage vision.

F. Refer to Site Safety Section of this specification.

3.05 Demolition Scheduling

A. Contractor acknowledges that Demolition Scheduling shall be coordinated with the Architect for the beneficial operation of the School Site. Contractor shall place no limitation on the extent of coordination of Demolition activities for this purpose.

B. Contractor acknowledges that Demolition work may occur in multiple and repetitive tasks and may occur at different locations at different times, dependent on the needs of the School Site to maintain access, operation, utilities, systems and safety.

1. Demolition tasks may be restricted to certain work times based on any one of the following:

   (a) Occupancy of adjacent areas by District and the need to minimize disruption at particular times.
   (b) Need to maintain operation of critical systems and utilities at particular times

2. Demolition tasks may be restricted to certain work areas based on the nature and scope of the task and its potential affect on the users of adjacent occupied spaces.

C. All Demolition Scheduling shall be reviewed with the Architect prior to commencing operations.

1. Demolition of any items that could affect daily operations of the school shall be scheduled with the District to occur and be replaced with new construction when school is not in session.
2. Demolition Operations may be limited to hours before and after school sessions depending on the time of year and the nature of the demolition work.
3. Demolition Operations may be limited to periods in which school is not in session, such as weekends and holidays.

D. Contractor shall provide allowance for multiple demolition exercises as may be required to facilitate school schedule. Coordination of demolition scheduling with District operational needs shall not be allowed as the basis of delay claims.

3.06 Notification of Demolition

A. Provide notification of the commencement of any demolition task or phase 48 hours in advance.

B. Do not commence demolition until the Architect has approved the task or phase and coordinated the schedule with the District.

3.07 Demolition Equipment

A. Contractor shall provide all equipment and materials as may be necessary to perform the demolition work within the limitations of this section. No claims shall be made for special equipment or processes based on limitations of this section.

B. Contractor shall provide equipment and tools of approp size, operation and function to accomplish demolition tasks within the restrictions described herein.

1. Provide equipment of appropriate size to ensure the protection of existing facilities, materials and systems.

3.08 Preparation

A. Provide, erect, and maintain temporary barriers and security devices. Include chain link fence around each phase of construction

1. Include protection of all existing trees.

B. Mark all items to be removed.

C. Provide layout as required to direct slab and wall removal. Identify slab and walls requiring precise cutting and demolition for future fitting of new construction.

3.09 Dust Control

A. All demolition activities shall include adequate measures for dust control. Contractor shall provide any and all means necessary to prevent the circulation of dust into adjacent buildings and site areas.

B. Contractor shall provide the following as needed or at the request of the Architect:

1. Watering shall occur over transit areas including equipment routes, equipment loads and parking areas.
2. Opening protection at all areas that may include plastic barriers, fans and other means to prevent dust from spreading throughout building.
3. Dust removal: Sweep or wash down of adjacent site and building areas that will be used by the public.

C. Use all means necessary to prevent the spread of dust during performance of the work of this Section; provide dust curtains of fireproof polyethylene where indicated and where applicable, moisten surfaces as required.

D. Provide sealed membranes with zipper operated doors over corridors and passage ways separating the work zone from occupied spaces. Provide sealed membranes over windows and ventilation openings.

1. Membranes shall not limit operability of windows and ventilation systems in areas occupied by the public.
2. In no case shall barriers obstruct required exit routes.

3.10 Demolition

A. Demolish and remove components in an orderly and careful manner, in sequence as indicated on Drawings or as determined by consultation with Architect.

B. Coordinate all structural shoring and demolition to insure that no settling, deflection or other failure occurs as a result of removal or modification of existing elements.

C. Protect existing supporting structural members.

D. Clearly direct demolition work so that items to remain are protected.

E. Disconnect, cap and identify designated utilities.

1. Cap utilities at appropriate locations for future service, reconnection.
2. Architect may require removal of piping and raceway beyond specific work areas in order to achieve appropriate location for utility termination.

F. Execute demolition work to ensure safety of persons and adjacent property against damage by falling debris or other causes in connection of this work.

3.11 Termination of Utilities

A. All demolition of utility piping, wring or ductwork shall include functional termination of piping, wiring and ductwork to remain such that:

1. Operation of remaining systems is not affected or disrupted.
2. Terminations can be accessed for reconnection or re-routing either as part of this work or as specified in other projects.

B. Demolition of site and building utilities shall provide for termination and investigation regarding the operation of remaining components in adjacent buildings. Contractor shall explicitly ensure that removal of any component specified herein does not prevent remaining components from operating in occupied spaces.

3.12 Re-Installation / Reconstruction

A. Demolition work may require the temporary removal of material, assemblies and equipment that is intended to remain. Demolition work shall require the re-installation of such items to their original condition

1. Reinstallation may affect utility systems and components, electrical systems , communications and data systems and alarm systems.
2. All critical systems shall be maintained in working order for the remainder of the site. No demolition work shall be allowed that will disable and system beyond the extent of a temporary shutdown.
3. Contractor is responsible for returning any system to operation for adjacent areas where work of this contract has interrupted that operation.

3.13 Repair and Replacement of Damaged Assemblies, Utilities Systems

A. Promptly repair damages caused to adjacent facilities by demolition operations, as directed by the Architect and at no cost to the District.

B. Contractor is responsible for repair, replacement of any system or component damaged by demolition work.

3.14 Surface Restoration of Materials to Remain

A. Where surfaces are to remain unfinished, as indicated on the drawings, Contractor shall restore such surfaces to be free of paint, plaster, fasteners, and holes.

1. Contractor shall power-wash and/or sand/bead-blast all masonry and concrete surfaces indicated as to remain unfinished.
2. Contractor shall extract all fasteners, including powder-driven fasteners, expansion anchors, and lead anchors, and patch resulting holes to match adjacent surface. Alternatively, fasteners may be cut off at least 1/2” below surface of remaining material, and patched to match adjacent surface.

B. Unfinished surfaces which are to remain visible when construction is complete shall be restored uniformly, regardless of whether the damage or marks were pre-existing or caused by demolition work.

C. Surfaces receiving new finishes shall be prepared per Specifications and manufacturer’s instructions for the specified finishes.

3.15 Disposal of Debris

A. Remove from the site and legally dispose of all debris resulting from demolition operations.

B. Provide certification that all materials have been disposed of at appropriate facilities via appropriate methods.

1. Provide dump receipts describing yardage and material content.
2. Provide certification for all hazardous materials.

3.16 Recycling

A. Prepare a recycling plan describing the types and estimated quantities of materials to be removed that can be recycled.

B. Dispose of all recyclable materials at appropriate disposal facilities as required by local regulatory agencies.

C. Provide receipts from all facilities at which material was deposited for recycling purposes.

3.17 Cleaning

A. Remove demolished materials from site as work progresses.

1. Provide debris box or trucking as appropriate to task.
2. Remove debris boxes upon filling to capacity.
3. Remove partially filled boxes within one week of delivery.
4. Prevent access to debris boxes by the public.

B. Leave areas of work in clean condition.

1. Provide sweeping, vacuuming, mopping and other janitorial services as required.

End of Section

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Section 02700

Asphalt Paving and Surfacing

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General AC Paving	• Barriers required to inhibit pedestrian traffic around construction • Spreading and compacting aggregate sub-base material • Spreading and compacting aggregate base material • Spreading and compacting asphaltic concrete pavement and surfacing • Grinding existing pavement at conforms and for overlaying • Applying prime coat, tack coat and fog seal • Dust alleviation and control • Cleanup and disposal of debris • Supplying all labor, materials, equipment, apparatus not specifically mentioned herein or noted on the plans, but which are incidental and necessary to complete the work • New Paving as noted on plans • Paving repairs adjacent to new or altered curbs, gutters and appurtenances.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• n/a
Product Data	• n/a
Reports	For aggregate bases and sub-bases, the Contractor shall arrange and provide for the following acceptance tests to be performed on samples taken at the job site, based on frequency of one series of tests per 3,000 tons of materials placed: • “R” Value, per California Test Method 301 • Sieve Analysis, per California Test method 202 • Sand equivalency, per California Test Method 217

	• For aggregate bases, the durability index, per California Test method 229.
Shop Drawings	• n/a
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References/Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining "Industry Standards" and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	• ASTM 3381 Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction • ASTM D-1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. • Spreading and compacting of aggregate sub-base material shall conform to the applicable provisions of Section 25 of the State Standard Specifications. • Spreading and compacting of aggregate base material shall conform to the applicable provisions of Section 26 of the State Standard Specifications. • Spreading and compacting of asphaltic concrete shall conform to the applicable provisions of Section 39-5 and 39-6 of the State Standard Specifications. • Traffic Control shall conform to the standards of the "Work Area Traffic Control Handbook", published by the Building News, Los Angeles, California, (213) 870-9871.

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Provide the Architect's field representative daily with 1 copy of a material certificate signed by the

	material producer certifying that each material item complies with or exceeds the specified requirements for each type of material delivered • Provide the Architect's field representative daily with 1 copy of certified plant load out slips for each load of material delivered showing net weight of the particular material delivered, to be attached to the appropriate material certificate • Allowable Tolerances: • Finish surface of the aggregate base or aggregate sub-base courses shall not vary more than .05' from the grade established by drawings. • Finish surface of asphaltic concrete when measured with a 12' straight edge shall not vary more than 0.01' in the longitudinal direction and 0.02' in the transverse direction below the lower edge of the straight-edge.
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item. • Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM Designation D1557.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• Sub-base Compaction Testing, coordination with Owner's Testing Agency
Special Inspections	• Per DSA Testing and Inspection Form

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	• Per Division 1. • Observation of environmental conditions on day of placement
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Refer to DSA Testing and Inspection Sheet • Sub-base Compaction Testing
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Commissioning

A. Provide Commissioning procedures and products per requirements of Division 1. Commissioning procedures shall include, but not be limited to, the following:

Item	Description
Drainage	• Selective Grade spot checks to be conducted by Conctractor in presence of Architect to demonstrate adequate surface draining characteristics and grading. Test method to be determined by Architect.

1.09 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Product Manuals	• Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	• Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems.
Maint. Tools/Materials	• n/a
Surplus Materials	• n/a
Training	• n/a

1.10 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1 • Contractor to provide warranty against defects in materials or workmanship. Replacement or repair of such defects shall be repaired or replaced in a timely fashion at no additional cost to the Owner
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Pavement Materials

A. Asphalt to be mixed with aggregate to form asphaltic concrete shall be steam refined paving asphalt, grade AR-4000, conforming to the requirements of Section 92-1.02 and 1.03 of the State Standard Specification.

B. Aggregate for asphaltic concrete shall be Type A conforming with the requirements of Section 39-2.02 of the State Standard Specification with the following special provisions:

1. Grading of combined aggregates for new asphaltic concrete pavement, walkways and overlays 2” or more in thickness shall be 3/4” maximum size, medium grading.
2. Grading of combined aggregates for new asphaltic concrete pavement, walkways and overlays 2” or less in thickness shall be 1/2” maximum size, medium grading.

C. Liquid asphalt for prime coat shall be Grade SC-70 conforming to the requirements of Section 92-1.01 and 1.02 of the State Standard Specification.

D. Asphaltic emulsion for tack coat (paint binder) shall be emulsified asphalt, Type SS-1h, conforming to the requirements of Section 94-1.01 through 1.05 of the State Standard Specification.

E. Suppliers certification showing conformance to these specifications shall be delivered with each shipment of materials to the job site.

2.02 Base Course Materials

A. Aggregate Sub-base materials shall conform to the requirements for Class 2 Aggregate Sub-base contained in Section 25-1.02A of the State Standard Specification.

B. Aggregate Base materials shall conform to the requirements for Class 2 Aggregate Sub-base contained in Section 25-1.02B of the State Standard Specification.

2.03 Soil Sterilent

A. A commercially available pre-emergent herbicide such as “Atrazine”, “Treflan”, or approved equal, as recommended by a State of California appropriately licensed individual.

Part 3. Execution

3.01 Environmental Requirements

A. Aggregate base or sub-base material shall not be placed until the subgrade has been approved.

B. Provide satisfactory dust alleviation and control measures continuously during the course of the work.

C. Prime or tack coat materials shall not be applied unless the ambient temperature is above 50 degrees F. and not below 35 degrees F. during the 12 hours immediately preceding application. Prime or tack coats shall not be applied when the surface to be coated is wet or contains excessive moisture.

D. Asphalt concrete shall not be applied unless the ambient temperature is above 50 degrees F. and rising, the surface is dry, and upon specific approval by the Engineer of Record.

E. Temperature of asphaltic concrete shall not be less than 250 degrees F. during initial spreading.

3.02 Examination and Preparation

A. Verify gradients and elevations of base.

B. Verify compacted subgrade is dry and ready to support paving and imposed loads.

3.03 Extent of Paving

A. Paving shall be required at all areas shown in documents plus the following:

1. Extent of paving shall cover transitions between new and old such that water traps are not created on either. This may require further extent of demolition, grinding and overlay than specifically shown on drawings.

(a) Contractor shall review perimeter areas to determine extent of paving with Architect prior to commencement.

2. At repairs and patches, extent of patching shall be determined by the extent of existing demolition and by the extent of damage from wear, excavation activities and installation activities. Contractor shall be responsible to repair paving over all areas of disruption and excess wear resulting from construction activities, regardless of extent of paving shown on drawings.

(a) Repair paving shall cover any cracking, depression, surface damage associated with installation of new curbs, trenching, appurtenances.

B. At a minimum, repair paving shall consist of 6" base over 95% compacted sub-base with 2-1/2" AC overlay

3.04 Soil Sterilent

A. Soil sterilent shall be spread over the sub grade surface in accordance with manufacturer's directions

B. Contractor shall take all precautions to avoid overspray or runoff onto planting areas, play areas, or other surfaces.

3.05 Sub-Base Construction

A. Sub-base material shall be placed, spread and compacted in conformance with Section 25-1.04 and 1.05 of the State Standard Specification.

B. Sub-base material shall be compacted to a relative density of not less than 95% when tested in accordance with the requirements of ASTM Standard 1557.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

3.06 Base Construction

A. Base material shall be placed, spread and compacted in conformance with Section 26-1.035, 1.04 and 1.05 of the State Standard Specification.

B. Sub-base material shall be compacted to a relative density of not less than 95% when tested in accordance with the requirements of ASTM Standard 1557.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

3.07 Prime , Tack Coats, and Surface Preparation

A. Immediately prior to applying prime coat or tack coat the surface to be paved shall be satisfactorily cleaned of all loose material by means of powered brooms supplemented by hand brooms as required. Liquid asphalt prime coat shall then be applied to the aggregate base course in conformance with Section 39-4.02 of the State Standard Specifications. Prime coat shall be applied at the rate of 0.25 gallons per square yard unless otherwise directed. After the liquid asphalt has penetrated the base course, any excess standing on the surface shall be absorbed to the satisfaction of the Architect's field representative with a suitable coating of clean sand.

B. Tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, catch basins, manhole frames and construction joints in the surfacing; to the surface of all existing pavements to be resurfaced; and other surfaces as designated. Asphaltic paint binder shall be provided in sufficient quantity to produce a thin, uniform black, glossy coat of asphalt. Pools in unevenly distributed areas shall be redistributed by means of hand brooms. Tack coat shall be applied in conformance with the requirements of Section 39-4.02 of the State Standard Specification.

C. Prior to placing asphalt over existing pavement, sweep the pavement of loose dirt to the satisfaction of the Architect's field representative.

3.08 Placing Asphalt Pavement

A. Asphalt concrete shall be proportioned, mixed, spread and compacted in conformance with applicable requirements of Section 39-3 and 39-6 of the State Standard Specification and the following"

1. All longitudinal joints shall be "hot" joints; cold joints are only allowed transversely at the discontinuance of the day's run.
2. Asphalt concrete for roadways shall be placed in layers when the total depth specified on the plans and details exceeds 2". In such cases, the wearing surface course shall not be less than 1-1/2" in compacted thickness nor more than 2". The next lower layer shall not exceed 2-1/2" in thickness.
3. Wearing surface course shall be placed by means of an approved self-propelled asphalt paving machine. Contractor may place lower courses and compact all courses with equipment conforming to the applicable requirements of Section 39-5 of the State Standard Specification.
4. Where asphalt paving is to be laid against concrete gutter, the first pass shall start at the gutter and successive passes shall work toward the center of the street. The finish surface of the wearing course shall be 1/4" above the surface of the gutter.
5. Trucks, loaded or empty, shall not be allowed on the new surface until it has reached ambient temperature.

B. When placing asphalt over existing pavement, repair large cracks, spalls and chuckholes, and clean the pavement surface to the satisfaction of the Architect's field representative.

C. Compact pavement by rolling to achieve even and smooth finish, without roller marks. Hand compact in areas inaccessible to rolling equipment.

3.09 Accessories

A. Existing manholes, valve and monument covers, or other such structures in the line of the work shall be adjusted to conform with the new grade after completion of paving operations.

B. Concrete collar shall be circular and shall be covered with a minimum of 2" asphalt concrete to blend in with the new surfacing.

C. Extension rings are not acceptable. Contractor is for preserving the survey point in its original position.

3.10 Pavement Grinding

A. At conforms, existing pavement shall be ground down a minimum of 1". Feathering will not be permitted.

B. For overlay, grind as necessary to allow minimum overlay of 1" to new elevations.

C. The contractor will be held responsible for any and all damage to trees, plants, and shrubs caused by the grinding operation and shall satisfactorily replace with new material or correct any damage.

D. Ground AC shall be removed from the job site and disposed of immediately after grinding.

E. Ground areas shall be overlaid within one week of grinding.

3.11 Dust Alleviation and Control

A. Contractor shall provide satisfactory pollution and dust abatement and control measures continuously during the course of the work.

B. The contractor shall utilize reclaimed water, or dust palliatives, in compliance with applicable Water Conservation Ordinance.

C. Notify district one week prior to any operations that will involve fumes that mat be considered a nuisance to students or faculty on site.

3.12 Cleaning

A. Upon completion of asphalt paving and surfacing operation, the entire work site shall be cleaned of all waste, rubbish and construction debris of any nature.

End of Section

Section 02710

Portland Cement Concrete Paving

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• Concrete walks and Site work • Concrete walk repair where existing walks are disturbed or damaged as part of the work of this project. • Incidental concrete repair for utility trenching and other sub-grade construction. • All other concrete flatwork required in conjunction with the work of this project.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1

Item	Description
Catalog Cuts	• n/a
Product Data	• Concrete Color Selection • Concrete Mix Design
Samples	• n/a
Shop Drawings	• Control / Expansion Joint Layout
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

- California Building Code
- Portland Cement Association

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project. • Provide paving subcontractor experienced in Institutional grade flatwork, accessibility requirements and pedestrian hazard management.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Provide assurance that concrete finish will match existing where specified
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item. • Commencement of work by Contractor implies acceptance of substrate by Contractor, including Compaction

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet
Mock Ups	• Provide 3’ x 3’ square for paving with integral color, for matching purposes with existing concrete paving. • Match color of existing paving • Match finish of existing paving

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description

Observation	• Per Division 1. • Architect to observe initial placement and finishing to verify compliance with expected finish quality and consistency. • Architect to observe selected placement throughout project and accept or reject based on expected finish quality and consistency
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Commissioning

A. Provide Commissioning procedures and products per requirements of Division 1. Commissioning procedures shall include, but not be limited to, the following:

Item	Description
Commissioning Outline	• Per Division 1. • Selective grade spot-checks to be conducted by Contractor in presence of Architect to demonstrate adequate surface draining characteristics and grading. Test method to be determined by Architect. • Specific review of finish consistency • Specific review of trip hazards

1.09 Closeout

A. Provide the following Close Out materials in accordance with Division 1

Item	Description
Product Manuals	• n/a
System Manuals	• n/a

1.10 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1 • General Contractor, Sub Contractor and Manufacturer to provide warranty against defects in materials or workmanship. Replacement or repair of such defects shall be repaired or replaced in a timely fashion at no additional cost to the Owner
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Concrete

A. All concrete shall be transit mixed in accordance with ASTM-C-94.

B. All concrete shall have a minimum compressive strength of 3,000 psi at 28 days, consisting of 3/4 inch maximum sized aggregate, minimum 5-1/2 sacks of cement per cu. yd., with a maximum slump of 4 inches.

C. Cement shall be Portland cement conforming to ASTM C-150, Type II. Temperature of cement delivered to the batch plant shall not exceed 150 degrees F.

D. All Aggregates shall conform to ASTM C-33-81. Fine aggregates shall be washed natural sand graded per ASTM C33.

E. Water shall be clean and free from deleterious substances.

F. Admixtures shall conform to ASTM Designation C 494, and shall be approved by the Architect. Air Entrainment, if used, shall conform to ASTM D-233, to entrain 3-5% air.

G. Provide color additive to match other existing campus walks.

2.02 Drypacking

A. Drypacking shall consist of one part each cement, fine aggregate (100% to pass No. 4 sieve), and nonstaining, non-shrink grout aggregate. Mix well per manufacturer's instructions with only enough water to cause hydration. Make consistency of mixture such that a ball of drypacking compressed in the hand will maintain shape showing finger marks, but not surface water.

2.03 Bonding Agents and Grout

A. Epoxy bonding agent shall be Concresive AEX 1438 as manufactured by Master Builders, San Mateo, CA or an approved equal.

B. Non-shrink grout shall be Masterflow 713 as manufactured by Master Builders, 5-Star grout as manufactured by U.S. Grout Corp., or an approved equal.

C. Ceramic epoxy shall be Heltig Burke Concrete Products or Ramset, applied in accordance with the manufacturer’s printed directions.

2.04 Reinforcing Steel

A. Reinforcing bars shall be uncoated billet steel bars complying with ASTM 615, Grade 40. Tie wires shall be #16 minimum, black and annealed.

B. Accessories shall be metal or plastic spacers, and supports appropriate for the requirements of supporting or securing the reinforcing in place.

C. All reinforcing shall be cleaned of loose rust, mill scale, and all deleterious substances. Bend cold bars accurately.

D. Flame cutting of reinforcing bars is **prohibited**.

2.05 Color Conditioner

A. All color conditioned concrete shall be Solomon Colors, Chromix Admixture by L. M. Scofield Co. of color selected by the Architect. Provide samples and mock up for Architect's approval and installation in full accordance with the manufacturer’s recommendation.

B. Assume premium colors as basis for bid. No limitation will be placed on color selection by Contractor.

C. Color shall match existing concrete paving at site, or as otherwise directed by the Architect.

2.06 Control Joints

A. Use Burke O.A.E. plastic zip-strip joint former, 1 1/2 inches in depth.

B. Match control joint patterns of existing concrete paving on site, or as otherwise directed by the Architect.

2.07 Expansion Joints

A. Use Burke, O.A.A.E. **full depth** by 1/2 inch wide with 1-inch deep breakaway top for placement of backer rod and sealant.

2.08 Soil Sterilent

A. A commercially available pre-emergent herbicide such as “Atrazine”, “Treflan”, or approved equal, as recommended by a State of California appropriately licensed individual.

2.09 Other Materials

A. Sub-grade: Cal-Trans Class II base rock or eq. Min. 4".

B. Forms: Wood material, profiled to suit conditions.

C. Joint Filler: Asphalt impregnated wood fiberboard.

Part 3. Execution

3.01 Scheduling

A. Work shall be performed during periods that will not affect the daily operations of the school campus. Work shall be scheduled/phased with the architect and owner to occur when school is not in session or at other approved times.

3.02 Soil Sterilent

A. Soil sterilent shall be spread over the sub grade surface in accordance with manufacturer’s directions

B. Contractor shall take all precautions to avoid overspray or runoff onto planting areas, play areas, or other surfaces.

3.03 Sub-grade

A. Prepare sub-grade to receive base rock or drain rock. Grade to accommodate required levels at building entries and at existing paving to remain.

B. Provide slope as required for sub-drainage system (where occurs).

C. Place base rock min. 4" in depth. Compact as required for selected material. Adjust finish grade to receive concrete formwork and concrete.

3.04 Examination and Preparation

A. Verify gradients and elevations of base.

B. Verify compacted subgrade is ready to support imposed loads.

C. Moisten substrate to minimize absorption of water from fresh concrete.

3.05 Forming

A. Place and secure forms to correct location, dimension, and profile.

B. Place joint filler in joints, vertical in position, in straight lines. Secure to formwork.

C. Place expansion joints as indicated. Align joints with existing.

D. Place joint filler between paving components and other appurtenances.

3.06 Reinforcement

A. Place reinforcement at mid-height of slabs-on-grade.

B. Interrupt reinforcement at expansion joints.

3.07 Preparation

A. Verify that all items to be embedded in concrete are properly placed and that all required clearances from reinforcing are met.

B. Thoroughly clean and roughen existing concrete and remove all standing water, wood scraps, or other debris from the areas in which concrete will be placed.

3.08 Placement

A. Convey all concrete to place of final deposit by methods that will prevent separation and loss of material. Place concrete as dry as practical, consistent with specified slump, and with a maximum temperature of 80 degrees F and minimum temperature of 50 degrees F at the time of placement. Do not use retempered concrete.

B. Thoroughly consolidate and compact the concrete by suitable means during placement, completely embedding reinforcing steel, anchors, and filling of corners.

C. Tamp slabs with a jitterbug and depress course aggregates, using pushfloat to level and finish to screeds without depressions. Trowel slabs to a smooth, dense surface, and finish as noted.

D. Wet slabs shall meet all screeds and existing work accurately and shall not rise above or be below them. Carefully contour at all new or existing imbedded items so as to avoid depressions or obstructions. No bird baths!

E. Make all slabs even and uniform in appearance, sloped uniformly to provide even fall or drainage. All surfaces shall have a slip-resistant finish.

F. Cure concrete for a minimum of five (5) days before removal of forms. Use spray applied biodegradable monomolecular curing compound for slabs such as Master Builders "Confilm."

G. Water-spray all concrete for minimum of three (3) days, and keep moist at all times during daylight hours.

3.09 Finishing

A. Sidewalk finish to match existing, originally constructed walks in color, texture, joint pattern and edge detail or as otherwise directed by the Architect.

B. Slopes less than 6% shall be light broom finish (at least as slip-resistant as a medium salted finish, regardless of actual finish specified). Slopes greater than 6% shall be slip resistant.

3.10 Defective Work

A. Immediately after forms are removed, inspect concrete surfaces. If voids, rock pockets, or other imperfections exist, patch before concrete becomes thoroughly dry.

B. Patching of minor defective areas shall include the wetting of the area to be patched and the surrounding area, the pre-coating of the area to be patched with the epoxy bonding agent specified, and the patching of the area with non-shrink grout, as specified, and in accordance with the respective manufacturer's printed recommendations.

C. Architect reserves the right to reject and require replacement of defective concrete work for reasons including, but not limited to, the following:

1. Deficient grades and “bird baths”
2. Deficient edge and joint tooling
3. Inconsistent finish texture or color
4. Inconsistent joint width and depth

End of Section

Section 02730

Pavement Marking

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
General	• Striping as indicated on site plan for parking, access routes, traffic control
Special Coordination	• Coordinate layout in field with Owner and Architect prior to commencing operations

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 References

References	• State of California "CALTRANS Standard Specifications," Sections 12, 82, 84 and 85. • Manufacturer specifications and recommendations. • Perform all work in accordance with all applicable laws, codes and regulations required by the City of San Jose. • Accessible parking: CBC 1129B

1.04 Submittals

A. Provide the following submittals per the requirements of Section 01330.

Item	Description
Catalog Cuts	• n/a
Product Data	• Information on painting product
Samples / Mock up	• Provide sample area of painting on pavement for Owner / Architect review prior to proceeding.
Shop Drawings	• Provide striping layout plan. 8.5 x 11 diagrams are acceptable for this scope of work • Provide stencils for lettering and symbols.
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.05 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Surplus Materials	• Provide 5 Gallons of surplus paint

Part 2. Products

2.01 Painting

A. Traffic marker paints shall conform to CALTRANS Standard Specifications 84-3.02 (Materials).

B. Colors selected as indicated on plans.

2.02 Accessible Parking Identification (where / if indicated on drawings)

A. Accessible Parking Stall Symbol: Provide one international wheelchair surface identification symbol sign at each accessible parking stall per California Building Code. Submit dimensioned scale drawing of stencil.

B. Accessible Parking Access Aisle Striping: Provide diagonal striping at each accessible parking access aisle, along with the words “NO PARKING” as shown on the Drawings and per California Building Code. Submit dimensioned scale drawing of lettering.

Part 3. Execution

3.01 Preparation

A. Pavements shall be fully cured and clean.

B. Lay out markings accurately and obtain approval before installation.

1. International Symbol of Accessibility shall be white on blue field at each parking space indicated as accessible parking.
2. Striping line width shall be 4”, color white, unless otherwise directed.
3. Traffic stripes delineating parking spaces parallel to curbs shall be 8”, color white.
4. Stop lines shall be 12”, color white.

C. Pavement markings shall be applied only on dry surfaces during periods of favorable weather. Temperature shall be above 35 degrees F. and rising, humidity less that 80 percent and falling, and no precipitation predicted for 24 hours.

3.02 Installation

A. Install pavement markings in accordance with reference standards.

B. Painted traffic stripes and pavement markings shall be applied in accordance with CALTRANS Standard Specifications 84-3.03 through 84-3.05.

C. Edges shall be clean and well defined.

D. Apply two coats of paint to the satisfaction of the Project Inspector.

3.03 Cleaning

A. Excess adhesives or paint overspray or tracking onto unmarked areas shall be removed per Section 01700.

B. Remove from premises; equipment, debris and surplus material needed for, or resulting from this work.

C. All work shall be left in a condition satisfactory to the Architect.

End of Section

Section 02740

Aggregate Base

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• Import, placement and compaction of base material under relocatable buildings. • Spreading and compaction of aggregate base to finish grades specified on Drawings • Weed killer and sterilization

B. Related work may be described in other sections of this Project Manual. All sections of this Project Manual and all other Contract Documents shall be considered related by the Contractor.

1.03 Submittals

A. provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• n/a
Samples	• n/a
Shop Drawings	• n/a
Product Data	Contractor shall arrange and provide for the following acceptance tests to be performed on samples taken at the job site, based on frequency of one series of tests per 3,000 tons of materials placed: • “R” Value, per California Test Method 301 • Sieve Analysis, per California Test method 202 • Sand equivalency, per California Test Method 217 • For aggregate bases, the durability index, per California Test method 229.
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation.

References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

Item	Description
Standards	• ASTM D-1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. • Spreading and compacting of aggregate sub-base material shall conform to the applicable provisions of Section 25 of the State Standard Specifications. • Spreading and compacting of aggregate base material shall conform to the applicable provisions of Section 26 of the State Standard Specifications.
Quality Standard	

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Provide the Architect’s field representative daily with 1 copy of a material certificate signed by the material producer certifying that each material item complies with or exceeds the specified requirements for each type of material delivered • Provide the Architect’s field representative daily with 1 copy of certified plant load out slips for each load of material delivered showing net weight of the particular material delivered, to be attached to the appropriate material certificate • Allowable Tolerances: Finish surface of the aggregate base or aggregate sub-base courses shall not vary more than .05’ from the grade established by drawings.
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

- Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM Designation D1557.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• Sub-base Compaction Testing, coordination with Owner's Testing Agency
Special Inspections	• Per DSA Testing and Inspection Form

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	• Per Division 1.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector;
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Commissioning

A. Provide Commissioning procedures and products per requirements of Division 1. Commissioning procedures shall include, but not be limited to, the following:

Item	Description
Drainage	• Selective Grade spot checks to be conducted by Contractor in presence of Architect to demonstrate adequate surface draining characteristics and grading. Test shall be performed prior to placing buildings on aggregate base. Test method to be determined by Architect.

1.09 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Product Manuals	• Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	• Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems.
Maintenance Tools and materials	• n/a

Surplus Materials	• n/a
Training	• n/a

1.10 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Aggregate Base

A. Import new Class 2 aggregate base to be installed to the depth indicated on Drawings.

B. Aggregate Sub-base materials shall conform to the requirements for Class 2 Aggregate Sub-base contained in Section 25-1.02A of the State Standard Specification.

C. Aggregate Base materials shall conform to the requirements for Class 2 Aggregate Sub-base contained in Section 25-1.02B of the State Standard Specification.

Part 3. Execution

3.01 Environmental Requirements

A. Aggregate base or sub-base material shall not be placed until the subgrade has been approved.

B. Provide satisfactory dust alleviation and control measures continuously during the course of the work.

3.02 Examination and Preparation

A. Verify gradients and elevations of base.

B. Verify compacted subgrade is dry and ready to support paving and imposed loads.

C. Provide Filter Fabric over prepared sub grade pad, prior to placement of base rock material. Filter Fabric shall serve as a means for future removal of base rock material, by Owner.

3.03 Sub-Base Construction

A. Sub-base material shall be placed, spread and compacted in conformance with Section 25-1.04 and 1.05 of the State Standard Specification.

B. Sub-base material shall be compacted to a relative density of not less than 95% when tested in accordance with the requirements of ASTM Standard 1557.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

3.04 Base Construction

A. Base material shall be placed, spread and compacted in conformance with Section 26-1.035, 1.04 and 1.05 of the State Standard Specification.

B. Sub-base material shall be compacted to a relative density of not less than 95% when tested in accordance with the requirements of ASTM Standard 1557.

C. Finish grade of aggregate base shall provide for positive drainage from under relocatable buildings, as indicated on Drawings.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

3.05 Weed Killer

A. A non-crystallizing type weed killer shall be spread over the sub grade surface in accordance with manufacturer's directions. Weed killer shall prevent germination and growth of all weeds in the sub-base materials to attain required compaction density.

End of Section

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Section 02780

Detectable Warning Pavers

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	Pre-cast Concrete Architectural Pavers with detectable warning (truncated domes) surface
Special Coordination	Installation of pavers at concrete and asphalt paving Preparation of bedding/substrate for pavers

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	Cut sheets, including dimensioned drawing of truncated dome pattern
Product Data	Manufacturer's Installation Instructions Product Data for tiles, sealant, and mortar
Reports	Test reports from an independent testing laboratory for compliance with performance requirements specified below.
Samples	(1) full-size (12"x12" min) paver, plus samples of all manufacturer's standard available colors
Shop Drawings	Layout, pattern, and relationship of paving joint to fixtures or other formed details at each area installed.
Schedule	Include Schedule entry on Gantt Chart for Installation

1.04 References/Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining "Industry Standards" and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references,

the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References
California Building Code, Section 1127B.5.7
Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 4.29: Detectable Warnings
California Division of the State Architect (DSA) Interpretation of Regulations IR-11B-4: Detectable Warnings

Standards

American Concrete Institute (ACI)

ACI 305, Standard Specification for Hot Weather Concreting.

ACI 306, Standard Specification for Cold Weather Concreting.

American National Standards Institute (ANSI)

ANSI A118.4-99, Latex-Portland Cement Mortar.

ASTM International

ASTM C 39-04, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

ASTM C 97-02, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone

ASTM C 140-03, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

ASTM C 144-04, Standard Specification for Aggregate for Masonry Mortar.

ASTM C 150-05, Standard Specification for Portland Cement.

ASTM C 418-98, Standard Test Method for Abrasion Resistance of Concrete Sandblasting.

ASTM C 496-04, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

ASTM C 920-05, Standard Specification for Elastomeric Joint Sealants.

ASTM C 936-01, Specification for Solid Concrete Interlocking Paving Units.

ASTM C 947-03, Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber-Reinforced Concrete (Using Simple Beam With Third-Point Loading).

ASTM C 1028-96, Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.

ASTM C 1262-98, Standard Test Method for Evaluating Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.

International Concrete Repair Institute (ICRI)

ICRI Technical Guideline No. 03732, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Manufacturer	Manufacturer shall be a company specializing in the manufacture of pre-cast concrete pavers for a minimum of (3) years.
Qualifications of Workers	Installation shall be by a contractor and crew with at least (3) years of experience in placing concrete pavers on projects of a similar nature. General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation.
Substrate Acceptance	General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	Per Division 1
Testing	Manufacturer shall provide test results from an independent testing laboratory to demonstrate compliance with performance requirements given below.
Special Inspections	Per DSA Testing and Inspection Form

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	Per Division 1.
Inspection	Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	Refer to DSA Testing and Inspection Sheet
Special Inspections	Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Product Manuals	Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems. Provide written instructions for recommended maintenance.
Surplus Materials	Provide not less than 1 percent of the total product installed maintenance stock for each type, color, pattern, and size of paver installed. Furnish maintenance materials from the same lot as materials installed, and enclosed in protective packaging with identifying labels. Deliver maintenance materials to the owner.

1.09 Warranty

Provide written warranty in accordance with Division 1

Item	Description
Warranty Form	Per Division 1
Warranty Period	Manufacturer/Installer shall warrant installed system against failure of workmanship and materials for a period of (3) years.
Warranty Start	Date of Substantial Completion

Part 2. Products

2.01 Manufacturers

A. Acceptable Manufacturers

1. Tekway Dome-Tiles by StrongGo Insdustries, Tucson, AZ, www.stronggo.com
2. or Approved Equal (submit product substitution in accordance with Division 01)

2.02 Precast Tactile Warning Surface Tiles

A. Composition of Standard Tiles: Polymer concrete mix with blended aggregates.

1. Compressive Strength: Greater than 11,700 psi; ASTM C 39.
2. Tensile Strength: Greater than 2,300 psi; ASTM C 496.
3. Flexural Strength: ASTM C 947.

   (a) Top Surface in Tension:

   (i) Yield Strength: Greater than 2,000 psi.
   (ii) Ultimate Strength: Greater than 2,900 psi.

   (b) Molded Surface in Tension:

   (i) Yield Strength: Greater than 1,800 psi.
   (ii) Ultimate Strength: Greater than 2,900 psi.

4. Water Absorption: Less than 0.49 percent; ASTM C 140.
5. Abrasion Resistance: Less than 0.03 cm3/cm2; ASTM C 418.

6. Freeze-Thaw Durability: No change; ASTM C 1262.
7. Static Coefficient of Friction per ASTM C-1028

   (a) Surfaces with Slopes 1:20 or Less: 0.6, minimum.
   (b) Surfaces with Slopes Greater Than 1:20: 0.8, minimum.

B. Tile Size

1. Provide tiles in the following nominal sizes: 12”x12”, 24”24”, 24”x30”, 24”x36”, 30”x36”
2. Use the largest tile sizes possible at each area to minimize joints.

C. Truncated Dome Dimensions:

1. Domes shall be .20” high,.90” diameter at base, .45” diameter at top
2. Staggered rows, 2.35” o.c. (1.67” o.c. at 45 degrees to path of travel)

D. Thickness: 11/16”, dimension tolerance ±0.0625”

E. Anchoring System: Tiles shall include galvanized threaded nuts embedded into back of tile to receive galvanized bolt anchors.

F. Colors to be selected by Architect from manufacturer’s stock color chart

1. manufacturer shall offer at least (6) standard colors
2. up to (2) colors may be chosen per project

2.03 Setting: Mortar Materials

A. Medium Bed, Polymer Modified, Single Component Mortar: Provide materials composed as follows, with physical properties equaling or exceeding those required for thin-set mortars based on testing of medium-bed specimens according to ANSI A118.4:

1. Prepackaged dry-mortar mix combined with acrylic resin liquid-latex additive.

   (a) Products:

      (i) Mortar: Kerabond, Mapei Corporation
      (ii) Latex Additive: Keralastic, Mapei Corporation.

2. Prepackaged rapid-setting mortar mix containing hydraulic cement.

   (a) Product: Granirapid System, Mapei Corporation.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

C. Aggregate: Washed natural sand conforming to ASTM C 144.

D. Water: Potable.

2.04 Elastomeric Sealants

A. Urethane Sealant: ASTM C 920.

1. Acceptable Products:

   (a) Sikaflex - 1a; Sika Corporation, Inc.
   (b) Ultra or NP 1; Sonneborn, Division of ChemRex Inc.
   (c) Vulkem 116; Tremco.

2. Type: Single component (S).
3. Grade: Nonsag (NS).
4. Class: 25.
5. Uses: Traffic (T) and mortar (M).

6. Color: Provide color of sealant to match color of tactile warning surfacing tiles adjoining sealed joints.

2.05 Mortar Mixes

A. Mortar for Thin-Set Installation: Mix to comply with ANSI A118.4 and mortar manufacturer's written instructions.

B. Mortar for Wet Installation: Mix 3:1:1 ratio of portland cement, aggregate, and water.

C. Use equipment and procedures that produce mortar of uniform consistency and quality.

Part 3. Execution

3.01 Examination

A. Examine concrete substrates and adjacent conditions where tactile warning surfacing will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tiles.

1. Verify that concrete is structurally sound, clean, and free of dust, oil, grease, curing or sealing compounds, laitance, or any other material, which could impede adhesion.
2. Verify that joints are coordinated with tactile warning surfacing tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
3. Verify that depth of recess is sufficient to accommodate both tile and setting mortar thicknesses to ensure a flush installation within tolerances specified.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Delivery, Storage, and Handling

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Store tactile warning surfacing tiles and cementitious materials on level, elevated platforms, under cover, and in a dry location.

3.03 Preparation

A. If concrete substrate does not have a raked surface, mechanically abrade substrate to a concrete surface profile of CSP No. 6 or greater in accordance with ICRI Guidelines.

B. Fill holes, cracks or depressions with trowelable leveling and patching compound. Use a product specifically recommended by setting mortar manufacturer.

3.04 Installation, General

A. Weather Conditions

1. Do not proceed with installation when ambient and substrate temperature conditions are outside limits permitted by manufacturers of the following:

   (a) Tactile warning surfacing tiles.
   (b) Joint sealant.
   (c) Setting mortar.

2. Do not install pavers during rain.

B. Install Pavers per Manufacturer's recommended procedure and details for wet concrete or thin set installation. See additional Installation sections below.

C. Lay out tactile warning surfacing tiles centered in the work area in both directions so that perimeter tiles are more than 1/2 of tile width.

D. Cut tiles using a concrete saw with a diamond blade. Provide clean, sharp, unchipped edges on cut tiles. Where cuts are made through domes, grind the remaining dome flush with tile surface.

1. Half-Cut Tiles: Ensure at least six anchors are retained in each cut tile that is installed.
2. Irregular Shape Tiles: Cut tiles to provide the most number of anchores possible, but ensure a minimum of one anchor is retained in each cut tile that is installed.

E. C. Joint Width:

1. Perimeter: 1/8 inch.
2. Between Tiles: 1/16 inch.

F. Brush back of tactile warning surfacing tiles with a stiff, moist brush to remove loose aggregate.

G. Set tile surface (base of domes) flush with the adjacent surfaces and other tactile warning tile surfaces.

H. Set tiles so that domes align between tiles in both directions.

I. Tolerances: Compared to level, or indicated slope, for finished tactile warning surfacing.

1. Lippage: Not to exceed 1/16-inch tile-to-tile offset from flush.
2. Overall: Not to exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet.

3.05 Installation, Wet Concrete Method

A. Place concrete in accordance with requirements of Section 03300 “Cast-In-Place Concrete.”

1. Comply with ACI 305 and ACI 306 for hot- and cold-weather placement when temperatures exceed or drop below the thresholds specified in the respective standards.

B. Remove no more than 3/4-inch of the fresh concrete in the area where tiles are to be installed using a hand trowel or manufacturer’s template and square-end shovel. Level area using a wood float.

C. Lightly dampen back of tiles using a brush.

D. Insert number of bolt anchors indicated below into all available embedded nuts in back of tiles per manufacturer’s instructions.

1. Full Size Tiles: 5 anchors.
2. Cut Tiles: As many anchors as possible.

E. Apply setting mortar to entire back of tiles in thicknesses indicated below before placing tile in fresh concrete.

1. Full Size Tiles: 1/8-inch.
2. Cut Tiles: 3/8-inch.

F. Set tiles in place with slight twisting motion.

G. Use a rubber mallet to lightly tamp tiles to ensure bond.

H. Verify proper slope. Remove and reset if tile does not comply with tolerances indicated.

I. Finish concrete edge adjacent to tactile warning surfacing with a 1/8-inch-radius edging tool. Finish and cure exposed concrete surfaces in accordance with the requirements of Section 03300 “Cast-In-Place Concrete.”

3.06 Installation, Thin-set Method

A. Saturate concrete substrate with clean water several hours before placing mortar setting bed. Remove standing surface water about one hour before placing mortar setting bed.

B. Lightly dampen back of tiles using a brush.

C. Apply setting mortar material to entire back of tiles in thicknesses indicated below and set tiles firmly with a light twisting motion to ensure good contact.

1. Full Size Tiles: 1/8-inch.
2. Cut Tiles: 3/8-inch.

D. Tamp or beat each tile with beating block and a rubber mallet to ensure tile is embedded into mortar setting bed. Set each tile in a single operation before initial set of mortar.

3.07 Sealant Installation

A. After tactile warning surfacing tiles have set, fill perimeter joint and joints between tiles with elastomeric sealant.

B. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

C. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

3.08 Cleaning and Protection

A. Remove protective covering from tiles immediately upon completion of installation.

B. Cleaning: Remove excess mortar and sealant from exposed tile surfaces; wash and scrub clean.

C. Protection: Keep pedestrian and vehicular traffic off tactile warning surfacing until mortar and sealants have set. Follow the setting mortar material and sealant manufacturers' instructions.

End of Section

Section 02800

Chain Link Fencing and Gates

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section. Items noted here are those specifically related to the General Contractor'

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• Provide chain link fencing where shown on drawings. • New chain-link fence and plastic slats where shown on Drawings • New hinged gates where shown on Drawings • New rolling gates where shown on Drawings

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• Description
Product Data	• Description
Samples	• Plastic Slats
Shop Drawings	• Layout of fencing with field verified dimension • Coordination with work by others, if any, such as footings and paving
Schedule	• Include Schedule entry on Gantt Chart

1.04 References / Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining "Industry Standards" and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	• ASTM-A392 Specification for Zinc-coated Steel

Chain Link Fencing

- ASTM A 653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy Coated (Galvanealed) by the Hot-Dip Process
- ASTM-F567 Practice for Installation of Chain Link.
- ASTM-F626 Specification for Fence Fittings
- ASTM-F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Weld, for Fence Structures
- ASTM F1553 Guide for Specifying Chain Link Fence
- Unless otherwise shown or specified, all materials and methods involved in chain link fence fabrication shall conform to Section 80 of the State of California, Department of Transportation Standard Specifications (DTSS).

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project. • Chain Link Fencing shall be installed by a firm that has not less than 5-years successful experience in the installation of systems similar to those required.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Installer shall fully inspect all related work by other trades prior to commencing installation of new chain link fencing.
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• n/a
Special Inspections	• Per DSA Testing and Inspection Form

Mock Ups	• n/a

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	• Per Division 1.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1

Item	Description
Product Manuals	• Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	• Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems.
Maint. Tools/Materials	• n/a
Surplus Materials	• n/a
Training	• n/a

1.09 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1 • Contractor, Subcontractor and Manufacturer to provide warranty against defects in materials or workmanship. Replacement or repair of such defects shall be repaired or replaced in a timely fashion at no addional cost to the Owner.
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Acceptable Manufacturers

A. USX-Cyclone

B. San Jose Steel

C. Anchor Fence

D. Products from qualified manufacturers having a minimum of five years experience manufacturing galvanized coated chain link fencing will be acceptable by the architect as equal, if approved in writing, ten days prior to bidding, and if they meet the following specifications for design, size gauge of metal parts and fabrication.

E. Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

2.02 Fencing Materials

A. Fabric: Chain link, 9-gauge with a uniform square mesh measuring approximately 2 inches between its parallel sides, woven galvanized wire, with a minimum of 1.20 oz per square foot. Selvage of fabric 1-1/4" at top & bottom.

B. Posts: Intermediate posts shall be hot dipped galvanized Sch. 40 steel pipe, 2-3/8 inches outside diameter. Terminal posts shall be 2-7/8 inches outside diameter for fences 6'-0" and higher.

C. Chain link fence accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.

D. Top Rail and Tension Wire: The fence shall have a continuous top rail for its full length of galvanized steel 1-5/8 inches outside diameter tubing, weighing 1.73 pounds per foot; and a bottom galvanized 6-gauge tension wire.

E. Truss Braces: Truss braces and truss rods with turnbuckle attachments shall be installed between terminal posts and each adjacent intermediate post; sizes and specific locations as engineered by the fabricator and approved on the shop drawing. Braces, trusses, and hardware fittings shall be galvanized to match posts, rails, and fabric.

F. Fittings: All fixed component parts, such as post tops, bands, connections and rail ends, shall be galvanized . All hog rings and tie wire shall be galvanized wire. Terminal post tops shall be simple C-shaped without ornamentation. Provide posts tops that permit the passage of top rail for intermediate posts.

G. Post caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one cap for each post.

H. Top rail and brace rail ends: Pressed steel per for connection of rail and brace to terminal posts

I. Top rail sleeves: 7" expansion sleeve with spring, allowing for expansion and contraction of top rail

J. Wire ties:9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.

K. Tie Wires: Secure fabric with 9 gauge aluminum ties to intermediate posts at 1'-2" on center spacing and to rails at 2'-0" on center spacing. Secure fabric to tension wire with galvanized hog rings spaced 1'-0" on center.

L. Tension (stretcher) bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16" x 3/4" or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.

M. Truss rods & tightener: Steel rods with minimum diameter of 5/16

N. Nuts and bolts: galvanized

O. Slats: Provide slats on all chain link fabric. Provide Standard –PDS (self-locking using horizontal bottom channel system). All slats are manufactured from a combination of color pigments, quality high density virgin polyethylene and ultraviolet inhibitors. Architect to select color.

P. Gate Frame:

1. Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized steel tubular members, 2" diameter, weighing 2.60 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit.
2. For gates over 8' high or 15' wide, provide minimum 1-1/2" diameter additional horizontal and vertical interior members to ensure proper strength.
3. Hardware materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size.
4. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° inward or 180° outward.
5. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate. Latch shall conform with ADA and California Building Code standards.
6. Keeper: Provide keeper for each gate leaf over 5' wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
7. Double gates: Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.
8. Gate posts: Standard weight schedule 40; minimum yield strength of 25,000 psi , size as indicated. Hot-dipped galvanized with minimum 1.8 oz/ft² of zinc. Gates with leaf 6'-0" or less, post shall be 2-7/8" in dia. Minimum 5.79 lbs/ft. Gates with leaf 6'-1" to 12'-0", post shall be 4" in dia. Minimum 9.11 lbs/ft. Gates with leaf over 12'-0", posts to be coordinated with Architect.
9. Rolling Gates: Provide double-wheel carrier with rubber wheels, no wheel track in pavement; provide (2) sets of rear wheels and horizontal guide rails.

Part 3. Execution

3.01 General

A. Layout

1. Prior to commencing installation, Contractor shall stake layout and request a review by the District Representative to determine adjustments on site from locations shown on drawings.

B. Verify areas to receive fencing are completed to final grades and elevations.

3.02 Installation

A. Chain Link Fence Fabric: Shall be installed on the side of the posts closest to the street; tops and bottom selvage knuckled and attached to posts with 9-gauge hog rings spaced no further than twelve inches apart. Attach so that fabric remains in tension after pulling force is released. Leave approximately 2" between finish grade and bottom selvage.

B. Posts: Space line posts uniformly, maximum spacing 10'-0" on center.

C. Concrete Set: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, minimum 1'-0" which, and depths approximately 6"(152 mm) deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post. Slope to direct water away from posts. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

D. Termination Posts: Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more. Install horizontal pipe brace at mid-height for fences 6'-0" and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.

E. Tension Wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge hog rings 24" on center.

F. Tension (stretcher) Bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15" on center.

G. Top Rail: Install lengths, 21'-0" maximum. Connect joints with sleeves for rigid connections for expansion/contraction. Top rail shall pass through openings provided in the post tops and each length shall be coupled with a sleeve coupling, or by a 3 inch long swaged end. Fabric shall be attached to the top rail by means of double-wrap tie wires spaced at intervals of approximately 2'-0".

H. Tie Wires: Bend ends of wire to minimize hazard to persons and clothing

I. Fasteners: Install nuts on side of fence opposite fabric side for added security

J. Slats: Install slats in accordance with manufacturer's instructions

K. Gate posts: Drill holes in firm, undisturbed or compacted soil. For gate leafs 6'-0" or less, holes shall have diameter 4 times greater than outside dimension of post, minimum 1'-0", and depths approximately 6" deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts. Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations. For gate leafs greater than 6'-0" coordinate installation with drawings and Architect.

L. Swinging Gates

1. Install gates plumb, level, and secure for full opening without interference. Attach hardware by means which will prevent unauthorized removal. Adjust hardware for smooth operation.
2. All Swinging Gates shall meet all applicable requirements for doors, including ADA compliance.
3. Bottom 10" of gates to have a smooth uninterrupted surface.

M. Rolling Gates: Install gates plumb, level, and secure for full opening without interference. Attach hardware by means which will prevent unauthorized removal. Adjust hardware for smooth operation.

End of Section

Section 03516

Concrete Surface Preparation

Part 1. GENERAL

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
General	• Inspection of the concrete substrate • Removal and replacement of non-durable concrete • Decontamination of the concrete surface • Creation of surface profile • Repair of surface irregularities

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 References / Standard

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

General Polymers	• Form G-1 Revised 04/10
American Society for Testing and Materials	• ASTM D 4258 “Practice for Surface Cleaning Concrete for Coating” • ASTM D 4260 “Standard Practice for Acid Etching Concrete” • ASTM D 4261 “Practice for Surface Cleaning Unit Masonry for Coating” • ASTM D 4262 “Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces”
International Concrete Repair Institute	• Technical Guideline No.03732, “Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays”. Includes visual standards to act as a guide in defining acceptable surface profiles for the application of

	industrial coatings and polymer floor toppings. • Technical Guideline No.03730, "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion".
The Society for Protective Coatings	• SSPC-SP 13 Surface Preparation of Concrete • SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

1.04 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Test Reports	Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria
Schedule	Include Schedule entries on Gantt Chart for shop drawing production and approval, fabrication and installation

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	**Description**
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• Firm experienced in the necessary craft • Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section • General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Manufacturer's Product Information shall expressly indicate that the proposed product is appropriate for the intended use
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item. • 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.

1.06 Quality Control

A. Inspection of the concrete substrate to determine its general condition, soundness, presence of contaminants, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the owner or the owner's appointed representative is critical. A proper evaluation will lead to the selection of the proper tools and equipment to accomplish the objective

Item	Description
Observation	• Per Division 1.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Preliminary Relative Humidity Test ASTM F 2170 was conducted 11-15-11. This report will be provided as a REFERNCE ONLY DOCUMENT and does not relive the Contractor of required testing mandated in Specifications.
Special Inspections	• Refer to DSA Testing and Inspection Sheet
Mock Up	• Contractor shall provide 4'x4' area mock-up of prepared surface. Contractor may not continue with work scope until review by Architect.

1.07 Warranty

A. Provide written warranty in accordance with Division 1

Part 2. Products

Part 3. Execution

3.01 Inspection

A. **Inspection of the concrete substrate** to determine its general condition, soundness, presence of contaminants, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the owner or the owner's appointed representative is critical. A proper evaluation will lead to the selection of the proper tools and equipment to accomplish the objective

B. **Removal and replacement of non-durable concrete** must be accomplished prior to installation of the polymer system. Localized weak or deteriorated concrete must be removed to sound concrete and replaced with cementitious or polymer concrete repair mortars, or an engineered concrete mix design utilizing 4700 series polyacrylate polymer additive. For application of these systems and compatibility with the selected polymer sealer, coating, lining or topping refer to the System Bulletins, Technical Data Sheets or the Technical Services Department. Occasionally, plain fresh concrete is required and must be bonded to existing concrete. When bonding fresh concrete to existing, prepare the existing concrete surface by scabbling, scarifying, abrasive (sand) blasting, needle scaling, high pressure water jetting (5,000 to 45,000 psi), or steel shotblasting. Apply a low modulus epoxy as the bonding agent at a rate of 80 square feet per gallon for a WFT of 20 mils, and then place the fresh concrete or mortar. Bonding to lightweight concrete may require a second coat of epoxy if the first coat is readily absorbed into the concrete surface. Always place the fresh concrete within the open time of the epoxy, while the epoxy-bonding agent is still wet. Rough concrete surfaces will require additional material depending on the

surface profile. Fresh concrete should have a low water cement ratio (w/c) not to exceed 0.40. When bonding fresh concrete containing latex polymer admixtures, check compatibility of the latex modified concrete mixture by either installing a test patch and performing a pull-off test, or by conducting a slant shear test in accordance with ASTM C 882, in an independent concrete testing laboratory.

3.02 Decontamination

A. . **Decontamination of the concrete surface** requires the removal of oils, grease, wax, fatty acids and other contaminants, and may be accomplished by the use of detergent scrubbing with a heavy duty cleaner/degreaser, low pressure water cleaning (less than 5,000 psi), steam cleaning, or chemical cleaning. The success of these methods is dependent upon the depth of penetration of the contaminant; which is completely dependent upon the contaminant's viscosity, the concrete's permeability and the duration of exposure. Special care should be taken when preparing concrete at an "in use" facility for repair, replacement or an initial floor topping. This is especially true for Food Processing facilities. Contaminants can be carried into exposed concrete as most of these facilities use copious amounts of water. The contaminants can be animal fats/oils, blood, cleaning solutions, microbes, etc. They may not be completely removed during preparation (shot blasting). The concrete may appear clean and well profiled.

B. A simple method to ensure you have sound concrete is to test the pH. The chemistry of concrete is alkaline in nature. Normal concrete should be in the range of 11 to 13. Most of the contaminants mentioned are neutral to acidic in nature. After preparation test the floor in multiple locations using distilled water and the pH paper. If the pH is 10 or lower additional preparation will be required to ensure a good bond. In areas where the contaminants can not be removed, the contaminated concrete must be removed and replaced as in 2., above.

C. CAUTION: Decontamination methods that introduce large amounts of water may contribute to moisture related problems.

3.03 Surface Profile

A. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross sectional view of the surface of the concrete.

B. This dimension is defined pictorially and through physical samples in the ICRI Technical Guideline No 03732, and is expressed as a Concrete Surface Profile number (CSP 1-9).

C. For General Polymers AquArmorTM S, AquArmor MCS, FasTopTM MVT and other topping applications from 40 mils to 1/8", the surface profile shall be CSP 4, 5, or 6. These are typically accomplished through decontamination of the concrete as defined in 3.02 above, followed by light scarification, medium shotblast or medium scarification..

3.04 Repair of Surface Irregularities

A. Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains and doorways, etc. must be repaired prior to the placement of the polymer system and/or the system must be designed to off-set the thickness of the irregularities. For removal and replacement information and materials, refer to item 3.01., above. For bugholes and other minor surface irregularities, fill with Epoxy Quick Patch (3500), 4700 Instant patch Resin or the system resin mixed with a vertical grade aggregate. For treatment of cracks and joints refer to the section below entitled "Crack Isolation". For additional questions, contact the Technical Service Department or, your local sales representative for specific recommendations..

B. For specific applications, always consult General Polymers System Bulletins, Technical Data Sheets or Technical Services Department.

3.05 Methods of Surface Preperation

A. Depending upon conditions of the concrete one or more methods of surface preparation may be required. It is common for decontamination to precede mechanical preparation, and if necessary a second decontamination to follow.

B. The preferred methods for creation of a surface profile, including the removal of dirt, dust, laitance and curing compounds, is steel shotblasting. The steel shotblasting or vacuum blasting process is commonly referenced by equipment brand names, such as, Blastrac, Vacu-Blast, Shot-Blast, etc.

Application	Profile	Surface Preparation Method
Sealers	0-3 mils	• Detergent scrub • Low-pressure Water
Thin Film	4-10 mils	• Abrasive Blast • Steel Shot Blast
High-Build	10-40 mils	• Abrasive Blast Steel Shot Blast Scarifying
Self-Leveling	50mils - 1/8 inch	• Steel Shot Blast
Polymer Overlay	1/8- 1/4 inch	• Abrasive Blast Steel Shot Blast Scarifying

C. Surfaces to receive the bonded polymer system must be inspected after the surface is prepared to insure that the substrate is sound and structurally durable. Areas found to be unsound or non-durable must be removed and replaced as described in 3.01., above. Dust or other deleterious substances not removed after the initial surface preparation must be vacuumed, leaving the surface dust free and clean.

D. Other surface preparation methods are mentioned in ADDITIONAL SURFACE PREPARATION REFERENCES below.

3.06 Crack Isolation

A. The performance of elastomeric products such as EPO-FLEX® internally flexible epoxy, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.

B. Prior to application of an elastomeric system, control/contraction joints, construction joints, and cracks should be sealed with the selected system flexible sealant, i.e., 3580 Joint and Crack Filler, 4880 Polyurea Joint Sealant, EPO-FLEX flexible sealant. This coating should extend a minimum of 6” on either side of the joint or crack. The entire surface area should then receive the specified crack isolation system. Isolation and/or expansion joints should be detailed in accordance with the plans and specifications of an architectural or engineering design professional for the type of structure being considered. Consult the Architect for the proper selection and use of Isolation materials and the potential use of fiberglass scrim cloth for additional crack bridging capabilities.

End of Section

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Section 03100

Formwork

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Description

A. Furnish and install all cast in place concrete formwork as shown and specified, including the following:

1. Design of the formwork, shoring and falsework.
2. Placement of all cast-in anchors, inserts, bolts, sleeves and similar items, including those furnished under other sections.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Quality Assurance

A. Comply with the following codes and standards by the California Building Standards Commission and American Concrete Institute (ACI):

1. 2019 California Building Code (CBC).
2. ACI 347, “Recommended Practice for Concrete Formwork”.
3. Applicable jurisdictional agency.
4. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent will apply.

B. Design and provide engineering services as required, for all formwork and related items such as bracing and blocking, required for the concrete work to be placed on the Project. Design shall be in accordance with the requirements of ACI 347, the requirements of these Contract Documents, and the applicable Building jurisdiction agency.

1.04 Sequence / Scheduling

A. Coordinate installation of forms with other Sections, including but not limited to, Mechanical (Division 15), and Electrical (Division 16), to provide all required sleeves, blockouts, openings, reglets, chases, etc., required.

Part 2. Products

2.01 Materials

A. Forms: ACI 347, Table 4.1.

B. Miscellaneous Materials

1. Ties and spreaders: Factory fabricated, adjustable length, removable or snap-off metal ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal of forms. MeadowBurke, of a type which does not leave an open hole through the concrete and which permits neat, solid patching at every hole. Any metal shall be a minimum of 1-1/2 inches from the outer concrete surface. Site fabricated ties, wire ties, or wood spreaders are not permitted.
2. Corner forms, recess and chamfer strips: Extruded polyvinyl chloride specially produced for concrete formwork; MeadowBurke, Dayton Superior or approved equal.
3. Form coating and/or form release: VOC compliant, of a type which will not harmfully affect the appearance and/or utility of the concrete surface or the application of sealers, paint, vinyl fabric, or any other finishes; BASF MBT Rheofinish 211, Conspec By Dayton Superior, or approved equal.

Part 3. Execution

3.01 Design and General Construction

A. Design and construct all forms, falsework, supports, etc. to be adequate in size and strength for safety, and to resist all loads imposed upon them without deformation, deflection, or settlement.

B. Design and place shoring so the load from successive parts of the structure will be transmitted directly through the falsework to adequate support, without creating bending or shearing stresses in the concrete. Do not remove shores until supported members have attained sufficient strength to carry the imposed loads. Construct forms to permit their removal without disturbing the original shoring. Re-shoring will not be permitted.

C. Use wedges in pairs, or jacks to bring forms, shoring, or falsework for beams, girders, slabs and other parts of the structure to exact elevations, required camber and uniform bearing before pouring concrete.

D. Construct formwork to the shape, lines and dimensions of the concrete members and tight enough to prevent cement paste leakage. Tie, brace shore, and support forms to resist pressure from any source. Deflection of any member shall not exceed one-eighth inch (1/8 inch). Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads. Where possible, brace forms for exposed concrete without using form ties.

E. Arrange formwork to allow erection in the proper sequence and permit removal without hammering, prying or damaging the concrete. Identify exposed surfaces so that plywood panel and form tie spacing can be carefully arranged.

F. Leave temporary openings necessary for inspection and cleaning before depositing concrete.

G. Form release agent:

1. Thoroughly clean forms and coat with release agent prior to initial use and before each re-use.
2. Apply release agent in strict accordance with manufacturer's directions and coverage recommendations.
3. Avoid starved areas or excessive applications.
4. Apply release agent before reinforcing steel is placed.

3.02 Installation

A. Openings, reglets, inserts, etc.:

1. Refer to the entire set of project drawings for locations, sizes, and types of all openings, reglets, inserts, anchors, sleeves, cans, electric boxes, conduit, etc.

2. Frame for all openings.
3. Install all cast-in items such as listed in 1 above which are not specifically required to be installed in other sections. Coordinate the installation of items to be installed by other sections.
4. Install all cast-in items securely and in exact locations required. Verify that all required cast-in items have been installed prior to pouring concrete.

B. Set screeds for leveling of finish on slabs. Depress slabs where required to receive special floor finishes. Slope slabs to drain where required, or as shown. Check screed elevations frequently during the pour, for concrete elevations.

C. Install 3/4-inch chamfer at all vertical and horizontal outside corners, unless shown otherwise.

D. Before depositing concrete, remove all debris from the space to be occupied by the concrete and wet thoroughly. Verify that all reinforcement and inserts are secured in position. Remove all free-standing water. Do not leave wood in concrete, except nailers.

E. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within tolerances specified in ACI 347.

3.03 Removal and reuse of forms

A. Remove forms without damage to the concrete, only after concrete has hardened sufficiently to permit their removal with safety, and the members have attained sufficient strength to safely support the imposed loads. The minimum time before removing forms shall be:

1. Walls, columns, sides of beams and girders: 24 hours*
2. Horizontal forms of joists, beams and girders (Spans 20 ft. and less): 14 days
3. Horizontal forms of joists, beams and girders (Spans greater than 20 ft):21 days
4. Slabs (Spans 20 ft. and less): 7 days
5. Slabs (Spans greater than 20 ft.: 10 days

*If forms also support formwork for other members, removal time for the latter will govern.

B. Forms may be stripped in less than the specified days, provided all of the following are met:

1. Tests indicate an adequate strength as designated by the Structural Engineer at an earlier time,
2. The Structural Engineer approves the time of stripping, and
3. Immediately after stripping the concrete is sprayed with a clear sealer.

C. Form material may be re-used providing it is straight, free from nails, hardened concrete, or other injurious matter, and has edges and surfaces in good condition.

D. Clean and re-oil or apply form release to wood forms after each reuse.

E. Upon removal of forms, bolts, wires, clamps, rods, etc., not necessary to the work, shall be removed to minimum of 1-1/2 inches from the surface.

F. Forms for exposed concrete surfaces shall be removed in such manner as to preclude damage to finish. Pinch bars and similar tools shall not be used for prying against exposed surfaces.

End of Section

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Section 03200

Reinforcing Steel

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Description

A. Furnish and install all steel reinforcement and related items required for concrete work as shown and specified.

B. All concrete shall be reinforced unless specifically marked "not reinforced" on the drawings. If no reinforcement is shown, reinforce in the same manner shown in similar places. Unless otherwise noted, all reinforcement shall be deformed.

C. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Quality Assurance

A. Comply with the following adopted codes and standards by the California Building Standards Commission, American Concrete Institute (ACI), Concrete Reinforcing Steel Institute (CRSI) and American Welding Society (AWS):

1. 2019 California Building Code (CBC).
2. ACI 117:“Standard Specification for Tolerances for Concrete Construction and Materials”.
3. ACI 301:"Specifications for Structural Concrete for Buildings".
4. ACI 315:"Manual of Standard Practice for Detailing Reinforced Concrete Structures".
5. ACI 318:"Building Code Requirements for Structural Concrete".
6. CRSI 63: "Recommended Practice for Placing Reinforcing Bars".
7. CRSI 65: "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
8. CRSI "Manual of Standard Practice".
9. AWS B2.1: “Welding Procedure and Performance Qualification”.
10. AWS D1.4:"Structural Welding Code-Reinforcing Steel".
11. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent will apply.

B. Comply with the referenced ASTM standards for materials.

C. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with AWS B2.1.
2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests, and possess a current card.
3. If re-certification of welders is required, re-testing will be Contractor's responsibility.

D. Testing and Inspection:

1. All material shall bear mill tags showing quantity, grade and heat number identification, mill analysis and test reports.
2. Reinforcement placement shall be checked and inspected by the Project Inspector prior to placement of concrete.
3. Perform tensile tests and bend tests per CBC Section 1916A.2.
4. Reinforcement placement shall be checked and inspected by the Project Inspector prior to placement of concrete. See CBC Section 1907A.4.

1.04 Delivery, Storage and Handling

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size, length and heat number.

B. Store reinforcement off the ground on platforms, skids, or other supports.

C. Store reinforcement in a manner that will avoid excessive rusting and coating with grease, oil, and other deleterious materials.

D. Store reinforcement in separate piles or racks to avoid loss of identification after bundles are broken.

1.05 Submittals

A. Submit shop drawings showing sizes, grades, schedules, splicing, bending and placing details of reinforcement necessary for complete and accurate location of reinforcement.

B. Details of reinforcement not covered shall be in accordance with ACI 318 and ACI 315.

C. Detailing, fabricating, and spacing of reinforcement shall be equal or superior to ACI 315, unless otherwise indicated.

D. If welding reinforcing bars are indicated on the Drawings, or specified herein, submit the reinforcing bar manufacturer's Certificate of Weldability for each type of reinforcing steel.

E. Contractor shall check all Drawings for anchor bolt sizes and locations, anchors, inserts, conduits, sleeves, and other items, which are required to be cast in concrete.

1. Make necessary provisions as required so that reinforcing steel will not interfere with placement of such embedded items.
2. Reinforcing steel shall not be fabricated or placed before Shop Drawings have been approved and returned to Contractor.
3. Review of shop drawings will not relieve Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

Part 2. Products

2.01 Materials

A. General:

1. All reinforcement material: new and free from scale, rust, or coatings, which will reduce bond to concrete.
2. Unless otherwise noted, use only deformed reinforcement.

B. Reinforcing steel: Deformed billet steel bars, ASTM A615, Grade 60, except stirrups and ties #3 or smaller may be Grade 40. ASTM A706 for reinforcement to be welded.

C. Tie wire: 16 gauge or heavier, black annealed steel wire.

D. Welded wire fabric: ASTM A185.

E. Accessories:

1. Chairs, spacers, ties, and other devices: as necessary for proper placement and to adequately support the reinforcing in conformance. Supports shall be steel or precast blocks designed and fabricated in accordance with CRSI standards.
2. Devices such as chairs which will later be exposed: galvanized or otherwise corrosive resistant.

2.02 Fabrication

A. Fabricate all reinforcement in strict accordance with the approved shop drawings. Do not use bars with kinks or bends not shown on the drawings or on the approved shop drawings.

B. Reinforcing steel shall be cut and bent cold to exact lengths and shapes to comply with Drawings, reviewed shop drawings, and referenced codes and standards.

1. Contractor is responsible to assure that reinforcement will comply with Drawings, reviewed shop drawings, and referenced codes and standards.

C. Do not bend or straighten the reinforcing steel in a manner that will damage the material.

Part 3. Execution

3.01 Preparation

A. Prior to installation, carefully inspect the installed work of all other trades and verify that all such work is complete and to the point where this installation may properly commence. Verify that concrete reinforcement may be installed in strict accordance with all referenced standards, the approved shop drawings, and the drawings.

B. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. Before placing new reinforcing, clean all dirt, hardened concrete, loose rust, and all other materials which will hinder bond from existing reinforcing extending into the new work.

3.02 Installation

A. Prior to placing reinforcing, verify that required formwork is properly and securely installed.

B. Comply with the referenced standards. Place bars as shown, properly secured and supported, in the correct position and so as to prevent movement during concrete pouring. Support bars so that they will not displace when walked upon.

1. Maintain reinforcement at proper distance from form face.
2. Displacement of reinforcement shall be immediately corrected.
3. Tie wires shall be bent away from form.

C. Provide clearances, laps, and splices as shown, and as required in the referenced standards if not shown.

D. Do not bend or straighten the reinforcing steel in a manner that will damage the material.

E. When there has been a delay in placing concrete, reinforcement shall be inspected and, if necessary, cleaned, relocated, and tied at no additional cost to the Owner.

F. Wherever reinforcing bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits, piping, inserts, sleeves, etc., obtain Structural Engineer's approval for method of procedure before concrete is placed.

G. Splices not shown on the Drawings shall be approved by Structural Engineer in writing.

H. Unless permitted in writing by Structural Engineer or these specifications herein, reinforcement shall not be bent after being partially embedded in hardened concrete

I. Dowels shall be tied securely in place before concrete is deposited.

1. In event there are no bars in position to which dowels may be tied, No. 3 bars (minimum) shall be added to provide proper support and anchorage.
2. Bending of dowels larger than #5 after placement of concrete will not be permitted, unless otherwise indicated on Drawings.

J. Lay welded-wire fabric flat in place. Lap splices shall be made in such a way that the overlapped area equals the distance between outermost crosswires plus two inches. Stagger laps to avoid continuous laps in either direction.

K. In the event of a discrepancy, immediately notify the Structural Engineer. Do not proceed until all such discrepancies are fully resolved.

End of Section

Section 03300

Cast in Place Concrete

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Description

A. Furnish and install all cast-in-place concrete and related work as shown and specified.

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Quality Assurance

A. Except where different requirements are specified, comply with the following adopted codes and standards by the California Building Standards Commission, American Concrete Institute (ACI), and American Welding Society (AWS):

1. 2019 California Building Code (CBC).
2. ACI 117: “Standard Specifications for Tolerances for Concrete Construction and Materials”.
3. ACI 211.1 “Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete”.
4. ACI 301: "Specifications for Structural Concrete for Buildings".
5. ACI 304:"Recommended Practice for Measuring, Mixing Transporting, and Placing Concrete".
6. ACI 304.2R:"Placing Concrete by Pumping Methods".
7. ACI 305R:"Hot Weather Concreting".
8. ACI 306R:"Cold Weather Concreting".
9. ACI 308.1:"Standard Specification for Curing Concrete".
10. ACI 318:"Building Code Requirements for Structural Concrete".
11. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent will apply.

B. Comply with the referenced ASTM standards for materials and testing.

C. Coordination: The Contractor shall be responsible for installation of all accessories embedded in concrete and for provision of holes, etc., necessary for execution of the work of other trades.

D. Testing and Inspection:

1. Testing laboratory will be hired and paid for by Owner to:

   (a) Review all concrete mixes.
   (b) Test all concrete ingredients.
   (c) Test all cylinders.

(d) Perform inspection services to meet code requirements for special inspection.
(e) Review certificates of compliance, and samples of materials proposed for use.
(f) Take samples as required from sources designated by Contractor.

2. Contractor shall:

(a) Deliver all cylinders to laboratory carefully and at the proper time.
(b) Use weighmaster at batching plant.
(c) Hire and pay for testing agency to:

(i) Test extra cylinders for Contractor's use.
(ii) Retest when concrete does not meet specifications.

(d) Assist testing laboratory in making all cylinders and slump tests.

3. Provide the testing laboratory free access to all places where concrete materials are stored, proportioned or mixed. All materials, equipment and methods used shall be subject to its inspection, test and approval.
4. The following tests will be taken. Provide all materials to be tested.

(a) Cement will be tested at place of manufacturer if:

(i) Certification from cement manufacturer that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of specification is not available; OR
(ii) Affidavit is not provided by the concrete supplier that identifies the cementitious material used for the project by the manufacturer's lot number, date of shipment from the manufacturer, date of receipt of cementitious material.

(b) Aggregate. See 1.5 below for submittal requirements.

(i) Sieve Analysis: In accordance with "Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregate", ASTM C-136.
(ii) Organic Impurities Test: In accordance with "Standard method of Test for Organic Impurities and Sands for Concrete", ASTM C-40-84.
(iii) Fineness Test: In accordance with "Standard Method of Test for Amount of Material Finer No. 200 Sieve in Aggregate", ASTM C-117.

(c) Compressive Test Cylinders: Comply with CBC Section 1905A.6. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or wherever the mix or aggregate is changed.
(d) Slump tests. Take slump tests of concrete in accordance with "Tentative Methods of Test for Consistency of Portland Cement Concrete for Pavements or for Pavement Base", ASTM C 143, taken when cylinders are made and at any other time at testing laboratory's discretion.
(e) Lightweight concrete density tests: Acceptance of lightweight concrete in the field will be based on fresh bulk density measured in accordance with ASTM C138. When the fresh bulk density varies by more than 3 pounds per cubic foot, adjust the mixture promptly to bring the density to the desired level.

5. Batch plant inspection will be performed. Comply with CBC Section 1704A.3 and 1704A.4.

E. Record of Work: A record shall be kept by the Contractor listing the time and date of placement of all concrete for the structure. Such record shall be kept until the completion of the Project and shall be available to the Architect for examination at any time.

1.04 Submittals

A. Submit list of all products to be used.

B. Transit-mix delivery slips:

1. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
2. Make the record available to the Architect for his inspection upon request.
3. Upon completion of this portion of the work, deliver the record and the delivery slips to the Architect.

C. Submit Materials for testing as follows:

1. Aggregates: Submit to the testing laboratory at least 15 days before concrete is required a fifty pound (50 #) sample of fine aggregate and a one hundred pound (100 #) sample of each size of coarse aggregate proposed for use. Select these samples to fairly represent the average quality and grading of the aggregate in question. When aggregates have been approved as acceptable for use, make no change without written permission of the Architect. Maintain stocks of accepted aggregates so that no pour need be interrupted.
2. Cement: Submit mill tests.

D. Prepare on-site samples as specified below.

E. Testing Laboratory will submit design mixes as evidence that the design requirements have been met, but not for formal review and approval.

F. Submit temperature and placement records.

G. Submit design mixes. Prior to pouring any concrete, the Contractor shall submit all concrete mixes to the Architect for approval. Separate mix designs shall be submitted for each type of concrete to be used in the Project. Submittals shall include all information used in designing the mixes. See 2.02 for design procedures.

H. Test Reports: Testing Laboratory will submit reports on tests and inspections performed to Owner, Architect, Contractor, and organization being tested and inspected.

I. Test Reports: "Special Inspection" reports of concrete compression, yield, air content, shrinkage, and slump test by Testing Laboratory.

J. Certificates:

1. Certification that materials meet requirements specified.
2. Certification from vendors that samples originate from and are representative of each lot proposed for use.

1.05 Sequencing / Scheduling

A. Schedule and coordinate with suppliers and other trades so that the embedment of items in concrete does not delay the project.

B. Take all precautions to maintain alignment and prevent damage of such items during placement of concrete.

C. Cutting and/or patching made necessary by failure or delay in complying with these requirements shall be at no cost to Owner.

1.06 Delivery, Storage and Handling

A. Hauling time: Discharge all concrete transmitted in a truck mixer, agitator, or other transportation device within 1-1/2 hours after the mixing water has been added.

B. Extra Water: Deliver concrete to the job in exact quantities required by the design mix. Should extra water be required before depositing the concrete, the Contractor's Superintendent shall have sole authority to authorize the addition of water. Any additional water added to the mix after leaving the batch plant shall be indicated on the truck ticket and signed by the person responsible. Where extra water is added to the concrete, it shall be mixed thoroughly for forty revolutions of the drum or 3-1/2 minutes at mixing speed, whichever is greater. Samples for control tests shall be taken after additional water has been thoroughly mixed.

C. Pre-wet lightweight aggregate and keep stockpiled after wetting for at least 12 hours before using.

Part 2. Products

2.01 Materials

A. General: Use ready-mix concrete conforming to ASTM C94 and CBC Section 1905A.2, 1905A.3 and ACI 318 Section 5.2 and 5.3. No on-job mixed concrete will be allowed.

B. Cement: ASTM C150, Type II. Temperature delivered at plant not to exceed 150 degrees F. Use only one manufacturer for all cement unless approved by Architect.

C. Pozzolan (Fly Ash): ASTM C618 Class F or N. Unless noted otherwise on Drawings, amount, measured by weight, shall not exceed 15% of the total cementitious content. Fly ash is not permitted in mixes receiving integral color additives.

D. Aggregates:

1. Fine aggregate: ASTM C33, natural, washed, clean sand. Use same sand for all exposed concrete. Comply with gradation limits specified in standard.
2. Coarse aggregate: ASTM C33. Footing concrete may use standard local aggregate. All other aggregate: Limestone or granite. Comply with the following:
   (a) Use only hard, durable material from established sources with proven history of successful use in producing concrete with minimum shrinkage, free from harmful amount of clay, shale, or other deleterious substances in amounts greater than those permitted in ASTM C33.
   (b) Use aggregate containing no thin or elongated pieces. Any piece having a major dimension more than 2-1/2 times the average thickness shall be considered thin or elongated.
   (c) Comply with gradation limits specified in ASTM C33.
3. Fine and coarse aggregate for lightweight concrete: ASTM C330, comply with gradation limits in standard.

E. Air-entraining Admixture: Conform to ASTM C260.

F. Water Reducing Admixture: Conform to ASTM C494, Types A or D. High range water reducing admixtures shall not be used unless approved in writing by the Structural Engineer.

G. Accelerating Admixture: Conform to ASTM C494, Types C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

H. Water: Clean, potable, and free of deleterious substances.

I. Miscellaneous Materials:

1. Curing and sealing compound: ASTM C309, Type 1, Class B clear, dissipating, non-yellowing, resin based. W.R. Meadows 1000 series, BASF Kure-N-Seal WB, or approved equal.
2. Grout: Non-shrink to comply with Corps of Engineers Specification CRD -C621 and ASTM C1107. BASF Embeco 885, Burke by Edoco NF NS Grout, or approved equal.
3. Bonding Agent: Larsen Products Weldcrete, W.R. Meadows Intralok, or approved equal.
4. Expansion Joint filler: Resilient and non-extruding type, pre- molded bituminous impregnated fiberboard units complying with ASTM D1751.
5. Waterstops: Rubber type complying with Corps of Engineers Specification CRD – C513 or polyvinyl chloride (PVC) complying with Corps of Engineers Specification CRD – C572.
6. Joint Sealer: ASTM D6690, hot poured type.
7. Vapor Barrier: Polyethylene sheets not less than 10 mils thickness and are resistant to decay when tested in accordance with ASTM E154.
8. Epoxy grout: Master Builder Concresive Standard Liquid LPL.

2.02 Design and Mixes

A. The quantity of cement and admixture required per cubic yard of concrete is given for estimating purpose only. The contractor shall base his bid on these quantities. The Owner reserves the right to vary the cement content upward or downward, and the contract price shall be adjusted if necessary based on the market price of bulk cement delivered to the batching plant.

B. The exact amount of cement, fine and coarse aggregate, and water to be used shall be determined by the design mix. The actual slump used shall not exceed amounts listed in the table. These proportions shall produce concrete of maximum density, minimum shrinkage and required minimum strength. The concrete shall work readily into the corners and angles of the forms and reinforcement without excessive puddling, spading or vibration and without permitting the materials to segregate or free water to collect on the surface. The amount of water used shall be the minimum consistent with the requirements. In general, the workability shall be improved by adjusting the grading rather than by adding water.

C. A sample load of each of the specified mixes may be poured in the foundation at the earliest possible date to check workability of the concrete. Test cylinders shall be prepared and tested as specified to verify compliance of the concrete with the specifications. All concrete shall develop the specified minimum strength. Adjustments will be made if test results warrant changes.

D. Basis for mix designs shall be as follows:

Class	Max. Size Aggregate	28 Day Comp Strength fc	Cement Sks/yd Min	Maximum Slump
A	1-1/2 in	3,000	6.60	4 in.
B	3/4 in.	3,000	7.10	4 in.*

* Slump may be increased to 5 in. only if necessary in areas of congested bars.

Note: Listed quantity of cement per yard of concrete is for cost estimation purpose only.

E. Use the various classes of concrete mixes for the following locations:

1. Class A: All footings (at Contractor's option, Class B may be used).
2. Class B: All concrete not otherwise specified.

F. Class B concrete shall include 4% (plus or minus 1%) entrained air. No other admixtures shall be used without specific approval of Structural Engineer. Calcium Chloride shall not be used.

G. Measure fine and coarse aggregates separately. The method of measuring aggregates shall be subject to the approval of the testing laboratory and shall be such that all ingredients can be uniformly and accurately controlled and easily checked.

H. The batching plant shall be equipped with an electric metering device capable of determining moisture content of sand. This device shall be subject to the approval of the testing laboratory.

I. Proportion lightweight concrete mixes to meet specified density by the calculated equilibrium method in ASTM C567. Correlate equilibrium density with the fresh bulk density of concrete. Use the fresh bulk density as the basis for acceptance during construction.

J. No admixtures will be allowed, except as specified herein, unless authorized by the Structural Engineer. All requests for approval or substitution must be made by the Contractor and be accompanied by sufficient information and test data for evaluation. No calcium chloride shall be added to concrete. Dosage shall be per manufacturer's recommendation.

Part 3. Execution

3.01 Preparation

A. Examine units of work to be placed and verify that:

1. Construction of formwork is complete.
2. Required reinforcement, inserts, and embedded items are in place.
3. Form ties at construction joints are tight.
4. Areas to receive concrete are free of debris and excess water.

B. Thoroughly clean the areas to ensure proper placement and bonding of concrete.

C. Thoroughly clean all transporting and handling equipment.

D. Notify Architect and Project Representative at least 48 hours before concrete will be placed.

E. Ensure availability of sufficient labor personnel, equipment, and materials to place concrete correctly in accordance with schedule. Adequate scaffolding, ramps, and walkways shall be provided so that personnel and equipment are not supported by in- place reinforcement.

F. Protect finished surfaces adjacent to areas to receive concrete.

3.02 Mixing

A. In general provide ready mixed concrete in compliance with the referenced ACI standards and ASTM C94, as modified herein.

B. Mix all concrete mixed in transit mixer for a period of not less than 10 minutes at a peripheral drum speed of 200 ft. per minute. At least 3 minutes of the mixing period shall be at the job site.

C. Start the discharge of concrete not more than 45 minutes after the introduction of mixing water. Complete placing of concrete within 90 minutes of the first introduction of water into the mix.

D. Do not add water to the mix after leaving the plant without the specific approval of the Project Representative or Architect. Upon his approval, water may be added as long as slump does not exceed that specified and the designed water/cement ratio is not exceeded.

E. Do not use lightweight concrete for which the fresh bulk density varies by more than four pounds per cubic foot from the required fresh bulk density.

3.03 Temperature Controls

A. In general, comply with the following temperature limitations:

1. Maximum temperature of concrete at time of placement: 85 degrees F.
2. Minimum temperature of concrete at time of placement: 50 degrees F.

B. Should the ambient temperature at time of concrete placement exceed 85 degrees F, or should it be expected to rise above this temperature for the 3 days following placement, submit a program for hot weather concreting as recommended in ACI 305R. Do not place concrete under these conditions unless such a program has been approved by the Structural Engineer. Do not add cement to the mix at a temperature higher than 150 degrees F. The program may include such treatment as follows:

1. Cooling aggregates.
2. Using cold water or crushed ice for mixing.
3. Limiting mixing speed.
4. Special admixtures or curing procedures.
5. Protecting or cooling reinforcement.

C. Should the ambient temperature at time of concrete placement be below 50 degrees F or should it be expected to drop below this temperature for the 3 days following placement, submit a program for cold weather concreting as recommended in ACI 306R. Do not place concrete under these conditions unless such a program has been approved by the Structural Engineer. Do not permit concrete to freeze for 7 days following placement. The program may include such treatment as follows:

1. Heating aggregates.
2. Heating water.
3. Heating forms.
4. Enclosing area of pour.
5. Special admixtures or curing procedures.

D. Keep accurate and detailed records of concrete pour locations, temperatures of air and concrete, and curing methods. Turn records over to Architect at completion of work.

1. Cure some test cylinders under conditions same as the placed concrete is if so requested by Architect or testing laboratory.

3.04 Placing, General

A. Keep a record of the time and date of placing all concrete in each portion of the project. Make this record open to the inspection of the Architect at any time.

B. Carry on concrete placing, once started, as a continuous operation until the section of approved reinforcement, size and shape is completed. Use pour cut offs of approved details and locations.

C. Handle concrete as rapidly as practical from the mixer to the place of final deposit by methods which prevent the separation or loss of ingredients. Deposit it as nearly as practical, in its final position to avoid re-handling or flowing. Do not drop concrete freely where reinforcing bars will cause segregation, no more than six (6) feet. Deposit concrete to maintain a plastic surface approximately horizontal. Do not deposit concrete that has partially hardened.

D. In pouring columns, use openings in the forms, elephant trunks, or other approved devices which will permit the concrete to be placed without segregation and the accumulation of hardening concrete.

E. Install such devices so the concrete will be dropped vertically. Provide pour holes in the forms to the extent necessary to insure filling or to allow necessary inspection.

F. Consolidate all concrete thoroughly using approved mechanical vibrators.

1. Use Mechanical vibrators, having a minimum frequency of 10,000 rpms, at each point of dump, and keep a stand by vibrator in good working condition, but not in use, on the job until all concrete is placed. Vibrators shall not be used to move concrete laterally.
2. Internal vibration must be direct action in the concrete and not against forms or reinforcement. Vibrate each pour until the water shows indications of rising, but not until the water has risen.
3. Along the faces of the forms, use suitable tools during the pour to force large particles away from the forms and bring mortar to the surface of the forms. In addition, when approved by the Architect, external form vibration may be used. Take all appropriate means to provide fully filled out, smooth, clean and properly aligned surfaces free from pockets and blemishes.
4. Tamp slabs with a jitterbug to depress the rock and push float with a fill float as necessary. Take care at all times that the wet slab meets the screeds accurately and does not rise above or fall below them.
5. Do not vibrate lightweight concrete to the extent that large particles of aggregate float to the surface.

G. In general, place concrete only against firm surfaces which have been sufficiently dampened to prevent rapid absorption of water from freshly poured concrete.

H. Moisten earth and spray forms and reinforcement with water before placing concrete.

I. Keep forms and reinforcement clean above placement line by removing clinging concrete with wire brush before placing next lift.

J. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary.

3.05 Construction / Control Joints

A. Joints shall be located and constructed as indicated on the Drawings or as approved by the Structural Engineer.

B. All reinforcement shall be continuous across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction joints in slabs on grade unless noted otherwise on the Drawings.

C. Construction Joints:

1. Unit of operation shall not exceed eighty (80) feet in any horizontal location.
2. Sandblast the entire top surface of all horizontal construction joints with coarse sand to clean and roughen the joint for bond to next mortar matrix. Clean away all drippings, sand, debris, etc., so next pour is placed on clean, solid, rough surface.
3. Water-blasting or other means can be used in lieu of sandblasting.
4. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least twenty-four (24) hours old.

D. Control Joints in slabs:

1. Control joints shall be produced by forming a weakened plane in the slab by the use of rigid inserts impressed in the concrete during placement, snap- out plastic joint forming inserts, or concrete sawing. Regardless of method used, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide.

3.06 Tolerances

A. Unless otherwise specified herein or is shown on the Drawings, permissible deviations from established lines, grades, and dimensions shall be those specified in ACI 117.

B. Unless otherwise noted, place slabs to the following tolerance: 1/8 inch in ten (10) feet. Also no more than 1/8-inch maximum deviation above or below the established datum lines.

C. Areas with floor drains: Unless detailed otherwise, pitch floors carefully to floor drains so as to afford an even fall from all parts of the room using screed extending from the flow drain in fan shape.

D. Construct new concrete columns to the following tolerances for all exposed surfaces:

1. In any 10' of length: 1/4" out of plumb.
2. Member thickness: -1/4", +1/2".

3.07 Grouting

A. Grout where required; proportion and install in accordance with manufacturer's recommendations to produce a grout which will not shrink and which will attain a minimum compressive strength of 4000 pounds per square inch at seven (7) days.

B. Where grout will not be encased in concrete, use non-staining, non-metallic type.

C. Grout shall not be re-tempered or subjected to vibration from any source.

3.08 Sacking

Perform where required immediately after forms are removed with a mixture of fine sand and cement, thoroughly rubbing the entire surface, filling all small holes and irregularities and producing a uniform appearance throughout the surface.

A. Sacking is in addition to the patching and repair work required for all surfaces in Article 3.11 below.

B. Architect may require sacking any concrete surfaces which he determines are unacceptable, at no extra cost to the Owner.

3.09 Curing, Protection, and Sealing

A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations. Keep all forms sufficiently wet to prevent drying out of concrete. Protect slabs and exposed corners of concrete from traffic or use which will damage them in any way.

B. Curing: Immediately following placing, keep concrete continuously moist by means of one of the following methods:

1. Interior Slabs: Apply membrane curing compound to freshly poured concrete floors following manufacturer's directions. Surface must be clear and free of oil, grease, dirt or foreign matter. Spray apply to concrete surfaces for curing within approximately one to two hours after completion of finishing operations and/or immediately after disappearance of the "sheen" of surface moisture. Coat surfaces uniformly leaving no pinholes or gaps, at a rate not to exceed 200 sq. ft. per gallon for broom finished surfaces. Do not puddle or leave heavy surface film.

(a) At integrally colored or trowel applied color hardener curing shall be accomplished using Schofield "Colorwax" at exterior conditions and "Colorcure" at interior conditions, applied in accordance with the manufacturers instructions.

(i) Interior Slabs, Concrete Finish: Near completion of job, remove dirt, grease, oil, etc., by sanding mopping and wet vacuuming. Allow to dry thoroughly. Apply membrane-curing compound for sealing by brush, airless spray or Squeegee following manufacturer's directions. Apply small amount on surface and immediately work it into pores. Do not let it puddle and do not cover more area than can be worked in 10-15 minutes as setting will start. Use without thinning. Apply in two coats at the rate of 600 sq. ft. per gallon each. Allow first coat to dry a minimum of 24 hrs.

(ii) Interior Slabs to Receive Finish Flooring or Carpet: Complete as in Item 1 above. No additional sealer required near job completion. Clean slabs of oil, grease, dirt, etc.

(iii) Exterior Slabs: Complete as in Item A above. No additional sealer required near job completion. Clean slabs of oil, grease, dirt, etc.

(iv) Walls, columns and other vertical surfaces of concrete that have had their formwork removed, shall be kept continuously moist for a period of 14 days, by means of water being mist applied a minimum of three times each day, or by application of a membrane as specified above for slabs and flatwork. Concrete that has had the formwork left in place for a minimum of 7 days will not require additional moisture application or membrane treatment.

3.10 Concrete Finishes

A. Slab Finish:

1. General: Uniformly spread, screed and float concrete.
2. Trowel: Apply two (2) steel troweling operations at surfaces to receive carpet, resilient materials, thin-set tile and where left exposed, finished to achieve burnished surface. Follow second troweling with light brooming perpendicular to direction of traffic to form non-slip surface.

B. Broom: Apply at exterior walks, perpendicular to direction of traffic flow. All slopes less than 6% shall be light broom finish (slip-resistant similar to equivalent as a medium salted finish, regardless of actual finish specified. Slopes greater than 6% shall be slip resistant.

C. Joints: Mark off exposed joints, where indicated, with ¼ inch radius edging tool. Markings to be clean cut, straight and square with respect to border. Tool edges of exposed expansion and contraction joints, border edges, and wherever concrete adjoins other material or vertical surfaces.

3.11 Patching

A. Repair defects in concrete work as follows: Chip voids to depth of at least one (1) inch or to remove all loose material with the edges perpendicular to the surface and parallel to form markings. Fill voids, surface irregularities, chipped areas, etc., by patching, gunite and/or rubbing, as directed. Duplicate the appearance of unpatched work. Prepare a sample of a repaired condition for approval by Architect before proceeding with all of this work.

3.12 Construction Tolerances

A. Construct new concrete columns to the following tolerances for all exposed surfaces:

1. In any 10' of length: 1/4".
2. Member thickness: -1/4", +1/2".

End of Section

Section 03516

Concrete Surface Preparation

Part 1. GENERAL

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, Apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of all work of this Contract.

Item	Description
General	• Inspection of the concrete substrate • Removal and replacement of non-durable concrete • Decontamination of the concrete surface • Creation of surface profile • Repair of surface irregularities

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 References / Standard

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining “Industry Standards” and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

General Polymers	• Form G-1 Revised 04/10
American Society for Testing and Materials	• ASTM D 4258 “Practice for Surface Cleaning Concrete for Coating” • ASTM D 4260 “Standard Practice for Acid Etching Concrete” • ASTM D 4261 “Practice for Surface Cleaning Unit Masonry for Coating” • ASTM D 4262 “Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces”
International Concrete Repair Institute	• Technical Guideline No.03732, “Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays”. Includes visual standards to act as a guide in defining acceptable surface profiles for the application of

	industrial coatings and polymer floor toppings. • Technical Guideline No.03730, "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion".
The Society for Protective Coatings	• SSPC-SP 13 Surface Preparation of Concrete • SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

1.04 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Test Reports	Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria
Schedule	Include Schedule entries on Gantt Chart for shop drawing production and approval, fabrication and installation

1.05 Quality Assurance

A. Provide the following per Division 1:

Item	**Description**
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• Firm experienced in the necessary craft • Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section • General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Manufacturer's Product Information shall expressly indicate that the proposed product is appropriate for the intended use
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item. • 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.

1.06 Quality Control

A. Inspection of the concrete substrate to determine its general condition, soundness, presence of contaminants, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the owner or the owner's appointed representative is critical. A proper evaluation will lead to the selection of the proper tools and equipment to accomplish the objective

Item	Description
Observation	• Per Division 1.
Inspection	• Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	• Preliminary Relative Humidity Test ASTM F 2170 was conducted 11-15-11. This report will be provided as a REFERNCE ONLY DOCUMENT and does not relive the Contractor of required testing mandated in Specifications.
Special Inspections	• Refer to DSA Testing and Inspection Sheet
Mock Up	• Contractor shall provide 4'x4' area mock-up of prepared surface. Contractor may not continue with work scope until review by Architect.

1.07 Warranty

A. Provide written warranty in accordance with Division 1

Part 2. Products

Part 3. Execution

3.01 Inspection

A. **Inspection of the concrete substrate** to determine its general condition, soundness, presence of contaminants, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the owner or the owner's appointed representative is critical. A proper evaluation will lead to the selection of the proper tools and equipment to accomplish the objective

B. **Removal and replacement of non-durable concrete** must be accomplished prior to installation of the polymer system. Localized weak or deteriorated concrete must be removed to sound concrete and replaced with cementitious or polymer concrete repair mortars, or an engineered concrete mix design utilizing 4700 series polyacrylate polymer additive. For application of these systems and compatibility with the selected polymer sealer, coating, lining or topping refer to the System Bulletins, Technical Data Sheets or the Technical Services Department. Occasionally, plain fresh concrete is required and must be bonded to existing concrete. When bonding fresh concrete to existing, prepare the existing concrete surface by scabbling, scarifying, abrasive (sand) blasting, needle scaling, high pressure water jetting (5,000 to 45,000 psi), or steel shotblasting. Apply a low modulus epoxy as the bonding agent at a rate of 80 square feet per gallon for a WFT of 20 mils, and then place the fresh concrete or mortar. Bonding to lightweight concrete may require a second coat of epoxy if the first coat is readily absorbed into the concrete surface. Always place the fresh concrete within the open time of the epoxy, while the epoxy-bonding agent is still wet. Rough concrete surfaces will require additional material depending on the

surface profile. Fresh concrete should have a low water cement ratio (w/c) not to exceed 0.40. When bonding fresh concrete containing latex polymer admixtures, check compatibility of the latex modified concrete mixture by either installing a test patch and performing a pull-off test, or by conducting a slant shear test in accordance with ASTM C 882, in an independent concrete testing laboratory.

3.02 Decontamination

A. . **Decontamination of the concrete surface** requires the removal of oils, grease, wax, fatty acids and other contaminants, and may be accomplished by the use of detergent scrubbing with a heavy duty cleaner/degreaser, low pressure water cleaning (less than 5,000 psi), steam cleaning, or chemical cleaning. The success of these methods is dependent upon the depth of penetration of the contaminant; which is completely dependent upon the contaminant's viscosity, the concrete's permeability and the duration of exposure. Special care should be taken when preparing concrete at an "in use" facility for repair, replacement or an initial floor topping. This is especially true for Food Processing facilities. Contaminants can be carried into exposed concrete as most of these facilities use copious amounts of water. The contaminants can be animal fats/oils, blood, cleaning solutions, microbes, etc. They may not be completely removed during preparation (shot blasting). The concrete may appear clean and well profiled.

B. A simple method to ensure you have sound concrete is to test the pH. The chemistry of concrete is alkaline in nature. Normal concrete should be in the range of 11 to 13. Most of the contaminants mentioned are neutral to acidic in nature. After preparation test the floor in multiple locations using distilled water and the pH paper. If the pH is 10 or lower additional preparation will be required to ensure a good bond. In areas where the contaminants can not be removed, the contaminated concrete must be removed and replaced as in 2., above.

C. CAUTION: Decontamination methods that introduce large amounts of water may contribute to moisture related problems.

3.03 Surface Profile

A. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross sectional view of the surface of the concrete.

B. This dimension is defined pictorially and through physical samples in the ICRI Technical Guideline No 03732, and is expressed as a Concrete Surface Profile number (CSP 1-9).

C. For General Polymers AquArmorTM S, AquArmor MCS, FasTopTM MVT and other topping applications from 40 mils to 1/8", the surface profile shall be CSP 4, 5, or 6. These are typically accomplished through decontamination of the concrete as defined in 3.02 above, followed by light scarification, medium shotblast or medium scarification..

3.04 Repair of Surface Irregularities

A. Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains and doorways, etc. must be repaired prior to the placement of the polymer system and/or the system must be designed to off-set the thickness of the irregularities. For removal and replacement information and materials, refer to item 3.01., above. For bugholes and other minor surface irregularities, fill with Epoxy Quick Patch (3500), 4700 Instant patch Resin or the system resin mixed with a vertical grade aggregate. For treatment of cracks and joints refer to the section below entitled "Crack Isolation". For additional questions, contact the Technical Service Department or, your local sales representative for specific recommendations..

B. For specific applications, always consult General Polymers System Bulletins, Technical Data Sheets or Technical Services Department.

3.05 Methods of Surface Preperation

A. Depending upon conditions of the concrete one or more methods of surface preparation may be required. It is common for decontamination to precede mechanical preparation, and if necessary a second decontamination to follow.

B. The preferred methods for creation of a surface profile, including the removal of dirt, dust, laitance and curing compounds, is steel shotblasting. The steel shotblasting or vacuum blasting process is commonly referenced by equipment brand names, such as, Blastrac, Vacu-Blast, Shot-Blast, etc.

Application	Profile	Surface Preparation Method
Sealers	0-3 mils	• Detergent scrub • Low-pressure Water
Thin Film	4-10 mils	• Abrasive Blast • Steel Shot Blast
High-Build	10-40 mils	• Abrasive Blast Steel Shot Blast Scarifying
Self-Leveling	50mils - 1/8 inch	• Steel Shot Blast
Polymer Overlay	1/8- 1/4 inch	• Abrasive Blast Steel Shot Blast Scarifying

C. Surfaces to receive the bonded polymer system must be inspected after the surface is prepared to insure that the substrate is sound and structurally durable. Areas found to be unsound or non-durable must be removed and replaced as described in 3.01., above. Dust or other deleterious substances not removed after the initial surface preparation must be vacuumed, leaving the surface dust free and clean.

D. Other surface preparation methods are mentioned in ADDITIONAL SURFACE PREPARATION REFERENCES below.

3.06 Crack Isolation

A. The performance of elastomeric products such as EPO-FLEX® internally flexible epoxy, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.

B. Prior to application of an elastomeric system, control/contraction joints, construction joints, and cracks should be sealed with the selected system flexible sealant, i.e., 3580 Joint and Crack Filler, 4880 Polyurea Joint Sealant, EPO-FLEX flexible sealant. This coating should extend a minimum of 6” on either side of the joint or crack. The entire surface area should then receive the specified crack isolation system. Isolation and/or expansion joints should be detailed in accordance with the plans and specifications of an architectural or engineering design professional for the type of structure being considered. Consult the Architect for the proper selection and use of Isolation materials and the potential use of fiberglass scrim cloth for additional crack bridging capabilities.

End of Section

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Section 05725

Steel Handrails and Guardrails

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section.

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Work Included

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	Fabrication and installation of steel handrails and guardrails, including posts and intermediate rails.
Special Coordination	Attachment to existing concrete stairs Powder-coat custom color finish

B. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• Provide manufacturer's product information for all components required for manufacture and fabrication, including all pre-manufactured items and hardware.
Product Data	• Include information on all materials, components, fabrication, and installation instructions.
Samples	• Provide color selector for powder coat finish
Shop Drawings	• Show entire assembly, at 1"=1'-0" scale, and existing stair, with field measurements. Indicate all connections, welded and mechanical. Indicate method of attachment to existing structure. • Verify compliance with CBC maximum opening sizes by depicting sphere test on drawings.
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References/Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining "Industry Standards" and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other

responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	American Society for Testing and Materials (ASTM): • A36: "Standard Specification for Structural Steel." • A500: "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes." • A501: "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing." • A569: "Standard Specification for Steel, Carbon (0.15 Maximum, Percent) Hot-Rolled Sheet and Strip, Commercial Quality." • B221: "Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire" • B361: "Standard Specification for Factory-Made Wrought Aluminum and Aluminum-Alloy Welding Fittings" American Welding Society (AWS) D1.1: Structural Welding Code California Building Code 2019 addition Americans with Disabilities Act Accessibility Guidelines (ADAAG)

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project. • Fabricator shall demonstrate a minimum of five years' experience with similar projects • Installer shall demonstrate a minimum of two years' experience on similar projects
Qualifications of Welders	• Qualify welding processes and welding operators in accordance with AWS B2.1. • Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests, and possess a current card. • If re-certification of welders is required, re-testing will be Contractor's responsibility.
Shop Fabrication	• Work shall be fabricated in an approved fabrication plant recognized by the project's local building

	jurisdiction per CBC Section 1704A.2.2 and 1704A.3.2.1. Special inspections required by CBC are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection.
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation.
Allowable Tolerances	• Unless otherwise specified, furnish and install all structural steel to comply with ASTM A6 and AISC Code of Standard Practice. • Unless otherwise specified, install all steel which remains exposed to comply with the referenced AISC Specification "Architecturally Exposed Structural Steel."
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.
Structural calculations	• Provide structural calculations as required to meet California Building Code. Calculations shall be by a Structural Engineer licensed in the state of California. Fabrication drawings shall be stamped by a California Licensed Structural Engineer.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	Per Division 1
Testing	Installed railing assembly shall resist a load of at least 200 pounds applied at any point in any direction without damage or permanent set.
Special Inspections	Per DSA Testing and Inspection Form
Mock Ups	

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation	Per Division 1.
Inspection	Per CCR Title 24: Continuous Inspection by DSA Certified inspector
Testing	Refer to DSA Testing and Inspection Sheet
Special Inspections	Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description

Product Manuals	Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems.
Surplus Materials	
Training	

1.09 Warranty

Provide written warranty in accordance with Division 1

Item	Description
Warranty Form	Per Division 1
Warranty Period	1 year
Warranty Start	Date of Substantial Completion

Part 2. Products

2.01 Materials

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, transient and application of surface finishes.

B. Structural Steel Wide-flange Shapes, Plates and Bars: ASTM A36.

C. Other Rolled Shapes, Plates and Bars: ASTM A36.

D. Tubular Railing: Steel pipe, ASTM A53, Type E or S, Grade B or steel tubing, ASTM A500 or A501.

2.02 Components

A. Size members as indicated on drawings

B. Posts: TS 2x1x.120

C. Top Rail: TS 2x1x.120

D. Inner Diagonals: TS 1x1x.120

E. Handrail: TS 1.5" Ø, extra strong steel pipe rail

2.03 Finish

A. Powder coat finish

B. Color: Architect shall select color from full (180+) selection of Cardinal or RAL colors.

2.04 Hardware

A. Handrail brackets, at attachment to guard and to wall: Julius Blum 402.

Part 3. Execution

3.01 Examination

A. Verify dimensions at site before commencing with fabrication. Indicate field-verified dimensions on shop drawings.

B. Verify conditions are satisfactory for the installation of all items or assemblies.

C. For all assemblies, verify that blocking is in place where indicated in the details

D. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected.

3.02 Fabrication

A. General: Work shall be executed in the best manner by workmen skilled in this trade. All work shall be accomplished in the shop to the greatest extent possible, except for necessary field connections.

1. Make members true to length so that assembling may be done without fillers. Bolts in exposed work shall not have more than 1/8" of thread projecting beyond nut.
2. Grind exposed welds smooth and flush with adjacent surfaces. Touch field welds with primer.
3. Make exposed joint butt tight, flush and hairline.
4. Accurately form components required for anchorage of railings to each other and to building structure.
5. Weld end closure plates at all exposed ends of pipe and tube railings.

B. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

C. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in connecting welding work.

D. Holes for Other Work:

1. Provide holes required for securing other work to structural steel framing as shown on final shop drawings.
2. Threaded nuts welded to framing, and other specialty items to as indicated to receive other work.
3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.03 Delivery, Storage, and Handling

3.04 Installation

A. Install all items plumb, level, and true to line in accordance with the Drawings the approved Shop Drawings.

B. Verify all dimensions and clearances during and after installation.

3.05 Cleaning

A. Following installation, clean rails.

B. Touch up any powder-coated surfaces marred during installation with nitrocellulose lacquer or acrylic enamel, provided by powder-coat vendor to match selected color.

End of Section

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Section 10 05 00

Signage

Part 1. General

1.01 Related Documents

A. The Drawings and general provisions of the Contract, including General and Special Conditions and Division 1, General Requirements, apply to the work specified in this section.

B. Parts 1,2,3,4,5,6, Title 24 of the California Code of Regulations (California Building Code) is to be considered an integral part of this section. Items noted here are those specifically related to the General Contractor'

C. All California Prevailing Wage Laws apply to the work of this section.

1.02 Signage

A. The following is a general description of the work included in this section. This description does not limit the scope of work shown in the drawings nor does it relieve the Contractor of any responsibility for coordination of **ALL** work of this Contract.

Item	Description
General	• Custom Room Identification and Wayfinding Signs • ADA Signage

B. Refer to signage schedule included in drawings for specific layout requirements of signs. This section is intended to ensure that all signage provided on the project meets all of the latest accessibility code requirements.

C. Related work may be described in other sections of this Project Manual. All sections of this project manual are related. Contractor shall coordinate the work of this section with all other sections.

1.03 Submittals

A. Provide the following submittals per the requirements of Division 1.

Item	Description
Catalog Cuts	• Signage cut sheets
Samples	• Example signs of each type
Shop Drawings	• Sign Layouts, and Key plans • Signage Schedule indicating exact text of each sign
Schedule	• Include Schedule entry on Gantt Chart for Installation

1.04 References and Standards

A. The following References and Standards are incorporated into the requirements of this Section as they apply to products, assembly, manufacturing procedures and installation. References shall be utilized in determining "Industry Standards" and other acceptable manufacture and installation methods but shall not relieve the Contractor of any other responsibilities of the Contract. Where conflicts occur between multiple listed references, the Contractor shall assume that the more restrictive standard applies and shall seek determination from the Architect regarding applicable standard.

References	• Comply with California Building Code Sections 1143A, Table 1143A.5, 1143A.7.1 • Comply with Americans with Disabilities Act

1.05 Quality Assurance

A. Provide the following per Division 1

Item	Description
Supervision	• Full time supervision and observation by the Contractor of all on-site Construction Activities including ordering, procurement and delivery of all materials and products manufactured or assembled off-site.
Qualifications of Workers	• General Contractor shall ensure that all workers providing labor on this project are fully competent and experienced in the area of work being performed. General Contractor shall require subcontractors to remove any unqualified workers from the project. • Installer: Firm shall have a minimum of five years experience in installation of systems similar to those required by this project and acceptable to the manufacturer
Product Acceptance	• General Contractor (Superintendent) shall verify and accept all products delivered to site prior to installation. • Architect will reject any material not installed per current industry standards or recommended installation instructions of the Manufacturer
Substrate Acceptance	• General Contractor (Superintendent) shall verify all substrates / conditions prior to allowing installation of any item.

1.06 Quality Control by Contractor

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract Documents.

Item	Description
Supervision	• Per Division 1
Testing	• Describe Testing
Special Inspections	• Per DSA Testing and Inspection Form
Mock Ups	• Provide one of each type of sign to Architect for review prior to proceeding • Install first sign for Owner and Architect review prior to proceeding with remainder

1.07 Quality Control by Owner

A. The following specific procedures shall be required to demonstrate adequate levels of quality provided for project components and systems. Exclusion of any item from this list does not relieve the Contractor of any responsibilities for quality procedures covered elsewhere in the Contract.

Item	Description
Observation Inspection	• Per Division 1. • Per CCR Title 24: Continuous Inspection by DSA Certified inspector

Testing	• Refer to DSA Testing and Inspection Sheet
Special Inspections	• Refer to DSA Testing and Inspection Sheet

1.08 Closeout

A. Provide the following Close Out materials in accordance with Division 1.

Item	Description
Product Manuals	• Maintenance and Operations instructions / manuals provided by all product / material manufacturers.
System Manuals	• Maintenance and Operations instructions / manuals provided by subcontractors for assemblies / systems.
Surplus Materials	• n/a
Training	• n/a

1.09 Warranty

A. Provide written warranty in accordance with Division 1.

Item	Description
Warranty Form	• Per Division 1
Warranty Period	• 1 year
Warranty Start	• Date of Substantial Completion

Part 2. Products

2.01 Manufacturers

1. Window Graphics Sign Company, Campbell, CA (www.windowgraphics.net)
2. or approved equal

2.02 Custom Signage

A. Sign dimensions, layout, text sizes, symbols, and fonts shall be as shown on the Drawings.

1. Text indicated on Sign Schedule in the Drawings is provisional. Contractor shall submit sign schedule with all text for Architect's final approval prior to fabrication.

B. Signage shall also conform to the following requirements of the California Building Code. Note that California's standards for signage are more stringent than Section 4.30 of the ADAAG.

C. The following specific code requirements are compiled from 2016 CBC for reference. This list does not limit Contractor's responsibility for compliance with all terms of the 2016 CBC. Contractor shall refer to 2016 CBC for the complete requirements.

1. Character Proportion: Letters and numbers shall be selected from fonts where the width of the width of the uppercase "0" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "i" (CBC 1143A.5.3).

2. Raised Characters and Pictograms:

   (a) Letters and numerals shall be raised 1/32 inch, minimum, sans serif, uppercase, accompanied with Grade 2 (Contracted) Braille (CBC 1143A.6)
   (b) Height of raised characters shall 5/8 in. min., 2 inch max. (CBC 1143A.6.2)
   (c) Pictograms shall be accompanied by the text description places directly below the pictogram. The height of the pictogram field shall be 6 inches min. (CBC 1143A.6.10)

(d) Characters and Braille shall be in horizontal format. Braille shall be placed 3/8 inch min and 1/2 inch max below the characters. Characters and text shall be justified flush left, or centered. When multiple lines of tactile text occur, all Braille shall be placed below all lines of text. (CBC 1143A.7.2)

3. Braille (CBC 1143A.7)

   (a) Contracted (Grade 2) Braille (Table 1143A.7.1)
   (b) Domed or rounded Braille dots
   (c) Spacing between dots within cell: 0.1 inch o.c.
   (d) Spacing between cells: 0.2 inch from center of second column of one cell to first column of next cell
   (e) Dots raised 0.025 inch min above background

4. Finish and Contrast: Characters, symbols, and background shall have non-glare (eggshell, matte) finish. Characters shall contrast with background – light on dark or dark on light (CBC 1143A.8)
5. Mounting Location and Height (CBC Table 1143A.5)

   (a) Room identification signs shall be mounted on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, signs shall be placed on nearest adjacent wall.
   (b) Mounting height: 60 inches above finish floor to centerline of sign
   (c) Located such that a person may approach within 3 inches of sign without encountering protruding objects or door swings.

6. Toilet Room Signage

   (a) In addition to typical room identification signage, doorways to sanitary facilities shall be identified by geometric symbols centered horizontally on the door at a height of 60 inches above finish floor to centerline of symbol (CBC 11B-703.7.2.6)
   (b) Men's accommodations shall be identified by an equilateral triangle measuring 12 inches on each side, vertex pointing up. (CBC 11B-703.7.2.6.1)
   (c) Women's accommodations shall be identified by a circle measuring 12 inches in diameter. (CBC 11B-703.7.2.6.2)
   (d) Unisex accommodations shall be identified by a circle measuring 12 inches in diameter, with an equilateral triangle inscribed within. (CBC 11B-703.7.2.6.3)

2.03 Signs

A. Colors:
   1. Text and symbols shall be White
   2. Background color shall be selected by Architect from Pantone Matching System colors

B. Graphic Process
   1. Sign shall be 1/8" thick melamine plastic, fire retardant and self-extinguishing.
   2. Text and symbols shall be blast-etched integral to the material of the sign.

      (a) Applied, glued-on, etched or chemically welded characters are not acceptable.

Part 3. Execution

3.01 Installation

A. Install signage per manufacturer's recommendations and in compliance with ADA/Title 24 requirements.

B. Install signage at the locations indicated on the Drawings. In the event the indicated locations is not feasible, coordinate with Architect to determine alternate location.

1. Signs shall not be mounted to glass sidelites; instead, mount the sign on the wall adjacent to the sidelite.
2. Signs shall be mounted such that a person may approach within 3 inches of the sign without encountering a protruding object or a door swing.
3. All signs shall be mounted such that the centerline of the sign is 60 inches above the finished floor.
4. Where multiple signs are installed adjacent to each other, and they are of varying heights, the signs shall be top-aligned.
5. Where signs are indicated adjacent to a door or window frame, they shall be mounted such that the edge of the sign nearest the frame is 4 inches from the frame.

C. Use manufacturer-specified adhesives and fasteners as indicated on the Drawings.

1. Exterior signs shall be attached with mechanical fasteners
2. Mechanical fasteners shall be tamper-proof (#6 spanner flathead screws)

D. Remove all excess adhesive and clean signage upon completion.

End of Section

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Section 210000

Fire Protection General Requirements

Part 1. General

1.1 Conditions and Requirements

A. Refer to the General Conditions, Supplementary Conditions, and Division 01 General Requirements.

1.2 Scope of Work

A. Provide all labor, apparatus, and materials that are required to provide a complete installation as indicated on the drawings and in the specifications, including that reasonably inferred for proper execution of this Division.

B. Consult all other Sections to determine the extent of this work specified elsewhere.

C. Coordinate all utility requirements for equipment furnished under this Division. Rough-in required systems and make final connections.

1.3 Regulations and Standards

D. Install all work to meet or exceed requirements prescribed by governmental bodies having jurisdiction and in accordance with all federal, state, and local codes and ordinances, and all OSHA requirements. These codes include, but are not limited to the latest applicable edition of the following:

1. California Building Code
2. California Electrical Code
3. California Plumbing Code
4. California Mechanical Code
5. California Energy Code
6. California Green Buildings Standard
7. California Fire Code
8. National Fire Protection Association

1.4 Quality Assurance

A. Comply with current governing codes, ordinance and regulations of the Authority Having Jurisdiction and the regulations and requirements of the Owner's insurance underwriter.

B. Where requirements differ between drawings, specifications, codes and standards, apply the more stringent.

C. Should any change in drawings or specifications be required to comply with governing regulations, notify the Architect prior to submitting bid.

D. After contract is awarded, if minor changes or additions are required by the aforementioned authorities, even though such work is not shown on drawings or overtly covered in the specifications, they shall be included at the Contractor's expense.

E. Execute work in strict accordance with the best practices of the trades in a thorough, substantial, skillful and well-executed manner by competent workers. Provide a competent,

experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

F. The Architect or Architect's Representative may conduct unannounced field reviews of any work completed or in progress. A report will be issued for all items that are found to be inconsistent with the contract documents. All items in the report shall be addressed in writing by the Contractor within two (2) weeks.

1.5 Safety

A. Contractors must conduct a weekly safety meeting with their employees and maintain documentation of attendance and topics of discussion. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities withing Contractor's scope of work.

1.6 Permits, Fees, and Utilities

A. Secure and pay for all permits, licenses, inspections, and fees required.

B. Coordinate with other Sections and schedule sequence of accomplishing the work in such a manner as not to interrupt existing services and utilities at a time that will inconvenience the Owner. Provide Owner a minimum 48 hour notice when utilities will be interrupted.

1.7 Painting

A. Paint all exposed piping and supports.

B. See Division 09 for painting.

1.8 Coordination

A. Coordinate with work performed by other Sections in order to ensure adequate space and proper location of all necessary work on this project whether or not work is under this Section. Coordination shall be done prior to order or manufacture of any systems or components.

B. At a minimum, coordinate location of each piece of equipment, requirements for access panels, space required for supports, power requirements for each piece of equipment, and control requirements for each piece of equipment.

C. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale to coordinate the work with the work of other trades. At completion, include a set of these drawings with the record drawings.

D. Install the work in cooperation with other trades. Before installation, make proper provisions to avoid interferences.

E. Pipes which pitch have right-of-way over those which do not pitch. For example, condensate drains and waste normally have right-of-way.

F. No additional costs will be considered for work which has to be relocated due to conflicts with other trades or for additional equipment/parts that need to be installed due to a lack of coordination prior to, or during, construction.

G. Coordination drawings: The contractor shall provide coordination drawings for all work in this section. All work shall be coordinated to clear work in other sections.

Part 2. Products

2.1 Equipment and Materials

A. Provide products and materials that are new, clean, free of defects, damage and corrosion. Inspect all materials and remove defective materials from the site.

B. Provide materials and equipment bearing the label of, or listed by, the Underwriter's Laboratories (UL), unless the material or equipment is of a type for which label or listing service is not provided.

C. Furnish all materials and equipment of the same type by the same manufacturer.

2.2 Alternate Equipment and Materials

A. No substitute materials or equipment may be installed without the written approval of the Architect.

B. Contract documents are based on materials specified and equipment manufacturers indicated. Acceptance of alternative equipment manufacturers does not relieve Contractor of the responsibility to provide equipment and materials which meet the quality and performance stated or implied in the contract documents. All submittals for substitution must include comparison to show equal with scheduled equipment.

C. Submit proposals to supply alternate materials or equipment, in writing, with sufficient lead time for review prior to the date equipment must be ordered to maintain project schedule.

D. No increase in the contract price will be considered to accommodate the use of alternative equipment, including revisions required by other trades.

2.3 Submittals

A. Submit shop coordination drawings, manufacturer's data, samples and test reports as specified.

B. The review of submittals is for general compliance with the design concept and contract documents. Comments or absence of comments does not relieve the Contractor/Vendor/Manufacturer from compliance with the contract documents. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of construction, for performing the work in a safe manner, and for coordinating the work with that of other trades.

C. No part of the work shall be ordered, procured, or installed until that work has been submitted, reviewed, and returned without comment.

D. A minimum period of ten (10) working days will be required in the Engineer's office each time a submittal is sent for review. Contractor shall prioritize submittal reviews where multiple submittals are sent for review. This time period must be considered by the Contractor in the scheduling of the work.

E. Submittals will be returned to indicate appropriate action taken as follows:

1. No Exceptions Taken.
2. Make Corrections Noted. No Resubmittal Required.
3. Revise and Resubmit.
4. Rejected.
5. Not Reviewed.

H. Use electronic form acceptable to Architect for electronic submittals, containing the following information:

1. Project name.
2. Date.
3. Name and address of Architect and Engineer.
4. Name of Owner.
5. Name, address and contact information of Contractor.
6. Names and contact information of sub-contractor, manufacturer, and supplier.
7. Name of entity that prepared submittal.
8. Category and type of submittal.
9. Specification Section number and title.
10. Drawing number and detail references, as appropriate.
11. Transmittal number, numbered consecutively, and revision number clearly identified.
12. Each item submitted labeled or identified the same as on the drawings.
13. Identify each sheet of submittal pages (using arrows, underlining or circling) to show applicable sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable information.

I. Inadequate or incomplete submittals will not be reviewed and will be returned to the Contractor for resubmittal.

J. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. No additional costs will be considered for any special handling charges or expedited processing required for materials or equipment not ordered in time.

Part 3 – Execution

3.1 Examination of Site

A. The Contract Documents do not make representations regarding the character or the extent of the subsoils, water levels, existing structural, mechanical, plumbing, and electrical installations, above or below grade, or other sub-surface conditions which may be encountered during the work.

B. Evaluate existing conditions that may affect methods or cost of performing the work, based on examination of the site or other information. Failure to examine the Drawings or other information does not relieve the Contractor of responsibility for satisfactory completion of the work.

3.2 Drawings

A. Drawings show general arrangement and location of piping and equipment. Drawings are diagrammatic and intended to show approximate location and routing. Dimensions on drawings shall take precedence over scaled dimensions on drawings. Allow for supports, expansion, and pitch of piping. Field verify all dimensions.

B. The exact locations of equipment and piping shall be ascertained from the Architect or the Owner’s representative in the field. The Architect reserves the right to make minor changes in the location of piping and equipment up to the time of installation without additional cost.

C. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.

D. Execute any work or apparatus shown on the Drawings and not specifically mentioned in the Specifications, or vice versa. Omission from Drawings or Specifications of any minor details of construction, installation, materials, or essential specialties does not relieve Contractor from furnishing complete workable system.

3.3 Record Drawings

A. Contractor shall maintain a complete set of documents on site that are marked up during the construction process indicating all changes that have been made. Record drawings shall be maintained up to date throughout construction. Indicate clearly all work installed differently from that shown.

B. Upon completion of work, certify all record drawings with a stamp including the date and name of Contractor. Submit one (1) complete, bookmarked, set of electronic record drawings to the Architect for final review.

C. Record drawings must include the following as a minimum:

1. Actual equipment locations.
2. Revisions or substitutions to equipment schedules.
3. Pipe size and routing.
4. Dimensional changes to drawings.
5. Revisions to details shown on drawings.
6. Changes made by RFIs, Addenda, or Change Orders.
7. Locations of access panels and shut-off valves.
8. Locations and depths of underground utilities.

3.4 Protection of Building

A. Protect new and existing building structures and adjacent finished surfaces during construction. Patch, repair, and refinish existing work damaged by work under this Division to match adjacent undisturbed areas.

3.5 Delivery, Drayage and Hauling

A. Include all drayage, hauling, hoisting, shoring and placement in the building of equipment specified and be responsible for the timely delivery of equipment to the project as required by the construction schedule.

B. Provide proper protection and storage of all items and tools required.

C. If equipment is not delivered or installed at the project site in a timely manner as required by the construction schedule, the Contractor shall be responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modification, delays, overtime costs, etc. at no additional cost to the Owner.

3.6 Equipment and Material Protection

A. Protect the work, equipment, and material of other trades from damage by work or workers of this trade, and correct damage caused without additional cost to the Owner.

B. The Contractor shall be responsible for all work, materials, and equipment until finally inspected, tested, and accepted. Protect work against theft, injury, or damage. Carefully store material and equipment received on site that is not immediately installed.

C. Cover open ends of work with temporary covers or plugs during construction to prevent entry of dust, dirt, water or other obstructing material. Cover and protect equipment and materials from damage due to water, humidity, paint, spray-on fireproofing, construction debris, etc. Store equipment subject to moisture damage, such as insulation or electrical components in dry, heated spaces.

D. Provide adequate means for fully protecting finished parts of the materials and equipment against damage from whatever cause during the process of the work until final acceptance.

E. Do not install damaged items. Take immediate steps to obtain replacement or repair. Replace all wet or damp insulation or acoustic lining.

F. Do not operate water systems until piping has been cleaned, disinfected and start-up strainers are in place.

3.7 Quality of Work

A. The quality of work shall be of a standard generally accepted in the respective trade. Use only experienced, competent, and properly equipped workers. Replace work falling below this standard as directed by the Architect.

B. Systems shall be worked into a complete and integrated arrangement with like elements arranged neatly with adequate head room and passageway free from obstructions.

3.8 Furring and Pipe Spaces

A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.

B. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from Architect before work is started.

3.9 Cutting and Patching

A. Do not cut, channel or drill unfinished masonry, tile, etc. unless written permission is obtained from the Architect. Perform this work in a manner acceptable to the Architect. Cutting of structural members or footings is prohibited without the prior written consent of the Structural Engineer.

B. Where cutting, channeling or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary from the proper installation, support or anchorage of piping or equipment, lay out the work carefully in advance. Repair any damage to the building, piping, equipment or finishes using skilled tradesmen for all required work.

C. Provide slots, chases, openings and recesses through floors, walls, ceilings and roofs as required. Where these openings are not provided, provide cutting and patching to accommodate penetrations.

D. Provide sleeves for all piping passing through new floors, walls, partitions, and any other building construction, of adequate diameter to allow minimum of 2” clearance all around between sleeve and piping. When piping is insulated, insulation shall pass continuously through sleeve with 2” clearance between insulation and sleeve or hole in existing construction.

3.10 Access

A. Indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building.

B. No controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether shown on Drawings or not.

C. Access panels shall be 24” x 24” unless otherwise directed, style as selected by the Architect. Panels shall have the same acoustic barrier or rating as the construction in which panel is installed.

D. Doors shall be Milcor, Newman or equal, with concealed hinges, screwdriver locks, prime coated with rust inhibitive paint, finish painted in field to match adjacent surface. Provide key locks where required by Architect/Owner. All access doors shall be keyed the same. Doors in walls of toilet rooms shall be stainless steel.

E. Continuously check installation manuals for clearance and accessibility of equipment. No allowance of any kind will be made for negligence on part of Contractor to foresee means of installing equipment in proper position.

3.11 Seismic Restraints

A. All equipment, piping, and materials shall be fastened and securely anchored to building structure as required by the Drawings, Specifications, NFPA13, and the California Building Code.

B. Piping shall be braced as follows:

1. Brace top of system riser.
2. Brace all feed and cross mains.
3. Brace branch lines that are 2 1/2" nominal diameter and larger.
4. Transverse bracings at 40’-0” on center maximum and shall be spaced as calculated in accordance with NFPA13.
5. Longitudinal bracings at 80’-0” on center maximum and shall be space as calculated in accordance with NFPA13.
6. Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 24” of the elbow or tee and is connected to the largest pipe.
7. Do not use branch lines to brace main lines.
8. Provide flexibility in joints where pipes pass through building seismic or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators.
9. At vertical pipe risers, support the weight of the riser at a point or points above the center of gravity of the riser wherever possible. Provide lateral guides at the top and bottom of the riser and at intermediate points not to exceed 30’-0” on center.
10. No bracing is required if the top of single pipe is suspended 12” or less from the connection point at the supporting structural member.

3.12 Manufacturer’s Directions

A. Materials and equipment shall be installed in accordance with manufacturer’s application and recommendations, requirements, and instructions, and in accordance with Contract Documents.

B. Conflicts between manufacturer’s instructions and Contract Documents shall be brought to the Architect’s attention for resolution prior to installation.

C. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

3.13 Electrical Equipment and Electrical Room Precautions

D. Do not install piping other than piping that serve the room for the following: switchgear, transformer, generator, elevator equipment, telephone, fire command, security, dimmer or electrical equipment rooms.

E. Do not install piping or equipment above or within the code required service space for switchboards, disconnects, panelboards, dimmers, control panels, VFDs, individual motor controllers, electronics, etc.

3.14 Cathodic Protection

A. Install dielectric unions at points in piping where dissimilar metal pipes are connected together.

3.15 Piping and Equipment Identification

B. Furnish and install engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, and pieces of equipment. Nameplates shall be white lettering on black background. For outdoor locations, provide brass engraved nameplates or plastic rated for outdoor use.

C. Each piping system installed under this work shall be identified and the direction of flow indicated. Markings shall be applied after all painting, priming, and cleaning of the piping and insulation is completed. Labels shall be black lettering on colored backgrounds. Lettering shall be easily readable from the floor and background colors easily discernible. Furnish labels in every room and every 20' of pipe length.

D. Tag all valves with 2" diameter brass tags noting the valve number and contents in the pipe. At the completion of the project, provide Owner with a valve listing for all valves installed in the project. Valve listing shall note valve tag number, contents in the pipe and the areas (room numbers, etc.) that are impacted by valve.

3.16 Guarantee

A. The Contractor shall guarantee the quality of all work and the quality of the equipment and materials in accordance with the provisions of the General Conditions and Special Conditions. Should any defects occur during this period, the Contractor shall promptly repair or replace defective items as directed by the Architect, without cost to the Owner.

B. Contractor shall be responsible for damage to any part of premises during guaranteed period caused by leaks or breaks in work furnished and/or installed under this Section.

3.17 Testing

A. Test all equipment, piping, and systems as called for in the Specifications. Notify Architect and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing.

B. Provide initial main drain test in accordance with NFPA25 and record on General Information Sign at riser.

3.18 Openings

A. Locating and sizing of all openings for piping through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

3.19 Clean-up

A. During the course of work under this Division, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean, and in a condition acceptable to the Architect.

B. Clean all work installed under this Contract to satisfaction of Owner.

3.20 Operating instructions and operator training

A. Provide the services of factory-trained specialists to supervise the operation of all equipment and train the Owner's operating and maintenance personnel.

B. Instruct the Owner's operating personnel in the basis of design, the available documentation, the proper starting sequences, operation, shut-down, minor adjustments, troubleshooting, recommended spare parts, and regular maintenance procedures.

C. Submit training agenda, schedule and list of representatives to the Owner for review ten (10) days prior to training. Confirm attendance at training by sign-in sheet. At a minimum, the training agenda shall cover all items required to be provided in the operating and maintenance manuals.

3.21 Operating and maintenance manuals

A. Provide operating instructions and maintenance manuals for all equipment and material furnished under this Division.

B. Provide the following equipment and maintenance information where applicable:

1. California NFPA 25 Edition (Based on 2011 Edition).
2. Product Data Sheets.
3. Record Drawings.

C. Contractor must start compiling above data immediately upon approval of submittals for equipment and materials.

D. Submit one (1) electronic copy of operating and maintenance manuals, indexed and bookmarked, for review by Architect/Engineer.

E. Submit three (3) complete sets of bound hard copies of operating and maintenance manuals, and one (1) electronic copy to Owner within thirty (30) days of issuance of final occupancy permit.

End of Section

Section 211000

Underground Fire Service

Part 1. General

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and Division 21 Sections apply to this Section.

1.2 Scope of Work

B. Provide labor, materials, equipment, and services to furnish and install complete underground fire service as shown on the contract drawings in accordance with, NFPA13 and NFPA24 which shall include, but not limited to connection to municipal water, backflow assembly, fire department connection and underground fire service piping to in building riser.

1.3 Submittals

A. Submit for review, within fifteen (15) days after signing Contract, the required number of copies of a complete list of materials proposed for use. This list includes:

1. Double Check Detector Assembly.
2. Fire Department Connection.
3. Piping.
4. Fittings.
5. Mechanical Joint Restraint.
6. Bolt Up Sets.
7. Polyethylene Wrap.
8. Valves.
9. In Building Riser.
10. Warning Tape.
11. Coordination Drawings: plans and details, drawn to scale, on which piping is shown and coordinated with other installations, using input from installers of the items involved.
12. Site Survey: Plans, drawn to scale, on which fire service piping is shown and coordinated with other services and utilities
13. Welding certificates.

B. No substitute materials or equipment shall be installed without the written approval of the Architect.

C. No increase in the contract price will be considered to accommodate the use of alternative equipment, including revisions required by other trades.

D. Submit test reports on all systems tested. Tests required by Authorities Having Jurisdiction over the work shall be submitted on appropriate forms to the satisfaction of such authorities.

1.4 Quality Assurance

A. Steel support welding qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, “Structural Welding Code – Steel.”

B. Pipe welding qualifications: Qualification procedures and operators.

C.

D. Each length of pipe, fitting, or device used in any piping system shall be stamped or indelibly marked with type, weight, quality, and manufacturer's name or mark.

1.5 Delivery, Storage, and Handling

A. Pipes shall be shipped so as not to bend, dent, or otherwise damage the pipe during transport. Contractor shall take all necessary precautions to prevent damage to pipe and fittings during delivery and unloading. Any pipe found to have been damaged due to improper handling shall be removed from the jobsite at Contractor's expense.

B. Hazardous liquids: Remove and dispose of liquids from piping according to requirements of authorities having jurisdiction.

C. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

D. Store and handle pipes and tubes having factory-applies protective coatings to avoid damaging coating, and to protect from direct sunlight.

1.6 Connections

A. The contractor shall provide underground service to approximately 5'-0" outside of the building or to top of In Building Riser approximately 1'-0" above finish grade as shown on the drawings.

Part 2. Products

2.1 Piping

A. Underground fire service piping shall be DR14 C900 PVC, Manville Blue Brute or approved equal. Piping within 5 feet of buildings or under footings shall be Class 50 cement lined ductile iron.

B. Tracer wire minimum #10 awg copper, UL listed for direct burial.

C. Bituminous Tar Mastic meeting ASTM D 4541 standards, Christy's HD50 or approved equal.

2.2 Mechanical Joint Restraint

A. Mechanical joint restraint for PVC piping shall be EBAA Iron Megalug series 2000PV or approved equal. Mechanical joint restraint for ductile iron piping shall be EBAA Iron Megalug series 1100 or approved equal.

B. Bell Restraint Harness for PVC or ductile iron piping shall be EBAA Iron Series 1500TD or approved equal.

2.3 Thrust Blocks

A. Thrust blocks shall be a minimum of 2000 psi strength concrete.

2.4 Valves

A. All fire service valves shall be UL listed and by a single manufacturer, Clow, Mueller or approved equal.

2.5 Bolt Up Sets

A. All bolt up sets shall be 316 stainless steel.

2.6 Polyethylene Encasement

A. All metallic pipe fittings and appurtenances below grade shall be wrapped for protection from corrosive soil with a minimum of 8 mil polyethylene encasement in accordance with ASSI/AWWA C105/A21.5, Polyethylene encasement shall be Christy's Fitting wrap or approved equal

2.7 Mastic

A. All metallic pipe fittings and appurtenances below grade shall be coated for protection from corrosive soil with a minimum of 18 mil bituminous coal tar mastic, Christy's HD 50 Bituminous Coal Tar Mastic or approved equal.

2.8 Post Indicator

A. Post indicators shall be UL listed, Clow style 2945 A or approved equal.

2.9 Fire Department Connection

A. Fire department connections shall be UL listed, Croker 6407 or approved equal Pressure Gauge: 4" FFPI-PG 300 psi air/water gauge with 3way valve gauge kit or approved equal.

2.10 Check Valves

A. FDC inlet riser check valves shall be UL listed, brass body, FPPI TrimFit or approved equal.

B. FDC underground isolation check valves shall be UL listed cast iron, swing check, Nibco F-908-W or approved equal.

2.11 Valve Boxes

A. Valve boxes shall be cast iron or concrete with cast iron cover rated for H20 traffic loading, Christy or approved equal.

2.12 Fire Hydrant

B. Fire hydrants shall be UL listed meeting local fire department requirements, typical one 4 or 4-1/2" pumper outlet and two 2 ½" hose outlets, Clow 960 or approved equal.

2.13 Backflow Assembly

A. Double check detector assembly: Ames Deringer 30G Lead Free or approved equal, size as indicated on plans.

B. Reduced pressure detector assembly: Ames M500 or approved equal, size as indicated on plans.

2.14 In Building Riser

A. The In Building Riser shall be UL listed one piece 304 stainless steel, Ames IBR or approved equal, size as shown on the plans.

2.15 Tamper Switches

A. Tamper switches shall be UL listed and CSFM approved. System sensor OS&Y or approved equal.

2.16 Fire Pump

A. Fire pump shall be UL listed, complete, skid mounted with factory enclosure meeting the standards of NFPA20. Capacity and power supply as shown on the drawings.

2.17 Fire Water Storage Tank

A. Fire water storage tank shall be steel bolted or welded tank meeting the standards of NFPA 22. Capacity as shown on the drawings.

Part 3. Execution

3.1 Piping General Installation

A. All underground fire service piping shall be tested and flushed in accordance with NPFA 24. Testing and flushing shall be witnessed by DSA inspector of record.All piping shall be pressure tested and flushed in accordance with NFPA13.

B. Thrust blocks and mechanical joint restraint shall be provided at all changes in direction.

C. All non metallic piping shall have tracer wire and marking tape installed. Tracer wire shall be strapped to pipe every 5 feet. Tracer wire shall be accessible at every riser on valve box Sleeve all lines rising in footings.

D. All metallic pipe and fittings shall be coated and wrapped.

E. Metallic pipe and fittings shall be protected from corrosive soil conditions with polyethylene wrap.

F. Ductile iron pipe shall be used within 5 feet of buildings and under footings.

3.2 Excavation and Backfill

A. Any work damaged by excavation or backfilling shall be repaired at the contractor's expense.

B. Piping shall be bedded on a minimum of 6" of clean sand with backfill of sand or clean gravel to 6" above pipe. Compaction not exceeding 8" lifts to 95% density in accordance with AASHO Standard T-99.

3.3 Hydrants

A. Hydrants shall be set plumb with pumper outlet facing the access roadway. The pumper outlet shall be no less than 18" or more than 36" above the access roadway.

B. 6" minimum runnout with gate valve shall connect each hydrant to the fire service main.

C. Thrust block and mechanical joint restraint shall be provided at all changes in direction.

3.4 Corrosion Protection

A. All metallic piping fitting, bolts, etc shall be coated in a minimum of 18 mils of bituminous coal tar mastic and the wrapped with a minimum of 8 mils of polyethylene fitting wrap for corrosive soils conditions.

B. All bolt-up sets (nuts, bolts, and washers) and tie rods for valves, fittings, and buries shall be stainless steel, ASTM A-276 type 316

3.5 Testing, Adjusting, and Cleaning

A. Provide testing of all fire sprinkler piping at 200 psi for 2 hours in accordance with NFPA24. Such tests shall be done in the presence of the Owner's representative, and all Authorities Having Jurisdiction. The inspection authority having jurisdiction and the Engineer shall be notified a minimum of 48 hours prior to performance of all tests so that they may be witnessed.

B. Provide the IOR and the Architect with the completed contractors test certificate in accordance with NFPA24.

C. Contractor shall provide all apparatus, temporary work, or any other requirements necessary for such tests. Take all due precautions to prevent damage to the building or its contents that may be incurred by such tests as the Contractor will be required to repair and make good, at own expense, any damage caused.

D. Any defects or deficiencies discovered as result of tests shall be immediately repaired and tests shall be repeated until all test requirements are fully met. No caulking of pipe joints to remedy leaks shall be permitted.

3.6 Training and O&MS

A. Refer to Section 21 00 00 Fire Protection General Requirements and Division 01 for Training requirements, Operating and Maintenance Manuals, and other Closeout procedures.

End of Section

Section 26 05 10

General Electrical Requirements

Part 1. General

1.01 Description of Work

A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations that are shown on the Drawings, included in these specifications, or otherwise needed for a complete and fully operating facility.

B. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

1.02 Related Work

A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 26.

1.03 Submittals

A. As specified in Division 1. Submit to the Architect shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Information to be submitted includes manufacturer's descriptive literature of cataloged products, equipment, drawings, diagrams, performance and characteristic curves as applicable, test data and catalog cuts. Obtain written approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Furnish manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contact compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.

B. Organize submittals for equipment and items related to each specification section together as a package.

C. Proposed substitutions of products will not be reviewed or approved prior to awarding of the Contract.

D. Substitutions shall be proven to the Architect or Engineer to be equal or superior to the specified product. Architect’s decision is final. The Contractor shall pay all costs incurred by the Architect and Engineer in reviewing and processing any proposed substitutions whether or not a proposed substitution is accepted.

E. If a proposed substitution is rejected, the contractor shall furnish the specified product at no increase in contract price.

F. If a proposed substitution is accepted, the contractor shall be completely responsible for all dimensional changes, electrical changes, or changes to other work which is a result of the substitution. The accepted substitution shall be made at no additional cost to the owner or design consultants.

1.04 Quality Assurance

A. Codes: All electrical equipment and materials, including installation and testing, shall conform to the latest editions following applicable codes:

1. California Electrical Code (CEC).

2. Occupational Safety and Health Act (OSHA) standards.

3. All applicable local codes, rules and regulations.

4. Electrical Contractor shall posses a C-10 license and all other licenses as may be required. Licenses shall be in effect at start of this contract and be maintained throughout the duration of this contract.

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA).

D. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Provide service entrance labels for all equipment required by the NEC to have such labels.

E. The electrical contractor shall guarantee all work and materials installed under this contract for a period of one (1) year from date of acceptance by owner.

F. All work and materials covered by this specification shall be subject to inspection at any and all times by representatives of the owner. Work shall not be closed in or covered before inspection and approval by the owner or his representative. Any material found not conforming with these specifications shall, within 3 days after being notified by the owner, be removed from premises; if said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the contractor.

1.05 Drawings

A. Drawings: The electrical Drawings shall govern the general layout of the completed construction.

1. Locations of equipment, panels, pullboxes, conduits, stub-ups, ground connections are approximate unless dimensioned; verify locations with the Architect prior to installation.

2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for those installations.

3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Architect for approval.

4. The general arrangement and location of existing conduits, piping, apparatus, etc., is approximate. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Architect.

5. All drawings and divisions of these specifications shall be considered as whole. This contractor shall report any apparent discrepancies to the Architect prior to submitting bids.

6. The contractor shall be held responsible to have examined the site and compared it with the specifications and plans and to have satisfied himself as to the conditions under which the work is to be performed. He shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.06 Closeout Submittals

A. Manuals: Furnish manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1.

1.07 Coordination

A. Coordinate the electrical work with the other trades, code authorities, utilities and the Architect.

B. Provide and install all trenching, backfilling, conduit, pull boxes, splice boxes, etc. for all Utility Company services to the locations indicated on the Drawings. All materials and construction shall be in accordance with the requirements for all the Utility Companies. Prior to performing any work, the Electrical Contractor shall coordinate with the various Utility Companies to verify that all such work and materials shown on the Drawings are of sufficient sizes and correctly located to provide services on the site. The Electrical Contractor shall verify with all the Utility Companies that additional contractor furnished and installed work is not required. If additional work, materials, or changes are required by any of the Utility Companies, the Electrical Contractor shall advise the Architect of such changes and no further work shall then be performed until instructed to do so by the Architect.

C. Utility Company charges shall be paid by the Owner.

D. Contractor shall pay all inspection and other applicable fees and procure all permits necessary for the completion of this work.

D. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods.

E. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 Job Conditions

A. Operations: Perform all work in compliance with Division 1

1. Keep the number and duration of power shutdown periods to a minimum.

2. Show all proposed shutdowns and their expected duration on the construction schedule. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities.

3. Carry out shutdown only after the schedule has been approved, in writing, by the owner. Submit power interruption schedule 15 days prior to date of interruption.

B. Construction Power: Unless otherwise noted in Division 1 of these specifications, contractor shall make all arrangements and provide all necessary facilities for temporary construction power from the owner's on site source. Energy costs shall be paid for by the Owner

C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.09 Damaged Products

A. Notify the Architect in writing in the event that any equipment or material is damaged. Obtain approval from the Architect before making repairs to damaged products.

1.10 Locations

A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.

B. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.

C. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.11 Safety and Indemnity

A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continually and not be limited to normal working hours. The contractor shall provide and maintain throughout the work site proper safeguards including, but not limited to, enclosures, barriers, warning signs, lights, etc. to prevent accidental injury to people or damage to property.

B. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.

C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers,

agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.

D. The project work area does not contain asbestos materials. However, if a work area is encountered that does contain asbestos materials, the contractor is advised to coordinate with the owner and it's asbestos abatement consultant all measures necessary to provide installation of conduit, and hangers. All asbestos containing materials related work shall conform to the directions given by the owner. Nothing herein shall be construed to create a liability for American Consulting Engineers regarding asbestos abatement measures.

1.12 Access Panels and Doors

A. The Contractor shall install access panels as required where floors, walls or ceilings must be penetrated for access to electrical, control, fire alarm or other specified electrical devices. The minimum size panel shall be 14” x 14” in usable opening. Where access by a service person is required, minimum usable opening shall be 18” x 24”.

B. All access doors installed lower than 7’-0” above finished floor and exposed to public access shall have keyed locks.

C. Where specific information or details relating to access panels differ from these specifications, shown on drawings and or details or on other Divisions of work, these requirements shall supersede these specifications.

D. Approved Manufacturers: Subject to compliance with requirements under Architectural Specifications, Milcor, Karp, Nystrom or Cesco.

1. Milcor Style K (plaster)

2. Milcor Style DW (gypsum board)

3. Milcor Style M (masonry)

4. Milcor Style “Fire Rated” where required.

Part 2. Products

2.01 Standard of Quality

A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Architect prior to installation.

B. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years

prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.

C. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.

D. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.02 Nameplates

A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.

B. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 0.5 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel or brass screws.

2.03 Fasteners

A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.04 Finish Requirements

A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Architect.

B. Wiring System: In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

Part 3. Execution

3.01 Workmanship

A. Ensure that all equipment and materials fit properly in their installation.

B. Perform any required work to correct improperly fit installation at no additional expense to the owner.

C. All electrical equipment and materials shall be installed in a neat and workmanship manner in accordance with the NECA Standard of Installation Manual and Workmanship of the entire job shall be first class in every respect.

3.02 Equipment Installations

A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.

B. Do all the cutting and patching necessary for the proper installation of work and repair any damage done.

C. Earthquake restraints: all electrical equipment, including conduits over 2 inches in diameter, shall be braced or anchored to resist a horizontal force acting in any direction as per Title 24, part 2, table 16a-o, part 3.

D. Structural work: All core drilling, bolt anchor insertion, or cutting of existing structural concrete shall be approved by a California registered structural consulting engineer prior to the execution of any construction. At all floor slabs and structural concrete walls to be drilled, cut or bolt anchors inserted, the contractor shall find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer. Submit sketch showing location of rebar and proposed cuts, cores, or bolt anchor locations for approval.

3.03 Field Tests

A. Test shall be in accordance with Acceptance testing specifications issued by the National Electrical Testing Association (NETA).

B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Architect prior to any test so that the tests may witnessed.

C. Provide instruments, other equipment and material required for the tests. These shall be of the type designed for the type of tests to be performed. Test instrument shall be calibrated by a recognized testing laboratory within three months prior to performing tests.

D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.

E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Architect. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.

F. Maintain records of each test and submit five copies to the Architect when testing is complete. All tests shall be witnessed by the Architect. These records shall include:

1. Name of equipment tested.

2. Date of report.

3. Date of test.

4. Description of test setup.

5. Identification and rating of test equipment.

6. Test results and data.

7. Name of person performing test.

8. Owner or Architect's initials.

G. Items requiring testing shall be as noted in the additional electrical sections of these specifications.

3.04 Cleaning Equipment

A. Thoroughly clean all soiled surfaces of installed equipment and materials.

3.05 Painting of Equipment

A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.

B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces.

3.06 Records

A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the "as built" condition. After completion of the work, the Contractor shall carefully mark the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Cable Size and Type: Provide the size and type of each cable installed on project.

2. Substructure: Where the location of all underground conduits, pull boxes, stub ups and etc. where are found to different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.

3. Size of all conduit runs.

4. Routes of concealed conduit runs and conduit runs below grade.

5. Homerun points of all branch circuit.

6. Location of all switchgear, panels, MCC, lighting control panels, pullcans, etc.

7. Changes made as a result of all approved change orders, addendums, or field authorized revisions.

8. As Builts: At the completion of the Work the Contractor shall review, certify, correct and turn over the marked up Drawings to the Architect for his use in preparing "as built" plans.

9. As built Drawings shall be delivered to the Architect within ten (10) days of completion of construction.

3.07 Clean Up

A. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Architect.

3.08 Mechanical and Plumbing Electrical Work

A. The requirements for electrical power and/or devices for all mechanical and plumbing equipment supplied and/or installed under this Contract shall be coordinated and verified with the following:

1. Mechanical and Plumbing Drawings.

2. Mechanical and Plumbing sections of these Specifications.

3. Manufacturers of the Mechanical and Plumbing equipment supplied.

B. The coordination and verification shall include the voltage, ampacity, phase, location and type of disconnect, control, and connection required. Any changes that are required as a result of this coordination and verification shall be a part of this Contract.

C. The Electrical Contractor shall furnish and install the following for all mechanical and plumbing equipment:

1. Line voltage conduit and wiring.

2. Disconnect switches.

3. Manual line voltage controls.

D. Automatic line voltage controls and magnetic starters unless otherwise noted, shall be furnished by the Mechanical and/or Plumbing Contractor and installed and connected by the Electrical Contractor. All line voltage control wiring installed by the Electrical Contractor shall be done per directions from the Mechanical and/or Plumbing Contractor.

E. All low voltage control wiring for Mechanical and Plumbing equipment shall be installed in conduit. Furnishing, installation and connection of all low voltage conduits, boxes, wiring and controls shall be by the Mechanical and/or Plumbing Contractor.

F. Manual motor starters, where required, shall have toggle type operators with pilot light and melting alloy type overload relays, SQUARE D COMPANY, Class 2510, Type FG-1P (surface) or Type FS-1P (flush) or ITE, WESTINGHOUSE or GENERAL ELECTRIC equal.

3.09 Access Doors

A. The Electrical Contractor shall furnish and install access doors wherever required whether shown or not for easy maintenance of electrical systems: As an example, fire alarm devices, controls, junction boxes, etc. Access doors shall provide for complete access to equipment for both removal and replacement of equipment.

End of Section

Section 26 05 11

Electrical Demolition

Part 1. General

1.01 Description of Work

A. General - Remove all material designated to be removed on the drawings and that is surplus to the needs of the system as may be designated by the Owner's Representative. Specific work shall be provided as specified below:

B. Remove Existing Equipment - Electrical Equipment to be removed shall include but not be limited to switchboards, panel boards, concrete foundations, equipment supports, lighting fixtures, conductors, conduit, raceway and other items as shown on the drawings or specified.

C. Clean Surface Areas - Clean all floors, streets, sidewalks, driveways, parking lots and landscaped areas of all trash and debris deposited as a result of the work. Clean daily and maintain the property free of trash and debris.

1.02 Related Work

A. See the following specification sections for work related to the work of this section.

1. 26 05 12 Shutdowns, Switching, Phasing and Cutovers

1.03 Standards and Codes

A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.

1. California Electrical Code (CEC).

Part 2. Products

NOT USED

Part 3. Execution

3.01 Disposal

A. Except where specifically noted otherwise on the drawings or elsewhere in these specifications, the contractor assumes ownership of all material removed from the project site and assumes all responsibility for its proper disposal.

3.02 Cleanup

A. Contractor shall maintain the work site in a neat and orderly state. Contractor shall remove demolition material from the job site daily. No demolition material shall be left on the job site after working hours without written approval from the Owner's Representative.

End of Section

Section 26 05 19

Low Voltage Wire and Cable

Part 1. General

1.01 Description of Work

A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

1.02 Related Work

A. See the following Specification Section for work related to the work in this Section:

1. 26 05 33 Conduits, Raceways and Fittings.

2. 26 05 34 Junction and Pull Boxes.

1.03 Submittals

A. In accordance with Division 1.

B. Submit complete material list with the manufacturer's specifications and published descriptive literature for all materials proposed for use.

1.04 Quality Assurance

A. Field tests shall be performed as specified in paragraph 3.04 of this Section.

Part 2. Products

2.01 Conductors

A. Conductors shall be copper, type THHN/THWN/MTW oil and gasoline resistant, 600 volt rated insullation.Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.

B. Conductors shall be stranded except that sizes #10 and smaller for receptacle circuits shall be solid and of the sizes indicated.

C. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.

D. All conductors used on this Project shall be of the same type and conductor material

2.02 Cables

A. All individual conductors shall be copper with type THHN/THWN, 600 volt rated insulation.

B. Insulation Marking - All insulated conductors shall be identified with printing colored to contrast with the insulation color.

C. Color Coding - As specified in paragraph 3.03.

D. Special Wiring - Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.

E. Other Wiring - Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.

F. Manufacturer - Acceptable manufacturers including Cablec, Southwire, or equal.

2.03 Terminations

A. Manufacturer - Terminals as manufactured by T&B, Burndy or equal.

B. Cable Termination for Copper - Crimp style two hole NEMA spade terminals designed and rated for copper cable.

C. Wire Terminations - Crimp on ring-tongue terminals, insulated sleeve, of proper size for the wire used.

D. End Seals - Heat shrink plastic caps of proper size for the wire on which used.

2.04 Tape

A. Tape used for terminations and cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material.

Part 3. Execution

3.01 Cable Installation

A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 26 05 33 - Conduits Raceway and Fittings.

B. Cable Pulling - Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.

C. Bending Radius - Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.

D. Equipment Grounding Conductors - Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in all conduits or all raceways.

E. Panelboard Wiring - In panels, bundle incoming wire and cables which are No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

F. Provide #10awg conductors for all 20 amp 120v branch circuits over 100 feet.

3.02 Cable Terminations and Splices

A. Splices - UL Listed wirenuts.

B. Terminations - Shall comply with the following:

1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.

2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.03 Circuit and Conductor Identification

A. Color Coding - Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. Ungrounded conductor colors shall be as follows:

VOLTAGE	208/120V	480/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

B. Color coding shall be in the conductor insulation for all conductors #10 AWG and smaller; for larger conductors, color shall be either in the insulation or in colored plastic tape applied at every location where the conductor is readily accessible.

C. Circuit Identification - All underground distribution and service circuits shall be provided with plastic identification tags in each secondary box and at each termination. Tags shall identify the source transformer of the circuit and the building number(s) serviced by the circuit.

3.04 Field Tests

A. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the requirements of the CEC. All circuits shall be tested for proper neutral connections.

End of Section

Section 26 05 26

Grounding

Part 1. General

1.01 Description of Work

A. The work of this section consists of furnishing, installing, connection and testing of all grounding systems as specified herein and as shown on the Drawings.

1.02 Related Work

A. See the following specification sections for work related to work in this section.

1. Section 26 05 10 - Electrical General Requirements.

2. Section 26 05 19 - Low Voltage Wire and Cable

1.03 Submittals: In accordance with Section 26 05 10 Submittals.

A. Submit manufacturer's literature for review.

1.04 Standards and Codes

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

1. B8-1986, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

2. B228-1988, Copper Clad Steel Conductors Specification.

B. The latest editions following applicable codes:

1. California Electrical Code (CEC).

2. Occupational Safety and Health Act (OSHA) standards.

3. All applicable local codes, rules and regulations.

1.05 Quality Assurance

A. Each and every concealed connection must be inspected by the Owner's Representative before it is covered up by the Contractor.

Part 2. Products

2.01 General

A. The grounding system shall consist of the grounding conductors, ground bus, ground fittings and clamps, and bonding conductors as shown on the Drawings and as required by codes and local authorities.

2.02 System Components

A. Ground Rods: Ground rods shall be cone pointed copper clad Grade 40 HS steel rods conforming to ASTM B228. The welded copper encased steel rod shall have a conductivity of not less than 27% of pure copper. Rods shall be not less than 3/4-inch in diameter and ten feet long, unless otherwise indicated. Rods longer than ten feet shall be make up of ten foot units joined together with threaded couplings. The manufacturer's trademark shall be stamped near the top.

B. Ground Conductors: Buried conductors shall be medium-hard drawn bare copper; other conductors shall be soft drawn copper. Sizes over No. 6 AWG shall be stranded conforming to ASTM B8. In all conduit runs, a green insulated copper ground wire, sized to comply with codes, shall be installed.

C. Ground Connections: Exposed ground connections shall be high copper alloy bolted pressure types or exothermically welded type as notes. Buried connections shall be either exothermically welded type or approved compression types for connection of copper to copper or copper to steel, as required. Lug for attachment of cables to steel enclosures shall be of the binding post type with a 1/2-13NC stud. Each post shall accommodate cables from #4 AWG to #2/0 AWG.

D. Ground Rod Boxes: Boxes shall be nine-inch diameter precast concrete units with cast iron traffic covers. Units shall be 12 inches deep. Covers shall be embossed with the wording "Ground Rod".

E. Ground Bus: 2” x 1/4” x (length as specified on drawings) copper busbar. Provide isolation stand off bushings. Provide drilled and tapped 3/8” diameter holes on 2 foot centers. Provide “ALCU” lugs and bronze bolts. Connect busbar to main grounding system and bond to metallic domestic cold water pipe with #8 ground conductor.

Part 3. Execution

3.01 Installation

A. Ground all equipment, including, but not limited to, panel boards, terminal cabinets and outlet boxes, for which a ground connection is required per the NEC, even though not specifically shown on the Drawings.

B. The ground pole of receptacles shall be connected to their outlet boxes by means of a copper ground wire connecting to a screw in the back of the box.

C. Provide a ground rod box for each ground rod so as to permit ready access for the connection and/or removal of any pressure connectors to facilitate testing.

D. Where ground rods must be driven to depths over ten feet, increase rod diameter used, sufficiently to prevent the rod from bending or being damaged.

E. Make embedded or buried ground connections, taps and splices with exothermically welded connections or approved compression type connectors.

F. Make connections of grounding conductors to equipment ground buses and enclosures using binding post type connectors.

G. Effectively bond structural steel for buildings to the grounding system, "UFER" ground.

H. Install a ground rod in each primary handhole. Connect the ground conductor installed for each primary duct bank to the ground rod in each handhole. Bond metal conduits to handhole ground rod.

3.02 Testing

A. Conduct ground resistance tests using a ground resistance tester with a scale reading of 25 ohms maximum.

B. Test methods shall conform to IEEE Standard 81 using the three electrode method. Conduct test only after a period of not less than 48 hours of dry weather.

C. Take resistance readings for each ground rod individually and for each system as a whole without benefit of chemical treatment or other artificial means. Ground resistance readings shall not exceed 25 ohms. If readings are not to the Contracting Officer's approval, provide lengthened or additional ground rods (maximum of two additional rods).

D. Furnish to the Owner's Representative a test report with recorded data of each ground rod location and each system.

End of Section

Section 26 05 33

Conduits, Raceways and Fittings

Part 1. General

1.01 Description of Work

A. The work of this section consists of furnishing and installing conduits, raceways and fittings as shown on the Drawings and as described herein.

1.02 Related Work

A. See the following specification sections for work related to the work in this section:

1. 26 05 43 Underground Ducts.
2. 26 05 44 In Grade Pull Boxes
3. 26 05 19 Low Voltage Wire and Cable.
4. 26 05 34 Junction and Pull Boxes

1.03 Submittals

A. As specified in Division 1.

1. Catalog Data: Provide manufacturer's descriptive literature.
2. Single Submittal: A single complete submittal is required for all products covered by this Section.

Part 2. Products

2.01 Conduits, Raceways

A. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized after fabrication. Couplings shall be compression or setscrew type.

B. Flexible Conduit: Flexible metal conduit shall be galvanized steel.

C. Galvanized Rigid Steel Conduit (GRS) shall be hot-dip galvanized after fabrication. Couplings shall be threaded type.

D. Rigid Non-metallic Conduit: Rigid non-metallic conduit shall be PVC Schedule 40 (PVC-40 or NEMA Type EPC-40) conduit approved for underground use and for use with 90°C wires.

E. The use of “MC Cable shall not be permitted without written approval.

2.02 Conduit Supports

A. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.

B. Supports for multiple conduits shall be hot-dipped galvanized Unistrut or Superstrut channels, or approved equal. All associated hardware shall be hot-dip galvanized.

C. Supports for EMT conduits shall be galvanized pressed steel single hole straps.

D. Clamp fasteners shall be by wedge anchors. Shot in anchors shall not be allowed.

2.03 Fittings

A. Provide threaded-type couplings and connectors for rigid steel conduits. Provide compression (watertight) steel type (die-cast zinc or malleable iron type fittings not allowed), or setscrew type for EMT. Provide threaded couplings and Meyers hubs for rigid steel conduit exposed to weather.

B. Fittings for flexible conduit shall be Appleton, Chicago, IL, Type ST, O-Z Gedney Series 4Q by General Signal Corp., Terryville, CT, T & B 5300 series, or approved equal.

C. Fittings for use with rigid steel shall be galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse Hinds Condulets, Syracuse, NY, Appleton Unilets, Chicago, IL, or approved equal. Provide threaded-type couplings and connectors; setscrew type and compression-type are not acceptable.

D. Fittings for use with rigid non-metallic conduit shall be PVC and have solvent-weld-type conduit connections.

E. Union couplings for conduits shall be the Erickson type and shall be Appleton, Chicago, IL, Type EC, O-Z Gedney 3-piece Series 4 by General Signal Corp., Terryvile, CT, or approved equal. Threadless coupling shall not be used.

F. Bushings

1. Bushings shall be the insulated type.
2. Bushings for rigid steel shall be insulated grounding type, O-Z Gedney Type HBLG, Appleton Type GIB, or approved equal.

G. Conduit Sealants

1. Fire Retardant Types: Fire stop material shall be reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL Classification 35L4 or as specified on the Drawings.

Part 3. Execution

3.01 Conduit, Raceway and Fitting Installation

A. For conduit runs exposed to weather provide rigid metal (GRS).

B. For conduit run underground, in concrete or masonry block walls and under concrete slabs, install minimum ¾" size nonmetallic (PVC) with PVC elbows. Where conduits transition from underground or under slab to above grade install wrapped rigid metal (GRS) elbows and risers.

C. For conduit runs concealed in steel or wood framed walls or in ceiling spaces or exposed in interior spaces above six feet over the finished floor, install EMT.

D. Flexible metal conduit shall be used only for the connection of recessed lighting fixtures and motor connections unless otherwise noted on the Drawings. Liquid-tight steel flexible conduit shall be used for motor connections.

E. The minimum size raceway shall be 3/4-inch unless indicated otherwise on the Drawings.

F. Installation shall comply with the CEC.

G. From pull point to pull point, the sum of the angles of all of the bends and offset shall not exceed 270 degrees.

H. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits concealed except where otherwise shown on the drawings.

1. Exposed Conduits: Support exposed conduits within three feet of any equipment or device and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps.
   a. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel or at right angles to building lines.
   b. Group exposed conduits together. Arrange such conduits uniformly and neatly.
2. Support all conduits within three feet of any junction box, coupling, bind or fixture.
3. Support conduit risers in shafts with Unistrut Superstrut, or approved equal, channels and straps.

H. Moisture Seals: Provide in accordance with NEC paragraphs 230-8 and 300-5(g).

I. Where PVC conduit transitions from underground to above grade, provide rigid steel 90's with risers. Rigid steel shall be half-lap wrapped with 20-mil tape and extend minimum 12" above grade.

J. Provide a nylon pull cord in each empty raceway.

K. Provide galvanized rigid steel factory fittings for galvanized rigid steel conduit.

L. Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the pull box or manhole located outside the building.

M. Conduits shall be blown out and swabbed prior to pulling wires.

End of Section

Section 26 05 34

Junction and Pull Boxes

Part 1. General

1.01 Description of Work

A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations shown on the drawings, included in these Specification, or otherwise needed for a complete and fully operating facility. The work shall include but not be limited to the following:

B. Furnish and install all required material, supports and miscellaneous material for the satisfactory interconnection of all associated electrical systems.

1.02 Related Work

A. See the following specification sections for work related to the work of this section.

1. 26 05 10 General Electrical Requirements.

2. 26 05 33 Conduits, Raceway and Fittings.

3. 26 05 19 Low Voltage Wire and Cable.

1.03 Standards and Codes

A. Submit in accordance with the requirements of Section 26 05 10: Electrical General Provisions, the following items:

1. Pull boxes larger than 6"x 6"x 4".

Part 2. Products

2.01 Outlet boxes, Junction and Pull boxes

A. Standard Outlet Boxes: Galvanized, one-piece die formed or drawn steel, knock-out type of size and configuration best suited to the application indicated on the Drawings. Minimum box size shall be 4 inches square by 1-1/2 inches deep with mud rings as required.

B. Switch boxes: Minimum box size shall be 4 inches square by 1-1/2 inches deep with mud rings as required. Install multiple switches in standard gang boxes with raised device covers suitable for the application indicated.

C. Conduit bodies: Cadmium plated, cast iron alloy. Conduit bodies with threaded conduit hubs and neoprene gasketed, cast iron covers. Bodies shall be used to facilitate pulling of controls

or to make changes in conduit direction only. Splices are not permitted in conduit bodies. Crouse-Hinds Form 8 Condulets, Appleton Form 35 Unilets or equal.

D. Sheet Metal Boxes: Use standard outlet or concrete ring boxes wherever possible; otherwise use a minimum 16 gauge galvanized sheet metal, NEMA I box sized to Code requirements with covers secured by cadmium plated machine screws located six inches on centers. Circle AW Products, Hoffman Engineering Company or equal.

E. Flush Mounted Pull boxes and Junction boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

Part 3. Execution

3.01 Outlet Boxes

A. General:

1. All outlet boxes shall finish flush with building walls, ceilings and floors except in mechanical and electrical rooms above accessible ceiling or where exposed work is called for on the Drawings.

2. Install raised device covers (plaster rings) on all switch and receptacle outlet boxes installed in masonry or stud walls or in furred, suspended or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.

3. Leave no unused openings in any box. Install close-up plugs as required to seal openings.

B. Box Layout:

1. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.

2. Locate switch outlet boxes on the latch side of doorways.

3. Outlet boxes shall not be installed back to back nor shall through-wall boxes be permitted.

4. For outlets mounted above counters, benches or backsplashes, coordinate location and mounting heights with built-in units. Adjust mounting height to agree with required location for equipment served.

C. Supports:

1. Outlet Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on specified box supports.

2. Fixture outlet boxes installed in suspended ceiling of gypsum board or lath and plaster construction shall be mounted to 16 gauge metal channel bars attached to main ceiling runners.

3. Fixture outlet boxes installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structure above where pendant mounted lighting fixture are to be installed on the box.

4. Fixture Boxes above tile ceilings having exposed suspension systems shall be supported directly from the structure above.

5. Outlet and / or junction boxes shall not be supported by grid or fixture hanger wires at any locations.

3.02 Junction and Pull Boxes

A. General:

1. Install junction or pull boxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not shown on the Drawings.

2. Locate pull boxes and junction boxes in concealed locations above removable ceilings or exposed in electrical rooms, utility rooms or storage areas.

3. Install raised covers (plaster rings) on boxes in stud walls or in furred, suspended or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.

4. Leave no unused openings in any box. Install close-up plugs as required to seal openings.

5. Identify circuit numbers and panel on cover of junction box with black marker pen.

B. Box Layouts:

1. Boxes above hung ceilings having concealed suspension systems shall be located adjacent to openings for removable recessed lighting fixtures.

C. Supports:

1. Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on specified box supports.

2. Boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted to 16 gauge metal channel bars attached to main ceiling runners.

3. Boxes installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structure above.

4. Boxes mounted above suspended acoustical tile ceilings having exposed suspension systems shall be supported directly from the structure above.

End of Section

Section 26 05 43

Underground Ducts

Part 1. General

1.01 Description of Work:

A. The work of this section consists of furnishing and installing raceways, raceway spacers and encasing material with necessary excavation for underground ducts.

B. Encasement - Encasement shall be sand for all other raceways.

C. Where required - All raceways, where run underground in and excavation shall be installed in compliance with the requirements of this Section. Conduits run underground without encasement shall be as indicated in the Drawings.

1.02 Related Work:

A. See the following specification sections for work related to the work of this section.
   1. 31 23 00 Excavation and Backfill
   2. 26 05 33 Conduit Raceway and Fittings

1.03 Standards and Codes:

A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.

B. National Fire Protection Association (NFPA), National Electrical Code (NEC) - Latest Revision:
   1. Underground Installations NEC - Article 300
   2. Rigid Nonmetallic Conduit NEC - Article 347

C. California Electrical Code (CEC).

D. Construction of Underground Electric Supply and Communication Systems, State of California Public Utilities Commission, General Order No. 128.

1.04 Submittals:

A. As specified in Division 1 and Section 26 05 10.

B. Catalog Data: Provide manufacturer's descriptive literature.

C. Single Submittal: A single complete submittal is required for all products covered by this Section.

Part 2. Products

2.01 Raceways:

A. As specified in Section 26 05 33 Conduits, Raceways and Fittings.

2.02 Spacers:

A. Molded plastic as furnished by the raceway manufacturer, to cradle and position the raceways in the excavation for placing the encasement.

B. Shape to accurately fit the raceway, provide the correct raceway spacing, to interlock in place and stack.

Part 3 Execution

3.01 Excavation:

A. As specified in Section 31 23 00, Excavation and Backfill and as required for the work shown on the Drawings.

3.02 Raceway:

A. Install raceways in spacers. Spacers installed at intervals of five feet and within one inch each side of all bends and joints.

B. Solvent weld connections.

3.03 Sand Encasement:

A. As shown on drawings and specified in Section 31 23 00 - Excavation and Backfill.

3.04 Backfill:

A. As shown on drawings and specified in Section 31 23 00 - Excavation and Backfill.

End of Section

Section 26 24 16

Panelboards and Distribution Panels

PART 1. GENERAL

1.01 Description of Work

A. The work of this Section consists of providing panelboards and circuit breakers as shown on the Drawings and as described herein.

1.02 Related Work

A. See the following specification sections for work related to the work in this Section.

1. 26 05 10 General Electrical Requirements
2. 26 05 26 Grounding
3. 26 05 19 Line Voltage Wire and Cable
4. 26 08 16 Circuit Breakers

1.03 Submittals

A. Shop Drawings - As specified in Division 1 and Section 26 05 10. For each panelboard and distribution panels furnished under this Contract, submit manufacturer's name, catalog data, and the following information:

1. Panelboard / distribution panel type.
2. Main bus and terminal connection sizes.
3. Location of line connections.
4. Cabinet dimension.
5. Gutter space.
6. Gauge of boxes and fronts.
7. Finish data.
8. Voltage rating.
9. Breaker manufacturer, types, trip rating, and interrupting ratings.
10. When information is available on the Drawings, show breaker circuit numbers and locations along with trip ratings on a panelboard layout.

B. Single Submittal - A single complete submittal is required for all products covered by this Section.

C. Closeout Submittals: Submit operation and maintenance data for panelboards and circuit breakers including nameplate data, parts lists, factory and field-test reports, recommended maintenance procedures and typewritten as-built panel schedules. Submit in accordance with Division 1.

1.04 Warranty

A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation or eighteen (18) months from the date of purchase.

Part 2. Products

2.01 Panelboards

A. General: Lighting and Receptacle Panelboards shall be the automatic circuit breaker type. The number and arrangement of circuits, trip ratings, spares and blank spaces for future circuit breakers shall be as shown on the Drawings or, if not shown, 42 circuits. All circuit breakers shall be quick-make, quick-break, thermal-magnetic bolt-on type, with 1, 2 or 3 poles as shown, each with a single operating handle. Tandem or piggyback breakers shall not be used.

B. Nameplates:

1. Each panelboard shall have a field mounted identifying, rigid, plastic nameplate giving the panel identification as shown on the Drawings. Nameplates shall be laminated with black characters minimum 3/16" high on a white laminated background. Nameplates shall be attached with screws.

2. Each panelboard shall have a manufacturer's nameplate showing the voltage, bus rating, number of phases, frequency and number of wires.

C. Construction:

1. Door and trim shall be finished to match color of surrounding wall. Box shall be hot-dip galvanized, field finished to match the front.

2. Panelboards and enclosures shall conform to requirements of all relevant codes. Panelboards shall be suitable for use as service equipment.

3. Panelboards shall be furnished with door-in-door or hinged trim fronts with key latch, on inner door and a typed directory card and holder. Panelboard circuits shall be arranged with odd numbers on the left and even numbers on the right. Provide weatherproof, NEMA type 3R enclosures for outdoor installation.

D. Busbars: Panelboard busbars shall be phase sequence type suitable for bolt-on circuit breakers. All busbars shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

1. Busbars shall be braced for the indicated short circuit level scheduled.

2. Busbars shall be installed completely throughout the panel for installation of both required and future breakers. Schedules indicate spaces for future breakers.

3. Busbars shall be designed so circuit breakers may be changed without machining, drilling or tapping.

4. Separate isolated Neutral and Ground busbars shall be provided. If called for on panel schedules, Neutral busbar may be oversized. Ground busbar shall be identified with green stripe and fully bonded to enclosure.

E. Circuit Breakers: Circuit breakers shall be the molded case type with trip and interrupting ratings as shown on the Drawings.

F. Series ratings shall not be allowed unless specifically noted on drawings.

G. Typed Circuit Directories: All panelboards shall have typed directories identifying all circuits installed behind plastic cover provided by the panelboard manufacturer.

H. Manufacturer:

1. Panelboards shall be Square D, Siemens or approved equal.

2.02 Distribution Panels

A. General: Distribution panels shall be the automatic circuit breaker type. The number and arrangement of circuits, trip ratings, spares and blank spaces for future circuit breakers shall be as shown on the Drawings. All circuit breakers shall be quick-make, quick-break, thermal-magnetic bolt-on type, with 1, 2 or 3 poles a shown, each with a single operating handle. Tandem or piggyback breakers shall not be used.

B. Nameplates:

1. Each distribution board shall have a field mounted identifying, rigid, plastic nameplate giving the panel identification as shown on the Drawings. Nameplates shall be laminated with black characters minimum 3/16" high on a white laminated background. Nameplates shall be attached with screws.

2. Each distribution panel shall have a manufacturer's nameplate showing the voltage, bus rating, number of phases, frequency and number of wires.

C. Construction:

1. Door and trim shall be finished to match color of surrounding wall. Box shall be hot-dip galvanized, field finished to match the front.

2. Distribution panels and enclosures shall conform to requirements of all relevant codes. Distribution panels shall be suitable for use as service.

3. Distribution panels shall have a front door with key latch and a typed directory card and permanently attached holder. Adhesive backed holders are not acceptable. Distribution panel's circuits shall be arranged with odd numbers on the left and even numbers on the right. Provide weatherproof, NEMA type 3R enclosures for outdoor installation.

D. Busbars: Distribution panel's busbars shall be phase sequence type suitable for bolt-on circuit breakers. All busbars shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

1. Busbars shall be braced for the indicated short circuit level scheduled.

2. Busbars shall be installed completely throughout the panel for installation of both required and future breakers. Schedules indicate spaces for future breakers.

3. Busbars shall be designed so circuit breakers may be changed without machining, drilling or tapping.

4. Separate isolated Neutral and Ground busbars shall be provided. If called for on panel schedules, Neutral busbar may be oversized. Ground busbar shall be identified with green stripe and fully bonded to enclosure.

E. Circuit Breakers: Circuit breakers shall be the molded case type with trip and interrupting ratings as shown on the Drawings.

F. Series rating shall not be allowed unless specifically noted on drawings.

G. Manufacturer:

1. Distribution panels shall be Square D, Siemens or approved equal.

Part 3. Execution

3.01 Installation: Panelboards and Distribution Panels shall be installed where indicated on the Drawings, and in accordance with the manufacturer's instructions.

3.02 Installation

A. Panelboards and Distribution Panels shall be installed with the top of the box 6'-6" above the floor. Panelboards and Distribution Panels shall be plumb within 1/8-inch. The highest breaker-operating handle shall not be higher than 72 inches above the floor.

B. Floor mounted Panelboards and Distribution Panels shall be installed on a concrete house keeping slab. The concrete slab shall be a minimum of 4" above finished floor, with minimum of 6" extension beyond equipment. The concrete slab shall have a ½" chamfer. See Division 3 for concrete work requirements.

3.03 Field Tests

A. Insulation Resistance Tests: Perform insulation resistance tests on circuits with #2 AWG and larger conductors to be energized with a line-to-neutral voltage of 120 volts or more. Make these tests after all equipment has been connected, except that equipment, which may be damaged by the test voltage, shall not be connected. Test the insulation with a 500Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

B. Grounding: Grounding shall conform to Section 26 05 26.

C. Continuity: Panelboard and Distribution Panel circuits shall be tested for continuity prior to energizing. Continuity tests shall be conducted using a dc device with a bell or buzzer.

End of Section

Section 26 27 26

Devices Wiring

Part 1. General

1.01 Description of Work

A. The work of this section consists of:

1. Furnishing, installing, and connecting all duplex receptacles complete with wall plates and/or covers, as shown on the Drawings.
2. Furnishing, installing and connecting all single pole and three-way switches complete with wall plates and or handle operators, as shown on the Drawings.

1.02 Related Work

A. See the following specification sections for work related to the work of this section:

1. 26 05 33 Conduits, Raceways and Fittings.
2. 26 05 19 Low Voltage Wire and Cable.
3. 26 05 34 Junction and Pull Boxes.

1.03 Submittals: As specified in Division 1.

A. Submit manufacturers published descriptive literature properly marked to identify the items to be supplied.

B. A single complete submittal is required for all products covered by this Section.

Part 2. Products

2.01 Receptacles

A. General - Receptacles shall be heavy duty, high abuse, grounding type.

B. Duplex Receptacles

1. Receptacles shall be specification grade, rated 20 ampere, two-pole, 3-wire, 120 volt, NEMA 5-20 configuration, self-grounding with screw terminals. Color shall be ivory or as selected by the Architect.
2. Devices shall have a nylon composition face, back and side wired.
3. Manufacturer: Leviton #5362 Series, Hubbell #5362-I Series.

C. GFCI Receptacles

1. Device shall be Smart Lock with lockout action, rated 20 ampere, 2-pole, 3-wire, 120 volt, conforming to NEMA 5-20 configuration. Face shall be nylon composition. Unit shall have an LED type green indicator light, test and reset push buttons. Color shall be ivory unless otherwise noted.
2. GFCI component shall meet UL 2003 Class A standards with a tripping time of 1/40 second at 5 milliamperes current unbalance. Operating range shall extend from -31°F to

158°F. Unit shall have transient voltage protection and shall have a diagnostic indication for miswiring.

3. Manufacturer: Leviton #8898-I Series.

D. GFCI Blank Face Devices

1. Device shall be Smart Lock with lockout action, rated 20 ampere, 2-pole, 3-wire, 120 volt, blank face, dead front. Face shall be nylon composition. Unit shall have a test and reset push buttons. Color shall be ivory unless otherwise noted.

2. GFCI component shall meet UL 2003 Class A standards with a tripping time of 1/40 second at 5 milliamperes current unbalance. Operating range shall extend from -31°F to 158°F. Unit shall have transient voltage protection and shall have a diagnostic indication for miswiring.

3. Manufacturer: Leviton #8590-I Series.

E. Surge Suppression Receptacles

1. Device shall be rated 20 ampere, 2-pole, 3-wire, 120 volt. Face shall be nylon composition. Unit shall have an LED type "Power-on" indication light and damage-alert audible alarm. Color shall be ivory unless otherwise noted.

2. Surge suppression protection shall be listed to UL standard 1449 and shall instantly absorb a transient surge of 6,000 volts minimum. A minimum of four (4) Metal Oxide Varistors shall be utilized to absorb transients.

3. Manufacturer: Leviton #8380-I Series, Hubbell #HBL8362S Series.

2.02 Switches

A. Switches shall be rated 20 amperes to 120/277 volts ac. Units shall be flush mounted, self-grounding, quiet operating toggle devices. Handle color shall be ivory or as selected by the Architect.

1. Manufacturer: Leviton #1221-2I Series, Hubbell #HBL1221 Series.

B. Timed switches: Shall be as designed by Paragon Electric Company # ET2000f, Watt Stopper TS-100 or Leviton # 6215M rated for the voltage specified on drawings. Time out shall be adjustable from 5 minutes up to 12 hours. Unit shall be provided with warning alarm.

C. Motion Sensor shall be dual technology as designed by Watt Stopper DT series. Use protective wire covers in restrooms, multi-use, cafeteria, etc.

2.03 Plates

A. General - Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform to NEMA WD 1, UL 514 and FS W-P-455A. Plates on finished walls shall be non-metallic or stainless steel. Plates on unfinished walls and on fittings shall be of zinc plated steel or case metal and shall have rounded corners and beveled edges.

B. Non-Metallic: Plates shall be plain with beveled edges and shall be nylon or reinforced fiberglass.

C. Stainless Steel: Plates shall be .040 inches thick with beveled edges and shall be manufactured from No. 430 alloy having a brushed or satin finish.

D. Cast Metal: Plates shall be cast or malleable iron covers with gaskets so as to be moisture resistant or weatherproof.

E. Blank Plates: Cover plates for future telephone outlets shall match adjacent device wall plates in appearance and construction.

Part 3. Execution

3.01 Installation of Wiring Devices

A. Interior Locations: In finished walls, install each device in a flush mounted box with washers as required to bring the device mounting strap level with the surface of the finished wall. On unfinished walls, surface mount boxes level and plumb.

B. Mounting Heights: Measure locations of wall outlets from the finished floor to the center of the outlet box. Adjust boxes so that the front edge of the box shall not be farther back from the finished wall plane than 1/4-inch. Adjust boxes so that they do not project beyond the finished wall. Height above finished floor to center of device unless otherwise noted on Drawings shall be as follows:

1. Receptacles 18 Inches above finished floor
2. Toggle Switches 48 Inches above finished floor

C. Receptacles

1. Ground each receptacle using a grounding conductor, not a yoke or screw contact.
2. Install receptacles with connections spliced to the branch circuit wiring in such a way that removal of the receptacle will not disrupt neutral continuity and branch circuit power will not be lost to other receptacles in the same circuit.

3.02 Installation of Wall Plates

A. General - Plates shall match the style of the device and shall be plumb within 1/16-inch of the vertical or horizontal.

B. Interior Locations, Finished Walls: Install non-metallic plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filling will not be permitted. Do not use oversized plates or sectional plates.

C. Interior Locations, Unfinished Walls: Install stainless steel or cast metal cover plates.

D. Exterior Locations: Install cast metal plates with gaskets on wiring devices in such a manner as to provide a rain tight weatherproof installation. Cover type shall match box type.

E. Future Locations: Install blanking cover plates on all unused outlets.

F. All receptacles shall be labeled with panel and circuit number. Contractor shall provide 3/8" clear label tape on each wall plate with ¼" black machine lettering.

3.03 Tests

A. Receptacles

1. After installation of receptacles, energize circuits and test each receptacle to detect lack of ground continuity, reversed polarity, and open neutral condition.

End of Section

Section 26 28 16

Circuit Breakers

Part 1. General

1.01 Description of Work

A. The work of this Section consists of providing circuit breakers as shown on the Drawings and as described herein.

1.02 Related Work: See the following Specification Sections for work related to the work in this Section.

A. 26 05 10 General Electrical Requirements

B. 26 24 13 Switchboards

C. 26 24 16 Panelboards and Distribution Panels

1.03 Submittals

A. Shop Drawings - Submittals shall be in accordance with Division 1. For each circuit breaker furnished under this Contract, submit manufacturer's name, catalog data, and the following information:

1. Terminal connection sizes.

2. Voltage rating.

3. Breaker manufacturer, types, trip ratings and interrupting ratings.

B. Single Submittal - A single complete submittal is required for all products covered by this Section.

C. Closeout Submittals: Submit in accordance with Division 1 and Section 26 05 10, operation and maintenance data for circuit breakers including nameplate data, parts lists, manufacturer's circuit breaker timer, current, coordination curves, factory and field test reports and recommended maintenance procedures.

1.04 Warranty

A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation of eighteen (18) months from the date of purchase.

Part 2. Products

2.01 Circuit Breaker: Each circuit breaker shall consist of the following

A. A molded case breaker with an over center toggle-type mechanism, providing quick-make, quick-break action. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers shall have variable magnetic trip elements which are set by a single adjustment to assure uniform tripping characteristics in each pole.

B. Breaker shall be calibrated for operation in an ambient temperature of 40°C.

C. Each circuit breaker shall have trip indication by handle position and shall be trip-free.

D. Three pole breakers shall be common trip.

E. The circuit breakers shall be constructed to accommodate the supply connection at either end of the circuit breaker. Circuit breaker shall be suitable for mounting and operation in any position.

F. Breakers shall be rated as shown on Drawings.

G. Series rating of circuit breakers shall not be allowed unless specifically noted on drawings. Breakers shall be UL listed. Circuit breakers shall have removable lugs.

H. Lugs shall be UL listed for copper and aluminum conductors.

I. Breakers shall be UL listed for installation of mechanical screw type lugs.

J. Circuit breakers serving HACR rated loads shall be HACR type. Circuit breakers serving other motor loads shall be motor rated.

K. Breakers indicated as “current limiting “ (CL), shall be of the non-fused type; Square D I-Limiter, Cutler Hammer Limit-R, or ITE Sentron only.

Part 3. Execution

3.01 Mounting

A. The highest breaker operating handle shall not be higher than 72 inches above the floor.

End of Section

Section 27 10 00

Low Voltage Structured Cabling

Part 1. General

1.01 Description of Work

A. The work to be performed under this Section consists of providing all wire and cable used for the data network, telephone system, and CATV broadband distribution system including terminations as shown on the Drawings and as described herein. Systems included are fiber optic backbone system; Category 6/6A data station distribution, telephone feeder cables, telephone station cables, and CATV coax cables. The intention of the data cabling is to provide a category 6/6A network that is capable of running at gigabit Ethernet speeds. The cabling, the terminations and the jacks used must meet these standards.

B. Furnishing, installing, and connecting all data, telephone, and CATV outlets, complete with wall plates and/or covers, as shown on the Drawings or within this section.

C. Furnishing, installing, and connecting all data and CATV equipment as specified within this section. Equipment includes but may not be limited to floor racks, wall equipment cabinets, wire management and fiber and category 6/6A patch panels

D. The installation shall meet the requirements of this section and of the Santa Cruz City SD Structured Cabling Standard CAT-6 and CAT-6A.

E. Final documentation submittal shall be provided in both hard and electronic copy.

F. The equipment specified in this section and in the Santa Cruz City SD Structured Cabling Standard CAT-6 and CAT-6A are the districts standard for low voltage systems. The standard system shall be Panduit/General Cable. The Panduit/General Cable warranty shall be extended to the School District. No substitutions allowed.

1.02 Related Work

A. See the following specification sections for work related to the work of this section:

1. 26 05 10 General Electrical Requirements.

2. 26 05 33 Conduits, Raceways and Fittings.

3. Santa Cruz City SD Structured Cabling Standard CAT-6 and CAT-6A.

1.03 Standards and Codes

A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following Standards and Codes:

1. National Electrical Manufacturers Association (NEMA):

2. WC 5-1973 (R1985), Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. WC7-1988, Cross-Linked-Thermosetting-Polyethylene, Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

4. National Fire Protection Association (NFPA), National Electrical Code (NEC) - Latest Revision.

5. California Electrical Code (CEC).

6. Underwriters Laboratories (UL):

   a. 44-83 (R1988), Rubber-Insulated Wires and Cable.

   b. 83-1983 (R1989), Thermoplastic-Insulated Wires and Cables.

   c. 510-1986, Insulating Tape.

   d. EIA/TIA-568, EIA/TIA TSB-36 and TSB-40

1.04 Submittals

A. In accordance with Section 26 05 10.

1. Within thirty-five (35) calendar days after the date of award of the contract, the contractor shall submit to the Architect for review, eight (8) copies of a complete submission. The submission shall consist of four (4) major sections, with each section separated with insertable index tabs. The first section shall be the "index", which shall include the project title and address, name of the firm submitting the proposal and the name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the authorized distributor's valid C-10 California State Contractors License, letters of factory authorization and guaranteed service, list of projects of equal scope and list of proposed instrumentation to be used by the contractor. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

2. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor.

3. In order to establish quality and standards of performance of equipment required by the Owner, the specified Data Systems is that of Panduit/Belden Integrity System. All mechanical, electrical and general information set forth on the respective data sheets for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Architect reserves the right to require a complete sample tested by an independent testing laboratory to prove equality. The decision of the Architect regarding equality of proposed equal items will be final.

4. Where specific make and models of equipment have been specified, the words "or equal" are understood to appear after the item specified. All parties understand that any substitution(s) of specified products are done for the purpose of cost savings to the Owner. Therefore, any material substitutions or deviations proposed by the Contractor shall be included with the initial bid and shall show a line item credit to the Owner for each item substituted in lieu of specified products.

5. Shop Drawings: Provide Shop drawings for the layout of the MDF room. The shop drawings should include the location of all racks and equipment and shall include elevations of the walls and racks. The shop drawings shall be provided to the architect, engineer and owner for review and approval prior to the installation of the equipment in the MDF room. Shop drawings shall be approved by the Architect, Engineer and the District Technology Representative. Coordinate the shop drawings with the district Security representative, Fire Alarm Contractor and PA/Intercom Contractor.

6. Upon completion "As-built" documentation showing actual devices locations and devices identification as installed and labeled, including Patch Panels and Data outlets. "As-built" shall include CATV One-line diagram showing all splitters/taps/amplifiers and each TV outlets actual output level.

1.05 Qualifications

A. The Contractor shall be from an established and locally run business, which has been operating and installing the specified products for a minimum of five years.

B. The Contractor shall be factory certified for installation of the product specified. Proof of certification shall be included in the submittal.

C. The contractor for this work shall have completed at least three- (3) similar size and complexity project experience. The contractor shall provide at least 50% of their technicians, having been trained by the manufacture, to perform all copper and fiber cable terminations.

D. The contractor shall be able to extend the manufacturer's warranties for this project directly to the end-user.

1.06 Quality Assurance

A. The data system shall carry the manufacturer's performance warranty for each cable link as defined by TIA/EIA-568A for a period of 25 years from the date of registration by the manufacture and extended directly to the school district. All active components shall extend their normal manufacture's warranty.

B. Field tests shall be performed as specified within this specification.

C. No splices will be permitted in feeder or drop cables. If splices are required the Contractor must designate desired location on system maps and obtain owners approval prior to any cable pulling on that run.

D. The specified products are the school districts standard and no substitutions will be allowed.

1.07 Product Guarantee

A. All structured cabling system must be installed per the following:

1. Meet all TIA/EIA commercial building wiring standards
2. Leviton categorized product must be used in conjunction with an Equivalent or higher Category UL or ETL verified cable.
3. Leviton Products must be installed per Leviton instruction sheets.
4. Belden products must be installed per Belden guidelines and in accordance with TIA/EIA standards

Note: All Networks shall be installed per applicable standards and manufacturer's guidelines.

Part 2. Products

2.01 Copper Conductors

A. Category 6 – Data/Telephone station cables shall be Category 6, 4 Pair UTP 23 AWG solid bare copper in a PVC jacket. The 4-pair non-plenum Cable is a high-speed, high performance, 100-ohm cable. It is capable of carrying high bit-rate signaling for extended distances in building distribution systems. The cable shall exceed the EIA/TIA-568A Commercial Building Wiring Standard for Category 6 cables. All cable used on this project shall be of the same type and conductor material. All cables are to be terminated to the appropriate RJ45 station jack or patch panel. All cables shall be numbered and labeled. Category 6 cables shall be as manufactured by General Cable GenSpeed 6000E / Blue / Plenum– P/N: 7131900.

B. Category 6A – Data/Telephone station cables shall be Category 6A, 4 Pair UTP 23 AWG solid bare copper in a PVC jacket. The 4-pair non-plenum Cable is a high-speed, high performance, 100-ohm cable. It is capable of carrying high bit-rate signaling for extended distances in building distribution systems. The cable shall exceed the EIA/TIA-568A Commercial Building Wiring Standard for Category 6A cables. All cable used on this project shall be of the same type and conductor material. All cables are to be terminated to the appropriate RJ45 station jack or patch panel. All cables shall be numbered and labeled. Category 6A cables shall be as manufactured by General Cable GenSpeed 10 / .250 O.D. / Blue / Plenum – P/N: 7141819.

C. Cable shall be routed in conduit or above T-bar and accessible ceilings through “J” hooks from outlet to patch panel.

D. Coax CATV cable – Cable shall be quad shield coaxial type PVC cable. All cable shall be UL listed for NEC compliance. All cable used on this project shall be of the same type and conductor material. Backbone cable from MDF to IDF locations shall be underground rated RG-11/U, Belden 1618A or equal. And station cable shall be RG-6/U, Belden 1189A or equal. All coax cables are to terminate to “F” style connectors as manufactured by Gilbert or Augut.

E. Telephone backbones shall be (3) Category 6 cables rated for outdoor/indoor use. Cable routed underground inside conduit shall be rated for underground use. Category 6 cables shall be Mowhawk #VersaLAN Indoor/Outdoor Category 6 or equal.

2.02 Fiber Conductors

A. Fiber Optic – Single-mode Fiber Optic cables shall be 12 strands fiber indoor/outdoor, plenum rated, tight buffer with a corrugated armor. Crush resistance rating shall be defined

by EIA-455-41. Impact resistance shall be defined by EIA-455-25. Cable shall be UL listed for NEC compliance. Cable shall be glass type 9/125 μm with maximum attenuation of 0.5/0.5 dB/km. Terminate Single-mode fiber optical cables using approved "LC" connectors. Twelve-strand fiber cable shall be General Cable Singlemode 9/125um Indoor / Outdoor 48 strand tight buffer Multimode 50/125um / OS2 distribution interlock armored plenum cable Part # AP0121ANU-ILPA/25691598. Fiber Optic cables routed underground inside conduit. One 12 strand, Single-mode fiber optic cables with proper termination, service loops and installation in fiber management units at both ends is required between each IDF and the MDF. Connectors shall be Panduit LC OptiCam Singlemode Fiber Connectors.

B. Cables shall be installed in conduit between each IDF and the MDF fiber patch panels. Minimum bend shall not be less than 7.5 inches or fifteen times the cable diameter.

C. A service loop of at least 10 feet is to be coiled into every Christie box and labeled for all cables passing through a pull can. A service loop of 30 feet shall be provided at each termination end of the cable run. The service loop shall be left in a neat workmanship manner, secured appropriately with all bend radius specifications observed.

D. All Multimode fibers are to be field terminated to LC style connectors and connected to the Fiber patch panel.

2.03 Data and Telephone Outlets

A. Data outlets shall be modular RJ45 Jack and shall be U.L. listed meet FCC Part 68 requirements and fully comply with NEC Article 800. Data outlets shall comply with TIA-568B electrical, mechanical and transmission requirements. All outlets shall comply with Category 6/6A rating. Outlet color shall be per the district standard. Panduit - MINI-COM® TX6A™ 10GIG™ UTP Jack Modules: CJ6X88TG**. Panduit - Mini-Com® TX-6™ TG Modules: CJ688TG**.

B. Telephone outlets shall be modular RJ45 Jack and shall be U.L. listed meet FCC Part 68 requirements and fully comply with NEC Article 800. Telephone outlets shall comply with TIA-568B electrical, mechanical and transmission requirements. All outlets shall comply with Category 6/6A rating. Outlet color shall be per the district standard. Panduit - MINI-COM® TX6A™ 10GIG™ UTP Jack Modules: CJ6X88TG**. Panduit - Mini-Com® TX-6™ TG Modules: CJ688TG**.

2.04 CATV Outlets

A. Device shall be a modular "F" connector jack and shall be U.L. listed. Faceplate shall be Panduit CFP4IW with "F" connector Jack, Panduit # CMFBA series. f

B. Coax cable from each CATV outlet shall be homerun to nearest IDF.

2.05 Plates

A. General - Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform with NEMA WD 1, UL 514 and FS W-P-455A. Telephone wall plates on finished walls shall be stainless steel. Television wall plates shall be Panduit and accommodate Panduit Mini-Com connectors.

2.06 Rack Equipment

A. Provide new floor mounted racks where noted for IDF/MDF. Coordinate installation of new with school district technology personnel. Racks are to be Panduit # R2P/ 25367212 with appropriate ladder racks for cable management and physical security.

B. Vertical wire management per the district standard.

C. Provide new wall mounted cabinet racks where noted for IDF/MDF. Rack shall have a plexiglas front door and shall be capable of swinging/opening to access the back of Patch panels. Rack shall be Hoffman EWMW362825/ 25231634 for 36" high racks. Rack shall be Hoffman EWMW242825/ 25231633 for 24" high racks. Provide fire treated backboard behind each cabinet. IDF racks shall have space for minimum of 19 rack spaces (36"H) or 12 rack spaces (24"H) for district use.

D. Provide new sliding rail system 19" racks mounted inside casework where noted for IDF/MDF. Rack shall be capable of sliding out to access the back of Patch panels. Rack shall be Middle Atlantic Product #SRS2-11 or equal. IDF racks shall have space for minimum of 11 rack spaces for district use.

E. See District Standard for horizontal wire management requirements.

F. Each MDF/IDF equipment shall be grounded to Building Steel or Cold Water Pipe by a #4 or larger copper conductor. Products for grounding equipment shall be Panduit TRGB19, TRG191, TRGK672, TRGKJ4120.

G. Each MDF/IDF shall be provided with Power Strip and Surge Protector. Power Strip with surge protector shall have a minimum of 6 outlets and shall be 19" rack mounted. Acceptable manufacturer are APC, APW and Leviton.

2.07 Patch Panels

A. Patch panel shall be 48 port, Panduit CAT-6A Model No. DPA486X88TGY/25067780 and Panduit CAT-6 Model No. DPA48688TGY/25067778 . Patch panels shall mount to standard EIA 19" racks. At each IDF and the MDF provide proper quantity of patch panels with appropriate jacks to terminate all incoming data station cables and 10% open connectors.

B. MDF Fiber patch panel shall be Panduit Model No. FRME2U/25190398. Patch panels shall mount to standard EIA 19" racks. Provide required inserts to terminate all incoming fiber and provide blank inserts to cover unused opening.

C. IDF Fiber patch panel shall be Panduit Model No. FRME1U/ 25190397. Patch panels shall mount to standard EIA 19" racks. Provide required inserts to terminate all incoming fiber and provide blank inserts to cover unused opening.

D. Horizontal wire management shall be per the District Standards.

2.08 Patch Cables

A. The contractor shall provide category 6 and category 6A data patch cables. Quantity of data patch cables shall equal to the total number of station cables of the site. Patch cables shall be 1' in length.

B. The contractor shall provide a single 1m, LC-LC, duplex multi-mode fiber optic patch cable for each IDF and MDF.

2.09 CATV Equipemnt

A. The CATV amplifier located in the MDF/IDF shall be a rack mounted Blonder Tongue BIDA 750 series amplifier w/ filter and return amp set.

B. The backbone splitter shall be a Blonder Tongue SXRS series splitter and distribution taps shall be Blonder Tongue CRT4A.

C. All unused tap or splitter outlets will be terminated with a Blonder Tongue FBT terminator.

Part 3. Execution

3.01 Cable Installation

A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 26 05 33 - Conduits Raceway and Fittings.

B. All "J" hooks are to be placed with a maximum distance of 4 feet between hooks. Cable will be attached to hooks in such a way such as not to affect any electrical property of the cable.

C. Cable Pulling - Exercise care in pulling wires and cables into conduit or raceways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.

D. Bending Radius - Cable bending radius shall be per applicable code and manufacturer recommendations. Install feeder cables in one continuous length.

E. All low voltage system conduit stub out and nipples shall have end bushing.

F. Examine areas and conditions under which LAN system is to be installed. Notify contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installed.

G. All backbone cable will be run through clean conduit with appropriately placed junction boxes.

H. All fiber backbones will be connected to patch points. All CATV drop and backbone cables will be connected to specified equipment including splitters to make a complete functioning system. All telephone cross connects from backbone 110 blocks to station cable 110 blocks will be done to district telephone systems supplier requirement. All voice cross connects

from the feeder cables in the MDF to the PBX cross-connect field will be done by District personnel or their representative.

I. All data and telephone station cabling can be run in J-Hooks above accessible ceiling or in conduit in non-accessible space then through raceway running to their respective station outlet unless otherwise specified.

J. All cabling can be run in J-Hooks above accessible ceiling or in conduit in non-accessible space.

3.02 Cabinet Layout

A. Cabinet layout shall be as follows:

1) 2nd 1u will be reserved for fiber optic panel.

2) 3rd 1u will be reserved for Analog panel.

3) 4th 2u will be reserved for Data panel #1.

4) 6-11 5u will be reserved for network switch.

5) 12th 2u will be reserved for Data panel #2.

3.03 Labeling

A. Low voltage cabling labeling shall be per the District Standards.

3.04 Installation of Wire Devices

A. Mounting Heights: Measure locations of wall outlets from the finished floor to the center of the outlet box. Adjust boxes so that the front edge of the box shall not be farther back from the finished wall plane than 1/4-inch. Adjust boxes so that they do not project beyond the finished wall.

B. The MDF floor racks and wire management will be installed in the exact location specified in writing by the owner at the time of installation. The general location is shown in the drawings.

C. IDF equipment cabinets are to be mounted on 3/4" fire treated backboard at an exact location to be specified by the district. The general IDF locations are shown in the drawings.

D. All cables are to be terminated to panels installed as part of this section.

E. All patch points, CATV splitter outputs, telephone 110 blocks and station outlets are to be labeled to district specifications.

3.05 Testing

A. Test all station cables for continuity, polarity and pairing on all pairs.

B. All data and telephone cat-6/6A cables are to be tested for compliance with the latest 1000Tx network standard and EIA/TIA 568B performance parameters for 100Base Tx Ethernet using a hand held network scanner. Network analyzer is to be a Fluke DSP 4000 / 6000 or Penta scanner. The tester used must meet the standards of the manufacture for the cabling and termination connectors used. . Hardcopy and softcopy results are to be provided for all jacks tested. Softcopy results to be provided in PDF on a USB drive.

C. All single-mode fiber optic strands are to be tested bi-directionally for the following 1310nm, 1490nm and 1550nm. Tests are to be performed using a power meter and laser source or an OTDR to measure attenuation from coupler-to-coupler at the distribution panels. No strand is to exhibit more than 0.5 dB/km at 1310nm, 0.5 dB/km at 1490nm, and 0.5 dB/km at 1550nm. Fiber optic cables shall be tested prior to installation or the manufacture certification.

D. Any cables that fail to meet the stated test requirements are to be repaired/replaced by the contractor prior to acceptance by the School District.

E. All CATV station outlets will produce a signal of +12 dBmV, ±4 dB at 55 MHz. Output level linearity must be +0/-10dB from 55 MHz to 750 MHz.

End of Section

Section 27 51 16

P.A./Intercom & Clock Systems

Part 1. General

1.01 Summary

A. Work included: Upgrades and modifications of the following existing campus systems to extend services to the new Portable Classrooms.

1. Public address/intercom system.
2. Clock system.

1.02 System Description

A. The above systems exist at the school campus and are to be relocated. See electrical plans for new location. The existing PA/Clock system is Dukane PA system.

B. Provide all new equipment at locations designated within each room and cabling from the device locations to interface with the existing school systems. Follow pathways shown in the drawings and on site electrical plans.

C. Include interface equipment and modifications of existing systems to accommodate the new or revised connections.

1.03 Submittals

A. Submit in accordance with the requirements of Section 26 05 10: General Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Describe system operation, equipment, dimensions and indicate features of each component.

3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

4. Shop drawings:

   a. Plot plans and building floor plans, showing location of and conduit routing to all devices.
   b. Point-to-point wiring diagram in block or riser format showing all clock components, conduit and wire types and sizes with cable legend.

5. Submit manufacturer's installation instructions.

6. Complete bill of material listing all components.

7. Warranty.

1.04 Operation and Maintenance Manual

A. Supply operation and maintenance manuals in accordance with the requirements of Section 26 05 10: General Electrical Requirements, to include the following:

1. A detailed explanation of the operation of the system.

2. Instructions for routine maintenance.

3. Pictorial parts list and parts numbers.

4. Schematic drawings of wiring system to include all equipment furnished and the intertie back to the existing headend.

5. Telephone numbers for the authorized parts and service distributors.

6. Final testing reports.

1.05 Product Delivery, Storage and Handling

A. Delivery: System components shall not be delivered to the site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to manufacturer at no cost to District.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to manufacturer.

1.06 Warranty

A. Units and components offered under this Section shall be covered by a 1-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the District.

Part 2. Products

2.01 Manufacturers

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

1. Dukane for P.A./intercom and clock systems.

2. Substitutions: Under provisions of Section 25 05 10: General Electrical Requirements.

2.02 Public address/intercom speakers

A. Classrooms shall be equipped with a 25-volt speaker. Speaker shall be installed flush in the T-Bar Ceiling. Contractor shall provide all hardware, t-bar hangers and equipment to install the devices flush in the ceiling. Speakers shall match that of the existing system and be fully compatible.

B. Exterior speakers shall be 25V, 15-Watt Flange-Mounting Loudspeakers. Unit shall be double re-entrant type with compression driver mounted within a weather-resistant housing and provided with transformer. Weatherproof speaker shall be mounted in an aluminum back box with a vandal resistant grille. Speaker shall be Atlas AFP-15T, Back box shall be Lowell CB86-6 and grille shall be Lowell SQLK8-L.

C. Provide system cabling and integration from each speaker to adjacent buildings for interface with existing system.

2.03 Intercom Telephone Handsets

A. Handsets shall be wall mounted, 12 button dialing telephone. Phone shall include wall mounting plate and modular jack. Dukane.

B. Provide system cabling and integration from each phone/handset to adjacent buildings for interface with existing system.

2.04 Analog Indicating Clocks

A. Provide synchronous-wired clocks with synchronous motor and correction armature. Clocks shall have individual and automatic supervision with correction each hour for synchronization with master clock controller.

B. Clocks shall operate at 24 VAC, but verify with the existing system.

C. Furnish semi-flush back box complete with receptacle assembly and connector.

D. Clocks shall be size and shape to match existing installation with high-impact, shatterproof acrylic lens.

E. Clock dial shall be that to match existing.

F. Clocks shall be wall mounted. Provide junction box and conduit to accessible ceiling as required.

G. Provide system cabling and integration from clocks to adjacent buildings for interface with existing system.

Part 3. Execution

3.01 Examination

A. Contractor shall thoroughly examine site conditions for acceptance of clock system installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.02 Installation

A. Install equipment in accordance with manufacturers written instructions, as shown on the drawings as specified herein.

B. Coordinate final equipment locations with the Architect prior to rough-in.

C. For wiring requirements refer to Section 26 05 19: Low Voltage Wire and Cable.

D. Do not permit final installation of equipment until building is secured and any work that could damage clocks is completed.

E. All wiring shall be installed in a conduit system and shall be sized as recommended by equipment supplier. Refer to Section 26 05 33: Conduits, Raceways and Fittings.

3.03 Field Quality Control

A. Manufacturer's field service: Electrical contractor shall arrange and pay for the services of a factory-authorized service representative to supervise the initial start-up, pretesting and adjustment of the clock system.

B. At least three weeks prior to any testing, notify the engineer so that arrangement can be made for witnessing test, if deemed necessary. All pretesting shall have been tested satisfactorily prior to the engineer's witnessed test.

C. Prefunctional testing:

1. Visual and mechanical inspection:

    a. Inspect for physical damage, defects alignment and fit.
    b. Perform mechanical operational tests in accordance with manufacturer's instructions.
    c. Compare nameplate information and connections to contract documents.
    d. Check tightness of all control and power connections.
    e. Check that all covers, barriers, and doors are secure.

2. Electrical tests:

    a. Test system equipment and wiring to verify proper operation.

3. Test Report:

    a. Provide a complete report listing every device, the date it was tested, the results and the date retested (if failure occurred during the previous test). The test report shall indicate that every device tested successfully.
    b. Submit two typed copies of the test report on 8-1/2" x 11" paper in a neatly bound folder for approval. Failure to comply with this will result in a delay of final testing and acceptance.

D. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation, the contractor shall bear all costs incurred by the

necessity for retesting including test equipment, transportation, subsistence and the engineer's hourly rate.

E. Contractor shall replace at no costs to the District all devices which are found defective or do not operate within factory specified tolerances.

F. Contractor shall submit the testing agency's final report for review prior to project closeout and final acceptance by the District. Test report shall indicate test dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.

3.04 Cleaning

A. Upon completion of project prior to final acceptance the contractor shall thoroughly clean all clock surfaces. Remove paint splatters and other spots, dirt, and debris.

End of Section

Section 28 31 00

Fire Alarm System

Part 1. General

1.01 Description

A. This section of the specification includes the furnishing, installation, and connection of an intelligent reporting, microprocessor controlled, addressable, fire detection and emergency voice alarm communication system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

C. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

D. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

E. The system shall be support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.

F. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

G. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

H. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

I. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.02 Scope

A. The Contractor shall furnish all labor, services and materials necessary to furnish and Install a complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.

B. It is further intended that upon completion of this work, the Owner be provided with:

1. Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date. Minimum (2) O + M shall be provided.

2. Complete documentation of system(s) testing.

3. Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by Section 1-6.2 of NFPA 72 - 2010 edition.

C. Related Work

a. Refer to the General Conditions, Supplementary General Conditions, and Division 1 General Requirements.

b. See the following specification sections for work related to the work in this section:

1	26 05 10	General Electrical Requirements.
2	26 05 33	Conduits, Raceways and Fittings.
3	26 05 19	Low Voltage Wire and Cable.

D. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance with the specifications and drawings.

E. The system shall be designed such that each signaling line circuit (SLC) is limited to only 80% of its total capacity at initial installation.

F. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style A) as part of an addressable device connected by the SLC Circuit.

3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an

addressable device connected by the SLC Circuit.

4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
6. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
7. Notification Appliance Circuits (NAC) speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.
8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
9. Notification Appliance Circuits (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.
10. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
11. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
12. 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.
13. 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.
14. 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:

    a. The digital amplifier shall automatically broadcast the stored audio message.
    b. 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.
    c. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
    d. 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.
    e. 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.
    f. 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.

G. Basic System Functional Operation

When a fire alarm condition is detected and reported by one of the system initiating devices, the

following functions shall immediately occur:

1. The System Alarm LED shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. The 640-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.
6. The audio portion of the system shall sound the proper audio signal (consisting of tone, voice, or tone and voice) to the appropriate zones.

1.03 Submittals

The owner or his designated representative shall approve all equipment submittal.

A. General

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. Equipment other than specified shall be considered for approval provided the following is submitted in writing by the electrical contractor to the engineer ten (10) days before the bid date. All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.
4. Complete list of current drain requirements during normal supervisory conditions, trouble conditions, and alarm conditions.
5. Battery standby calculations showing total standby power needed to meet the system requirements as specified

C. Manuals

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

E. Substituted Equipment

Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than NOTIFIER Model NFS2-3030 Series Expandable Emergency Evacuation Fire Alarm System, provide proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

If equipment other than that specified is supplied, it shall be the contractor’s obligation to submit the appropriate documentation listed above and allow the specifying engineer sufficient time (minimum 2 weeks) to consider the equality of the substituted items.

F. Certifications

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

G. Satisfying the entire intent of these specifications.

It is the contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the contractor until the date of

final acceptance by the architect, engineer, and owner's representative. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the electrical contractor.

1.04 Guaranty

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.05 Post Contract Maintenance

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.06 Post Contract Expansions

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.07 Applicable Publications

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

A. National Fire Protection Association (NFPA) - USA:

No. 12A Halon 1301 Extinguishing Systems
No. 13 Sprinkler Systems
No. 15 Water Spray Systems
No. 16 Foam/Water Deluge and Foam/Water Spray Systems
No. 17 Dry Chemical Extinguishing Systems
No. 17A Wet Chemical Extinguishing Systems
No. 70 National Electric Code (NEC)
No. 72-1996 National Fire Alarm Code
No. 90A Air Conditioning Systems
No. 92A Smoke Control Systems
No. 92B Smoke Management Systems in Malls, Atria, Large Areas
No. 101 Life Safety Code

B. Underwriters Laboratories Inc. (UL) - USA:

No. 50 Cabinets and Boxes
No. 268 Smoke Detectors for Fire Protective Signaling Systems
No. 864 Control Units for Fire Protective Signaling Systems
No. 268A Smoke Detectors for Duct Applications.
No. 521 Heat Detectors for Fire Protective
No. 228 Door Closers-Holders for Fire Protective Signaling Systems.
No. 464 Audible Signaling Appliances.
No. 38 Manually Actuated Signaling Boxes.
No. 346 Waterflow Indicators for Fire Protective Signaling Systems.
No. 1481 Power supplies for Fire Protective Signaling Systems.
No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems.
No. 1971 Visual Notification Appliances.

C. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.

1. 2019 California Building Standards Administrative Code, Part 1, Title 24 California Code of Regulations (C.C.R.).

2. 2019 California Building Code (CBC), Part 2, Title 24 C.C.R.

3. 2019 California Electric Code (CEC), Part 3, Title 24 C.C.R.

4. 2019 California Mechanical Code (CMC), Part 4, Title 24 C.C.R.

5. 2019 California Plumbing Code (CPC), Part 4, Title 24 C.C.R.

6. 2019 California Fire Code.

7. 2019 California Energy Code

8. Title 19 C.C.R., Public Safety, State Fire Marshal Regulations.

9. NFPA 72, 2016 National Fire Alarm Code with California Amendments.

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

1.08 Approvals

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
UL Underwriters Laboratories Inc
ULC Underwriters Laboratories Canada
FM Factory Mutual
FM6320 Approved for Gas Detection

B. The Fire Alarm Control Panel and all transponders shall meet the modular listing requirements of the ninth edition of UL Standard 864 (Control Units). Each subassembly, including all printed circuits, shall include the appropriate UL modular label. This includes all printed circuit board assemblies, power supplies, and enclosure parts. Systems that do not include modular labels may require return to the factory for system upgrades, and are not acceptable.

C. The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of high and low pressure CO2.

Part 2. Products

2.01 Equipment and Material, General

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.02 Conduit and Wire

A. Conduit

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760.
4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.

B. Wire

1. All fire alarm system wiring must be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than #16 AWG (1.02 mm) for initiating device circuits, signaling line circuits, and #12 AWG for notification appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
5. The system shall permit the use of IDC and NAC wiring in the same conduit with the multiplex communication loop.
6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
7. All analog voice speaker and analog telephone circuits shall use twisted/shielded pair to eliminate cross talk.

C. Terminal Boxes, Junction Boxes and Cabinets

All boxes and cabinets shall be UL listed for their intended purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The fire alarm control panel shall be connected to a separate dedicated branch circuit,

maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.03 Main Fire Alarm Control Panel or Network Node

A. The main FACP Central Console shall be a NOTIFIER Model NFS2-3030 and shall contain a microprocessor based Central Processing Unit (CPU). 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, control circuits, and notification appliance circuits, local and remote operator terminals, printers, 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.
4. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.
5. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur.

    a. The system alarm LED shall flash.
    b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
    c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
    d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
    e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
    f. When a trouble condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
    g. The system trouble LED shall flash.
    h. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
    i. The 640-character backlit LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
    j. Printing and history storage equipment shall log and print the event information along with a time and date stamp.

k. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.

6. When a supervisory condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur.

    a. The system trouble LED shall flash.
    b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
    c. The 640-character backlit LCD display shall indicate all information associated with the supervisory condition, including the type of trouble point and its location within the protected premises.
    d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
    e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

7. When a security alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur.

    a. The system security LED shall flash.
    b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
    c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
    d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
    e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

8. When a pre-alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur.

    a. The system pre-alarm LED shall flash.
    b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
    c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
    d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
    e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

C. Operator Control

1. Acknowledge Switch

a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.

b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Signal Silence Switch

a. Depression of the Signal Silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Drill Switch

a. Depression of the Drill switch shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch

a. Depression of the System Reset switch shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.

5. Lamp Test

a. The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

6. Scroll Display Keys

a. There shall be Scroll Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. Depression of the Scroll Display key shall display the next event in the selected queue allowing the operator to view events by type.

7. Print Screen

a. Depression of the PRINT SCREEN switch shall send the information currently displayed on the 640-character display to the printer.

D. System Capacity and General Operation

1. The control panel shall be capable of expansion via up to 10 SLC modules. Each module shall support a maximum of 318 analog/addressable devices for a maximum system capacity of 3180 points. The system shall be capable of 3072 annunciation points per system regardless of the number of addressable devices.
2. 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 either the owner or installing company.
3. 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.
4. The FACP shall be able to provide the following software and hardware features:

    a. 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.
    b. 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.
    c. 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.
    d. 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.
    e. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
    f. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
    g. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the requirements of NFPA 72.
    h. 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.
    i. 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.
    j. 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.

k. 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.

l. 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.

m. Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or "drill". If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function.

n. 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.

o. Two Wire Detection: The system shall support standard two wire detection devices specifically all models of System Sensor devices, Fenwal PDS-7125/7126 and CPD-7021, Hochiki model SLK-24F/24FH, Edwards 6250B/6270B and 6264B and Simplex models 2098-9201/9202 and 9576.

p. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions

q. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.

r. 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.

s. 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.

t. Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broad cast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, prealarms, disabled points and activated points, all installed points filtered by SLC points, logic zones, annunciators, releasing zones, special zones, and trouble zones.

u. 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.

v. Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will Resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will Resound the panel sounder.

w. 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.

x. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.

y. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to 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 or product of all cooperating detectors chamber readings.

z. Tracking/Latching Duct (ion and photo): The system shall support both tracking and latching duct detectors either ion or photo types.

aa. 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.

bb. 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.

cc. Security Monitor Points: The system shall provide means to monitor any point as a type security.

dd. 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 annunciators 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.

ee. 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.

ff. 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.

gg. 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.

hh. 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.

ii. 10 trouble equations per device: The system shall provide support for up to 10 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.

jj. 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.

kk. 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.

ll. 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 or indicating panel module input. 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. Central Processing Unit

1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.
2. 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.
3. 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.

4. 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.
5. Consistent with UL864 standards, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.
6. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.
7. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
8. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
9. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.
10. The CPU shall provide one high-speed serial connection for support of network communication modules.
11. The CPU shall provide double pole relays for FIRE ALARM, SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts.

12. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

F. System Display

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide ten 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, and CPU FAILURE.
4. The system display shall provide a QWERTY style 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.
5. The system display shall include the following operator control switches: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the 640-character LCD.

G. 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. The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 6 (Class B) circuit.
4. The SLC interface board shall be able to drive an NFPA Style 6 twisted unshielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 6, no twist, no shield circuit for limited distances determined by the manufacturer. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.
5. 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.

H. Enclosures

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.
4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

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.
    b. Operate as a two-way emergency telephone system control center.
    c. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
    d. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
    e. Provide all-call Emergency Paging activities through activation of a single control switch.
    f. As required, provide vectored paging control to specific audio zones via dedicated control switches.

g. 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.
h. Provide a software utility capable of off-line programming for the VCC 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 VCC shall not inhibit the emergency operation of other nodes on the fire alarm network.
i. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SCL controlled switching.
j. 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.
k. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply

1. The Addressable Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Addressable 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 Addressable 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 Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Addressable Main Power Supply shall be power-limited per UL864 requirements.

K. Auxiliary Field Power Supply - Addressable

1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.
2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .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 7.0 - 25.0 amp hour batteries.
3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
4. 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.
5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
6. 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. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.

7. 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.
8. 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 eight or sixteen hours shall be Dip-switch selected.
9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.
10. The addressable power supply mounts in either the FACP backbox or its own dedicated surface mounted backbox with cover.
11. Each of the power supply's four output circuits shall be DIP-switch selected 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.
12. 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 and end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.
14. 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.
15. 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.
16. 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.

L. Field Charging Power Supply (FCPS)

The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
3. The FCPS shall include an attractive surface mount backbox.
4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
5. The FCPS include power limited circuitry, per 1995 UL standards.

M. System Circuit Supervision

1. The FACP shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communication with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information in the history buffer and on the printer.
2. Transponders that lose communication with the CPU shall sound an audible trouble and light an LED indicating loss of communications.
3. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.
4. All speaker and emergency phone circuits shall be supervised for opens and shorts. Each transponder speaker and emergency phone circuit shall have an individual ON/OFF indication (green LED).

N. Field Wiring Terminal Blocks

1. All wiring terminal blocks shall be the plug-in/removable type and shall be capable of terminating up to 12 AWG wire. Terminal blocks that are permanently fixed to the PC board are not acceptable.

O. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power (@25 Volts RMS) 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:

    - Earth Fault on DAP A (Digital Audio Port A)
    - Earth Fault on DAP B (Digital Audio Port B)
    - Audio Amplifier Failure Detected Trouble
    - Active Alarm Bus input
    - Audio Detected on Aux Input A
    - Audio Detected on Aux Input B
    - Audio Detected on Firefighter's Telephone Riser
    - Receiving Audio from digital audio riser
    - Short circuit on speaker circuit 1
    - Short circuit on speaker circuit 2
    - Short circuit on speaker circuit 3
    - Short circuit on speaker circuit 4
    - Data Transmitted on DAP A
    - Data Received on DAP A
    - Data Transmitted on DAP B
    - Data Received on DAP B
    - Board failure
    - Active fiber optic media connection on port A (fiber optic media applications)
    - Active fiber optic media connection on port B (fiber optic media applications)
    - Power supply Earth Fault

- Power supply 5V present
- Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble

4. The audio amplifier shall provide the following built-in controls:

   - Amplifier Address Selection Switches
   - Signal Silence of communication loss annunciation Reset
   - Level adjustment for background music
   - Enable/Disable for Earth Fault detection on DAP A
   - Enable/Disable for Earth Fault detection on DAP A
   - 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.

P. 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:

   LED Indicators:
   - Lamp Test
   - Trouble
   - Off-Line Trouble
   - Microphone Trouble
   - Phone Trouble
   - Busy/Wait
   - Page Inhibited
   - Pre/Post Announcement Tone

Q. 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.

R. 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.

S. System Expansion

Design the main FACP and required components so that the system can be expanded in the future (to include the addition of twenty percent more circuits or zones) without disruption or replacement of the existing control panel. This shall include hardware capacity, software capacity and cabinet space.

T. 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. It shall be possible to program through the standard FACP keyboard all system functions.
3. All field defined programs shall be stored in non-volatile memory.
4. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password.
5. The system programming shall be "backed" up via an upload/download program, and stored on compatible removable media. A system back-up disk shall be completed and given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.
6. The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time equations, etc. This test shall be performed on an IBM-compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

U. Specific System Operations

1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
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 function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or anytime after system turn-on. Alarm verification shall not require any additional hardware to be added to the control panel. 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.

V. 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 Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:
5. 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.
6. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
7. 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.
8. 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.
9. 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.

2.04 System Components

A. Speakers

1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

B. Audible/Visual Combination Devices

1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

C. Programmable Electronic Sounders

1. Electronic sounders shall operate on 24 VDC nominal.
2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.
3. Shall be flush or surface mounted as shown on plans.

D. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria

1. The maximum pulse duration shall be 2/10 of one second
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

E. Horn/Strobes
1. Operate on 24 VDC
2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
3. Have at least 2 audibility options
4. Maximum Pulse Duration: 0.2 second.
5. Strobe Intensity: UL 1971.
6. Flash Rate: UL 1971.
7. Strobe Candela Rating: Determine by positioning selector switch on back of device.

F. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.
2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.
4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

G. Conventional Photoelectric Area Smoke Detectors

1. Photoelectric smoke detectors shall be a 24 VDC, two wire, ceiling-mounted, light scattering type using an LED light source.
2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
4. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash at least every 10 seconds, indicating that power is applied to the detector.
6. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.
7. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
8. All field wire connections shall be made to the base through the use of a clamping plate and screw.

H. Conventional Ionization Type Area Smoke Detectors

1. Ionization type smoke detectors shall be a two wire, 24 VDC type using a dual unipolar chamber.
2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
4. It shall be possible to perform a calibration sensitivity and performance test on the detector without the need for the generation of smoke.
5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs) over 360 degrees, on the detector, which may be seen from ground level. This LED shall flash every 10 seconds, indicating that power is applied to the detector.
6. The detector shall not alarm when exposed to air velocities of up to 1,200 feet (365.76 m) per minute. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
7. All field wire connections shall be made to the base through the use of a clamping plate and screw.

I. Duct Smoke Detectors

Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.

J. Projected Beam Detectors

1. The projected beam type shall be a 4-wire 24 VDC device.
2. The detector shall be listed to UL 268 and shall consist of a separate transmitter and receiver capable of being powered separately or together.
3. The detector shall operate in either a short range (30' - 100') or long range (100' - 330') mode.
4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
5. The detector shall feature a bank of four alignment LEDs on both the receiver and the transmitter that are used to ensure proper alignment of unit without special tools.

6. Beam detectors shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses.
7. The unit shall be both ceiling and wall mountable.
8. The detector shall have the ability to be tested using calibrated test filters or magnet activated remote test station.

K. Automatic Conventional Heat Detectors

1. Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not exceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius).
2. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation.
3. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.
5. Automatic heat detectors shall have a smooth ceiling rating of 2500 square feet (762 square meters).

L. Waterflow Indicator

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

M. Sprinkler and Standpipe Valve Supervisory Switches

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

a. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.

b. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

N. Alphanumeric LCD Type Annunciator

1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. An audible indication of alarm shall be integral to the alphanumeric display.
4. The display shall be UL listed for fire alarm application.
5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
7. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset, which shall be protected from unauthorized use by a key switch or password.
8. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

O. Interactive Display

1. The system shall be an ONYX FirstVision™.
2. The system shall operate on an UL listed Embedded platform operating at no less than 700 MHz on the Microsoft® Windows® XP Embedded platform.
3. The Embedded platform shall have: no less than 256 megabytes of RAM, a flash drive with no less than 1 Gigabytes of storage space, 100 Base-T Ethernet NIC card, and USB ports.
4. The Embedded platform shall have a minimum 17" touch screen display.
5. The Embedded platform shall come equipped with all necessary gateway modules to allow connection to the network it monitors as standard equipment.

    a. A UL listed Ethernet Hub shall be provided for connection of multiple interactive displays and/or gateways.

P. Portable Emergency Telephone Handset Jack

1. Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on the plans. Jacks shall be approved for emergency telephone system application.
2. Insertion of a portable 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.

Q. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled as "Emergency Telephone." The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection so 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. On activating the remote phone, the phone earpiece shall sound a telephone ring signal until the master handset is lifted.
4. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

R. 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 three different telephone numbers.
3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
5. Communication shall include vital system status such as:

    - Independent Zone (Alarm, trouble, non-alarm, supervisory)
    - Independent Addressable Device Status
    - AC (Mains) Power Loss
    - Low Battery and Earth Fault
    - System Off Normal
    - 12 and 24 Hour Test Signal
    - Abnormal Test Signal (per UL requirements)
    - EIA-485 Communications Failure
    - Phone Line Failure

6. 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 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
7. AN IP Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet to a compatible receiver.

2.05 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 (numbered 0 to 15) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
3. Detectors shall be Analog and Addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash 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 illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. 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, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
8. The following bases and auxiliary functions shall be available:

    a. Sounder base rated at 85 DBA minimum.
    b. Form-C Relay base rated 30VDC, 2.0A
    c. Isolator base

9. 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 magnetic switch) or initiated remotely on command from the control panel.
10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (example: ION, PHOTO, THERMAL).

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. 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

1. The detectors 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 Laser Photo Smoke Detector

1. The intelligent laser photo smoke detector shall be a spot type detector 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.
2. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
3. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.
4. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
5. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
6. 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.
7. 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

1. The detectors 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

1. The intelligent multi criteria Acclimate detector shall be an addressable device 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.
2. 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).
3. 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

1. Thermal detectors shall be intelligent 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. It shall connect via two wires to the fire alarm control panel signaling line circuit.

H. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. 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.

I. Advanced Multi-Criteria Intelligent Detector

1. The intelligent multi criteria IntelliQuad detector shall be an addressable device combining four sensing elements in a single sensing device providing the ability to detect all four major elements of a fire. The detector design shall allow sensitivity setting between 1% to 4% per foot obscuration.
2. The detector shall include a photoelectric sensing element, thermal sensing element, IR (Infrared) sensing element and CO (carbon monoxide) sensor.

J. 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.
2. The IDC zone shall be suitable for 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 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.

K. 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).
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 or 3 Style D input circuits.

L. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
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. For speaker applications the module is rated for 50 watts at 25 or 70.7.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
5. For multiple circuit control a module shall be available that provides 6 Style B or 3 Style D control circuits.

M. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive. 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.
2. For multiple relay control a module shall be available that provides 6 programmable Form-C relays.

N. Addressable Releasing Control Module

1. An addressable FlashScan releasing module shall be available to supervise and control compatible releasing agent solenoids.
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.

O. Isolator Module

1. 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.
2. 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.
3. 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.
4. 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.

P. Smoke Control Annunciator

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.

Q. 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 annunciators, 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. An optional version shall allow the EIA-485 circuit to be transmitted over Fiber optics. 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.

2.06 Batteries and External Charger

A. Battery

1. Shall be 12 volt, Gell-Cell type.

2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

B. External Battery Charger

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120/240-volt 50/60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.

Part 3. Execution

3.01 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 annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual Pull Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

3.02 Typical Operation

A. Actuation of any manual station, smoke detector heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:

1. Activate all programmed speaker circuits.
2. Actuate all strobe units until the panel is reset.
3. Light the associated indicators corresponding to active speaker circuits.
4. Release all magnetic door holders to doors to adjacent zones on the floor from that the alarm was initiated.
5. Return all elevators to the primary or alternate floor of egress.
6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1

requirements and be coordinated with the electrical contractor.

8. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers as appropriate.
9. Activation of any sprinkler system low pressure switch or valve tamper switch shall cause a system supervisory alarm indication.

3.03 Test

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all flow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open signaling line circuits and verify that the trouble signal actuates.

G. Open and short notification appliance circuits and verify that trouble signal actuates.

H. Ground initiating device circuits and verify response of trouble signals.

I. Ground signaling line circuits and verify response of trouble signals.

J. Ground notification appliance circuits and verify response of trouble signals.

K. Check presence and audibility of tone at all alarm notification devices.

L. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.

M. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

N. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.04 Final Inspection

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.05 Instruction

A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

End of Section

Title: SANTA CRUZ CITY SCHOOLS STRUCTURED CABLING SPECIFICATIONS STANDARD

Issuing Department:
Issued By:
Last Review Date: **May 4, 2018**
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1 Purpose

The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within SANTA CRUZ CITY SCHOOL DISTRICT telecommunications facilities. It is geared toward leveraging our legacy cable infrastructure while upgrading to more recent technologies in all new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.

Such standardization will maximize system reliability by ensuring that critical operational and legal requirements are met, while enhancing safety to personnel and the public.

Note that while many portions of this document are addressed to "The Contractor", the contents herein apply equally to anyone doing the work. Whether employees internal to SANTA CRUZ CITY SCHOOL DISTRICT, or outside contractors employed on specific projects the expectation of SANTA CRUZ CITY SCHOOL DISTRICT is that all work be carried out and executed as prescribed in this document.

2 Scope

This specification addresses the requirements and materials in the following structured cabling subsystems:

- Work Area (Equipment Outlets)
- Copper Horizontal Cabling
- Wireless Access Points
- Fiber Backbone Cabling
- Telecommunications and Equipment Rooms
- Pathways
- Cable Bundling and Dressing Accessories
- Communications Structured Grounding
- Communications Labeling

Information regarding Legacy Voice Cabling is contained in Appendix D at the end of this document.

2.1 Exclusions

The information contained in this document is based on our experience to date and is believed to be reliable. It is intended as a guide for use by persons having technical skill and is to be used with their own discretion and risk. This document is not to be used to negate good engineering principles, design practices or common sense.

This specification is meant to be a part of the overall IT standards suite and provide a background of consistency to project-specific requirements. There may be application specific standards released after the writing of this document that may provide more detailed information on some of the areas covered. Wherever requirements of this

document are in conflict with existing cabling standards or state or local codes, the most stringent will apply.

Dimensions contained herein are for reference purposes only. For specific dimensional requirements of a cabling component, consult the manufacturer or distributor of that component, or the document specific to that project. For questions of architectural or structural dimensions, consult the project documentation or submit the question to IT for resolution.

This publication is not to be taken as a license to operate under, or a recommendation to infringe any existing patents. This supersedes and voids all previous literature, etc.

3 Responsibilities

The Sr. Director of IT

- Responsible for approving, revising and distributing this standard.

IT I&O Managers

- Responsible for ensuring that IT employees are aware of, and accountable for, consistent and uniform compliance with the area specific requirements of this standard when involved with the installation, maintenance, repairing, removal, or restoration of equipment.

IT Managers and Supervisors

- Responsible for the safe, efficient and timely performance of the necessary work to ensure compliance with this standard.
- Responsible for ensuring that IT employees that will be involved with installing, maintaining, repairing, removing and replacing equipment are trained, knowledgeable and qualified to perform the assigned tasks.

All Employees

- Employees assigned the task of installing, maintaining, repairing, removing, or replacing equipment are responsible for safely, effectively, and efficiently performing their assignments.
- Responsible for their own safety and that of the general public.
- Responsible for only performing tasks for which they are trained, knowledgeable and qualified.
- Responsible to notify their supervisors of whenever additional training, equipment, or resources needed to safely, effectively, and efficiently perform their assigned tasks.

3.1 Implementation

In implementation, this document applies particularly to the following:

- IT Field Engineers

- IT Design Engineers
- Network Specialists
- Network Architects/Planners- Enterprise Architecture Network Services
- Project Managers
- Cabling Contractors and Vendors

4 Safety

The following are general safety requirements that should be followed:

- Always perform a pre-task safety assessment of the planned work activities to ensure proper resources have been assembled.
- Confined spaces safety procedures must be followed if applicable.
- IT personnel must coordinate their work with the appropriate departments, must be trained as appropriate, and must be accompanied by a qualified worker as appropriate. Contractors must always be accompanied by a qualified SANTA CRUZ CITY SCHOOL DISTRICT employee while working inside SANTA CRUZ CITY SCHOOL DISTRICT facilities, where deemed applicable. Often contractors are able to work unescorted.

5 Environmental Statement

This standard supports SANTA CRUZ CITY SCHOOL DISTRICT's values of protecting the environment and reducing environmental impacts by:

- Reducing the amount of materials required for infrastructure by utilizing new products that optimize rack and equipment space, investing in new technologies that reduce the need for traditional cabling schemes, and limiting the amount of un-utilized copper cables being installed in work spaces.
- Seeking vendors that have an established environmental policy and minimize environmental impacts by deploying manufacturing strategies and processes including Restriction of the use of Hazardous Substances (RoHS), Waste Electrical and Electronic Equipment (WEEE), and ISO 14001, reducing packaging materials, and promoting product and process efficiencies and energy conservation.
- Removing all old, unused cables as required by TIA and NEC Article 800.
- Implementing proper cable management strategies that improve air flow and air conditioning/cooling efficiencies.
- Recycling obsolete and unused copper cables as areas are re-stacked or upgraded.

6 Regulatory Compliance

6.1 General

- All installations should be in compliance with the requirements of the National Electric Code, UBC, the local Building Code, local OSHA rules, the FCC as well as the recommendations and guidelines of BICSI and the TIA Standards.
- In cases where listed Standards and Codes have been updated, the most recent revisions, including all relevant changes or addenda at the time of installation should be used.
- Anywhere cabling Standards conflict with electrical or safety Codes, installer should defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
- Contractors are required to be familiar with all applicable codes and standards. Knowledge and execution of applicable codes is the sole responsibility of the installer.
- All active equipment installed should comply with the minimum requirements of NEMA, IEEE, ASTM, ANSI and Underwriters' Laboratories, as applicable.
- Should any change in plans or specifications be required to comply with governmental regulations, the Contractor is to notify the General Contractor/Engineer at the time of submittal.

6.2 Applicable Regulatory References

6.2.1 ANSI:

a. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

b. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems – Transmitter Output Optical Power Measurement for Single-Mode Optical Fibre Cable

c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology

d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)

f. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards

g. TIA-568-C.2-1 (July 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 1: Specifications for 100 Next Generation Cabling

h. TIA-568-C.2-2 (November 2014) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 2: Additional Considerations for Category 6A Patch Cord Testing

i. TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard (will be superseded by ANSI/TIA-568.3-D after default ballot)

j. TIA-568-C.3-1 (October 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors (will be superseded by ANSI/TIA-568.3-D after default ballot)

k. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard

l. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)

m. ANSI/TIA-569-D (April 2015) Telecommunications Pathways and Spaces

n. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding

o. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard

p. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure

q. ANSI/TIA-606-B-1 (December 2015) Administration Standard for Telecommunications Infrastructure Addendum 1 - Automated Infrastructure Management Systems - Addendum to ANSI/TIA-606-B

r. ANSI/TIA-607-C (November 2015) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

s. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard

t. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems

u. ANSI/TIA-942-B (Juy 2017) Telecommunications Infrastructure Standard for Data Centers (will be superseded by ANSI/TIA-942-B after balloting)

v. ANSI/TIA-942-A-1 (March 2013) Telecommunications Infrastructure Standard for Data Centers, Addendum 1 - Cabling Guidelines for Data Center Fabrics (will be superseded by ANSI/TIA-942-B after balloting)

w. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard For Industrial Premises

x. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard For Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A

y. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balum-Less Measurements of Balanced Components and Systems

z. ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz - Addendum to TIA-1183

aa. ANSI/TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

bb. ANSI/TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard

cc. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities

dd. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)

ee. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables

ff. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16

gg. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO

hh. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard

ii. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T

jj. TSB-184-A (March 2017) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling

kk. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field

ll. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths

mm. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points

nn. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems

oo. TIA-492AAAE (June 2016) Detail Specification for 50-µm Core Diameter/125-µm Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers with Laser-Optimized Bandwidth Characteristics Specified for Wavelength Division Multiplexing

pp. TIA-492AAAB-A (November 2009) Detail specification for 50-µm core diameter/125-µm cladding diameter class Ia graded-index multimode optical fibers

qq. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Single-mode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis

rr. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques

6.2.2

- ANSI/TIA-569 (April 2012)
- ANSI/TIA-568-C.0 (September 2010) Generic Telecommunications Cabling for Customer Premises

- TIA-568-C.0-1 (September 2010) Generic Telecommunications Cabling for Customer Premises-Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
- ANSI/TIA-568-C.1 (February 2009) Commercial Building Telecommunications Cabling Standards
- TIA-568-C.1-2 (November 2011) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
- ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards
- ANSI/TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard
- ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
- ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- ANSI/TIA-942-A (August 2012) Telecommunications Infrastructure Standard for Data Centers
- TIA-569-C (May 2012) Telecommunications Pathways and Spaces
- ANSI/TIA-606-B (June 2012) Administration Standard for Telecommunications Infrastructure
- TIA-607-B (September 2011) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- TIA-758-A (August 2004) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- ANSI/TIA-862-A (April 2011) Building Automation Systems Cabling Standard
- ANSI/TIA-1005A (May 2012) Telecommunications Infrastructure Standard for Industrial Premises
- TIA-1005-1 (March 2010) Telecommunications Infrastructure Standard for Industrial Premises; Addendum 1 - Industrial Pathways and Spaces
- TIA-TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths

6.2.3 ISO/IEC

ss. ISO/IEC TR 11801-99-01 Information technology – Generic cabling for customer premises: Guidance for balanced cabling in support of at least 40 GBit/s data transmission: Parts 1 and 2

tt. ISO/IEC TR 29106 AMD 1 Information technology -- Generic cabling -- Introduction to the MICE environmental classification

uu. ISO/IEC 14763-3 Ed 2.0 Information technology -- Implementation and operation of customer

premises cabling -- Part 3: Testing of optical fibre cabling

vv. ISO/IEC 24764 AMD 1 Information technology – Generic cabling for data centres

ww. ISO/IEC 11801 AMD 1 AMD 2 Information technology – Generic cabling for customer premises

xx. ISO/IEC 15018 AMD 1 Information technology – Generic cabling for homes

yy. ISO/IEC 24702 AMD 1 Information technology – Generic cabling – Industrial premises

zz. ISO/IEC 14763-1 AMD 1 Information technology – Implementation and operation of customer premises cabling – Part 1: Administration

aaa. ISO/IEC 14763-2 Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation

bbb. ISO/IEC 14763-2-1 Information technology – Implementation and operation of customer premises cabling – Part 2-1: Planning and installation – Identifiers within administration systems

ccc. ISO/IEC TR 24704 Information technology – Customer premises cabling for wireless access points

ddd. ISO/IEC TR 24750 Information technology – Assessment and mitigation of installed balanced cabling channels in order to support 10GBASE-T

eee. ISO/IEC TR 29125 IT Telecommunications cabling requirements for remote powering of terminal equipment

- ISO 11801 - Generic Cabling for Customer Premises

6.2.4 National Electric Codes

fff. National Electrical Safety Code (NESC) (IEEE C2-2012)

ggg. NFPA 70-2016, National Electrical Code© (NEC©)

hhh. ANSI/IEEE C2-207, National Electrical Safety Code®

iii. National Electrical Code (NEC) (NFPA 70)

jjj. NFPA 72 National Fire Alarm and Signaling Code

- National Electrical Safety Code (NESC) (IEEE C2-2012)
- National Electrical Code (NEC) (NFPA 70)

6.2.5 OSHA Standards and Regulations – all applicable

6.2.6 Local Codes and Standards – all applicable

6.2.7 BICSI

1. BICSI – Building Industry Consultative Services International – Published Standards

kkk. ANSI/BICSI 001-2009, Information Transport Systems Design Standard for K-12 Educational Institutions

lll. ANSI/BICSI 002-2014, Data Center Design and Implementation Best Practices

mmm. ANSI/BICSI-003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems

nnn. BICSI 004-2012, Information Technology Division Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities

ooo. ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices

ppp. BICSI 006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices

qqq. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling

rrr. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

- Telecommunications Distribution Methods Manual, 13th Edition

2. BICSI – Building Industry Consultative Services International – Manuals

sss. Telecommunications Distribution Methods Manual, 13th Edition

ttt. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition

uuu. Outside Plant Design Reference Manual, 5th Edition

vvv. BICSI's ICT Terminology Handbook, Version 1.0

www. Telecommunications Project Management Manual (TPMM), 1st edition

xxx. Telecommunications Project Management Reference Document (TPMRD), 2nd Edition

yyy. BICSI's Special ICT Design Considerations, Version 1.0

zzz. Essentials of Bonding and Grounding, Version 1.0

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- Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
- ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
- ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
- NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- AV Design Reference Manual, 1st Edition
- Network Design Reference Manual, 7th Edition
- Outside Plant Design Reference Manual, 5th Edition
- Wireless Design Reference Manual, 3rd Edition

7 General Guidelines

7.1 Maintenance of Patch Fields

Any persons with Contractor or SANTA CRUZ CITY SCHOOL DISTRICT adding or moving copper or fiber optic patch (equipment) cords should do so in a neat, workmanlike fashion in keeping with the original system concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.

Persons performing such moves, adds, or changes (MACs), should further adhere to the following:

- Contactor should use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between

different types of copper cables.

- Cables should be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
- All patch cords used should be of same copper Category or fiber OM/OS designation or higher than the media used in the permanent links.
- Patch cords shall not be run across fan blades such that it will prohibit the maintenance of the switch.
- Patching in all cases should be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
- All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front cabinets or racks will not be accepted.
- Any persons moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a port.
- Any persons with SANTA CRUZ CITY SCHOOL DISTRICT or Installing Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling guidelines outlined in this document.
- Any persons with SANTA CRUZ CITY SCHOOL DISTRICT or Installing Contractors performing moves, adds or changes within patch field will record the move according to documentation guidelines outlined in this document.

7.2 Cable Pulling and Termination

- The cable should be restricted to a single four-pair cable construction to support a broad range of applications.
- Keep all permanent cable runs to a maximum of 295 feet / 90 meters for each run. CAT 6 & 6A Channel has a max distance of 328 feet / 100 meters with patch cords, and CAT 6 Permanent Link has a max distance of 295’ or 90 meters.
- Be conscious of conduit fill guidelines. No pathway, including conduits should have greater than a 35% fill per TIA and BICSI fill charts. Contractor is responsible for bringing to the attention of Santa Cruz City Schools project manager any insufficiently sized conduit in project documentation.
- Keep CAT 6 & 6A cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
- Use low to moderate force when pulling cable. Maximum tensile load may not 25’ lbs. maximum pulling force per 4 pair cable.
- Always use grommets to protect the cable when passing through metal studs or anything that can possibly cause damage to the cable.
- Do not deform the jacket of the cable. The jacket should be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
- Install proper cable supports, spaced less than 5 feet apart and no more than 49 cables and/or 25 lbs. max per support.
- Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
- All copper horizontal cabling should have slack service loops no less than 12” at the work area (equipment outlet) and not less than 3 feet in the telecommunications room. Slack at the work area may be stored in the ceiling and in the telecommunications room may be wall mounted or contained in pathways or racking systems if done in a neat, workmanlike fashion.
- Note service loops may not touch the ceiling assembly and if so must be remedied at the Contractor expense.
- Always label every termination point within 6 in. of the end. Use a unique number for each cable segment as required by the documentation for that project.
- Dress the cables neatly with hook and loop cable ties (“Velcro”), not plastic cable ties. Use low to moderate pressure.
- Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.
- All UTP patching should be accomplished using CAT 6 & 6A rated modular patch panels as indicated elsewhere in this document.
- Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards. This is mandatory; Contractors must consider this when placing bids.

- All removed copper cable is to be disposed of in a SANTA CRUZ CITY SCHOOL DISTRICT recycling bin designated for “copper.”

8 Work Area

8.1 General

A model of one computer and one IP phone per cable has been established with wireless networking available as a secondary option for connectivity as the technology matures and the resources are deployed. Case-by-case exceptions can be made depending upon business justifications or type of work area where network cable is to be installed such as a classroom, administration room, conference room, etc.

The Work Area should consist of the connectivity equipment used to connect the horizontal cabling subsystem and the equipment in the work area. Both copper and fiber media should be supported. The connectivity equipment should include the following options:

- UTP Cable
- Outlets and surface mount boxes
- Surface raceway and outlet poles
- Patch Cords and Modular Connectors

The use of “mini-hubs” is not allowed since they cannot be seen or managed when connected to SANTA CRUZ CITY SCHOOL DISTRICT network.

The PANDUIT Mini-Com Network Cabling System or SANTA CRUZ CITY SCHOOL DISTRICT approved equivalent should be used for the Work Area subsystem, including all modular connectors. The network cabling system should be comprised of modular connectors in support of high-speed networks and applications designed for implementation on copper cabling. All outlets should utilize fully interchangeable and individual connector modules that mount side-by-side to facilitate quick and easy moves, adds, and changes.

The cable standards at the equipment outlet (work area) will reflect a classroom, administration, multi-purpose, or other system depending on the critical nature of the network traffic. These ratings are described as follows:

- Classroom locations will have two Category 6A (wifi) and six Category 6 (data, AV, clock/speaker, VOIP and future) cables to each work area. Classroom locations require high reliability and so more redundancy is built into classroom networks at all levels.
- Administration locations usually have three Category 6 (data, VOIP, and future) cables to each work area, but this may be upgraded depending on the needs of that project.
- Multi-purpose locations will have one Category 6 (clock) and four 6A (wifi) cables per work area.

- Other locations will receive three Category 6 drop and are not likely to be upgraded.

Further detail on these four work area types are provided below.

8.2 Classroom Facility

- All facilities rated classroom should have a minimum of two Category 6A and six Category 6, 4 pair station cables installed at the outset between the telecommunications room (or to the location of the serving network switch) and the work area.
- Additional cables may be installed to a work area if there is a business need for extra outlets. In cases requiring more than two drops, Contractor will use a four-hole faceplate or larger as needed by the project documentation for that job.
- Examples of this would be a classroom labs or a training room where there would be a large demand for network connections. For special cases like this, reference project-specific documentation attached to this specification.

- Cables are to be installed and tested per the Testing and Acceptance section of this document.
- The telecommunications Room end of the cables will be installed in to a patch panel per illustrations in the Telecommunications Room section of this document.

8.3 Outlets and Surface Mount Boxes

- Work area outlets will generally be one of three types.

- Modular Furniture Faceplate
- Surface Mount Box
- Wall Face Plate
    - The outlets and surface mount boxes should support the network system by providing high-density in-wall, surface mount or modular office furniture cabling applications. The outlets consist of faceplates for flush and recessed in-wall mounting as well as mounting to the modular office furniture systems. The surface mount boxes can be mounted where in-wall applications are not possible or to support applications where surface mount is the best option.
    - All outlets should utilize the interchangeable, individual Mini-Com connector modules that mount side by side to facilitate quick and easy moves, adds and changes. All outlets should be manufactured from high-impact thermoplastic material with a U.L. flammability rating of 94 HB or better.
    - The standard color for outlets and surface mount boxes is Panduit Off White (IW). Other colors may be used to match a pre-existing color scheme.

- 45° Angled Wire Caps for TX6A, TX6 PLUS and TX5e Mini-Com® UTP Jack Modules

- 45° angled wire caps, when mated with compatible UTP jack modules, shall provide improved cable routing to jacks in confined spaces. Angled wire caps shall terminate 4-pair, 22 - 26 AWG, 100 ohm unshielded twisted pair cable and shall use a forward motion termination method to optimize performance by maintaining cable pair geometry while eliminating conductor untwist.

The wire caps shall be color-coded to designate performance category and shall include a universal label coded for T568B wiring scheme.

8.4 Configuration of Work Areas

- Outlet configuration should be assembled as follows dependent upon the installed cable infrastructure for the facility. A new administration facility would only use ports 1, 2 and 3 of an outlet for the three standard data cables, filling the remaining ports with blanks or additional cables if needed. A other location with TDM voice services would use port 1 for data and port 2 for the VOIP.

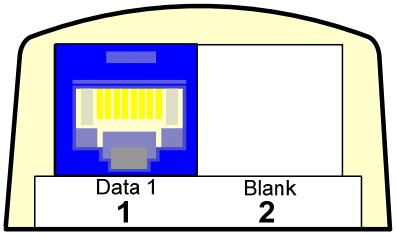
8.5 Outlet Port Assignments

- Port #1 – Data # 1
- Port #2 – VOIP # 1 or Blank
- Port #3 – VOIP # 2, Data # 2 or Blank
- Port #4 – VOIP # 3. Data # 3 or Blank

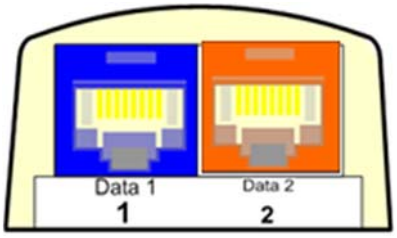
8.6 Outlet Example Diagrams

- Surface Mount Boxes.

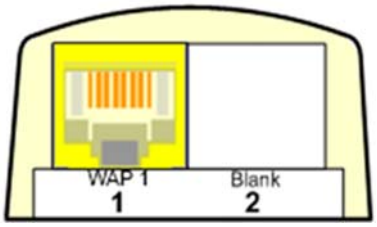
Surface box requiring one Ca 6 / 6A drop.
(Good example is WAP connection).



Surface box requiring a second data drop

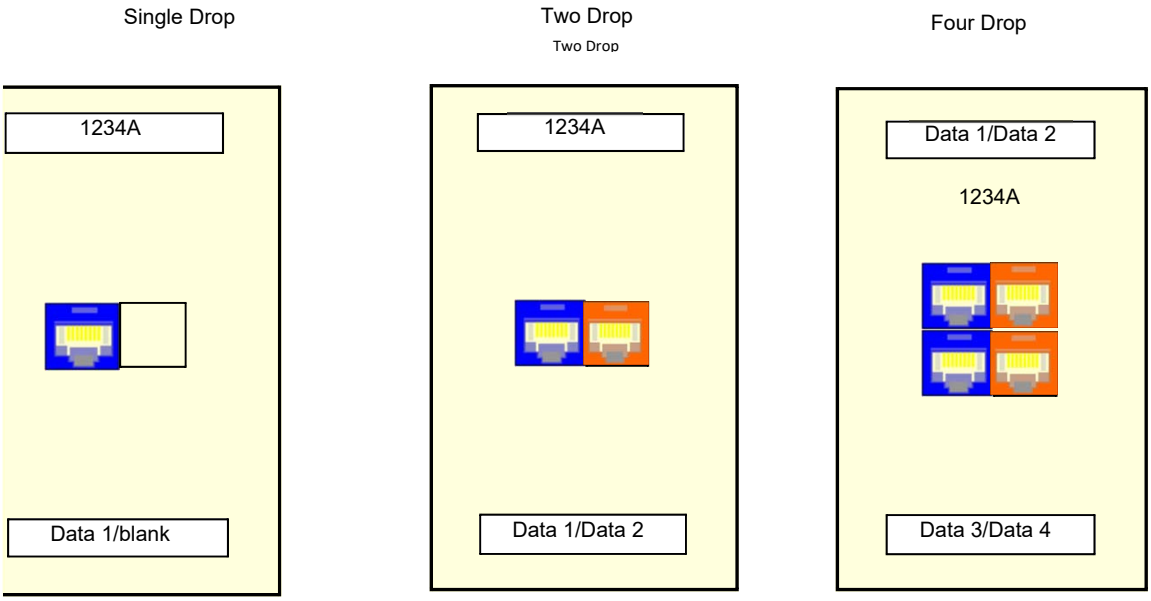


*Note wireless access points may use color coded jack yellow as noted below.



**If more drops are needed in a surface box, Contractor may need to install 4-hole surface box. Consult project documentation for details.

- Flush Mount Faceplates



9 Copper Horizontal Cable

9.1.1 COPPER CABLE CAT.6E: GENSPEED 6000E / BLUE / PLENUM– P/N: 7131900

• Superior performance exceeds all TIA/EIA-568-B.2-1 Category 6 and ISO 11801 Edition 2.0 for Class E cable requirements
• ETL tested and verified for Category 6 component performance
• Conductors are twisted in pairs with four pairs contained in a flame retardant PVC jacket separated by a spline
• Performance tested to 650 MHz
• Plenum (CMP) and non-plenum/riser (CMR) flame rated
• Maximum installation tension of 25 lbs (110 N)
• Installation temperature range: 32°F to 140°F (0°C to 60°C)
• Operating temperature range: 14°F to 140°F (–10°C to 60°C)
• Cable diameter: Riser – 0.260"; Plenum – 0.250"

• Easy payout, reel-in-a-box and descending length markings on cable speed installation
• Supports the following applications: Ethernet 10BASE-T, 100BASE-T (Fast Ethernet) and 1000BASE-T (Gigabit Ethernet); 1.2Gb/s ATM; Token Ring 4/16; digital video; and broadband/baseband analog video

9.1.2 COPPER CABLE CAT.6A: GENSPEED 10 / .250 O.D. / BLUE / PLENUM – P/N: 7141819

The GenSpeed 10 UTP Category 6A cable shall meet or exceed both channel and component compliant standards (ANSI/EIA/TIA-568-B.2-10, IEC/ISO 11801 Class E_A (channel) and IEC 61156-6 (component) standards). Category 6A UTP 4-pair copper cable shall be constructed of 23 AWG conductors. The insulated conductors shall be twisted in pairs and all four pairs shall be covered by a flame retardant PVC, FEP, or PE jacket depending on cable flame rating. The copper conductors shall be twisted in pairs and separated by a crossweb. All four pairs shall be surrounded by Encapsulated Isolation Wrap and flame retardant jacket. The Encapsulated Isolation Wrap shall suppress the effects of alien crosstalk allowing 10Gb/s transmission. This innovative cable design shall provide installation flexibility as cables can be routed in tight bundles through pathways and spaces. The GenSpeed 10 UTP Copper Cable at .250 O.D.must be installed as part of a complete TX6A™ 10GIG™ Copper Cabling System in order to achieve 10GBASE-T certified performance.

All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) .
Cable listed to NEC Article 800-51(a) will be used for “Plenum” installations.
Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor.

9.1.3 UTP CAT.6 & 6A JACK MODULES

MINI-COM® TX6A™ 10GIG™ UTP Jack Modules shall be Category 6A modules featuring MaTriX Technology. The eight position modules shall terminate unshielded twisted 4 pair, 22 – 26 AWG, 100 ohm cable and shall not require the use of a punchdown tool. Jack module shall use Enhanced Giga-TX™ Technology with forward motion termination to optimize performance by maintaining cable pair geometry and eliminating conductor untwist. The termination cap shall provide strain relief on the cable jacket, ensure cable twists are maintained to within 1/8” (3.18 mm) and include a wiring scheme label. The blue module base shall signify Category 6A performance and shall include a universal label representing T568A and T568B wiring schemes. The MINI-COM® TX6A™ Jack Modules include MaTriX Tape on the external portion of the jack module, which assists in suppressing alien crosstalk. The jack modules shall be universal in design, including complying with the intermateability standard IEC 60603-7 for backward compatibility. Category 6A jack modules shall be UL and CSA approved and RoHS compliant.

The jack modules shall be ETL verified to ANSI/TIA/EIA Category 6A and

IEC/ISO 11801Class E_A channel performance. They shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to the outer jack contacts. The jack modules shall be able to be re-terminated a minimum of 20 times and be available in 11 standard colors for color-coding purposes. The jack module shall snap into all MINI-COM® outlets, patch panels and surface mount boxes. The MINI-COM® TX6A™ 10GIG™ Jack Module must be installed as part of a complete TX6A™ 10GIG™ Copper Cabling System with MaTriX Technology in order to achieve 10GBASE-Tcertified performance.

Part number	Style	Category	Colors
CJ6X88TG**	RJ-45	6A	11

**To designate a color, add suffix IW (Off White), EI (Electric Ivory), IG (Int'l Gray), WH (White), BL (Black), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow) or VL

9.1.4 MINI-COM® TX-6™ TG MODULES SHALL BE CATEGORY 6 MODULES FEATURING GIGA-TX™ TECHNOLOGY. THE EIGHT POSITION MODULES SHALL BE USED IN ALL WORK AREAS AND SHALL EXCEED THE CONNECTOR REQUIREMENTS OF THE TIA/EIA CATEGORY 6 STANDARD. TERMINATION SHALL BE ACCOMPLISHED BY USE OF A FORWARD MOTION TERMINATION CAP AND SHALL NOT REQUIRE THE USE OF A PUNCH DOWN TOOL. THE TERMINATION CAP SHALL PROVIDE STRAIN RELIEF ON THE CABLE JACKET, ENSURE CABLE TWISTS ARE MAINTAINED TO WITHIN 1/8" (3.18 MM) AND INCLUDE A WIRING SCHEME LABEL. THE WIRING SCHEME LABEL SHALL BE AVAILABLE WITH BOTH T568A AND T568B WIRING SCHEMES. ALL TERMINATIONS FOR THIS PROJECT SHALL USE THE T568B (B) WIRING SCHEME. THE MODULES SHALL TERMINATE 4 PAIR 23 100-OHM SOLID UNSHIELDED TWISTED PAIR CABLE. THE MODULES SHALL BE UNIVERSAL IN DESIGN, INCLUDING COMPLYING WITH THE INTERMATEABILITY STANDARD IEC 60603-7 FOR BACKWARD COMPATIBILITY. CATEGORY 6 MODULES SHALL HAVE UL AND CSA APPROVAL. THE MODULES SHALL HAVE ETL VERIFIED CATEGORY 6 PERFORMANCE AND ISO CLASS E PERFORMANCE (AS DEFINED IN ISO/IEC 11801) IN BOTH THE BASIC AND CHANNEL LINKS. THEY SHALL BE UNIVERSAL IN DESIGN, ACCEPTING 2, 3, OR 4 PAIR MODULAR PLUGS WITHOUT DAMAGE TO THE OUTER JACK CONTACTS. THE MODULES SHALL BE ABLE TO BE RE-TERMINATED A MINIMUM OF 10 TIMES AND BE AVAILABLE IN 11 STANDARD COLORS FOR COLOR-CODING PURPOSES. THE JACK SHALL SNAP INTO ALL MINI-COM OUTLETS AND PATCH PANELS. THE MODULE SHALL INCLUDE A BLACK BASE TO SIGNIFY CATEGORY 6 400 MHZ PERFORMANCE.

Part number	Style	Category	Colors
CJ688TG**	RJ-45	6	11

**To designate a color, add suffix IW (Off White), EI (Electric Ivory), IG (Int'l Gray), WH (White), BL (Black), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow) or VL

TX6A™ Category 6A UTP Field-Term RJ45 Plug

The TX6A™ Category 6A UTP Field Terminable RJ45 Plug is a simple-to-attach plug for field termination of 4-pair unshielded twisted pair cable. Providing Category 6A performance the TX6A™ plug is also compatible with Category 6 and 5e systems. The two-piece TX6A™ plug terminates 4-pair, 22 - 26 AWG, 100 ohm unshielded twisted pair cable and uses proven TG-style

forward motion termination technology to optimize performance by maintaining cable pair geometry while eliminating conductor untwist.



Part number	Style	Category	Colors
FP6X88MTG	RJ-45 Plug	6A	1 (Black)

- All copper Category 6 & 6A terminations should be the T568B pin-out.
- Refer to the "Appendix A - Materials" for specific cable part numbers.
-

10 Wireless Access Points

For information regarding the design and installation of Wireless Access Points, SANTA CRUZ CITY SCHOOL DISTRICT employees should refer to the manufacturer standards.

11 Fiber Backbone Cabling

11.1 General

Installation of fiber in legacy installations must match the installed base both mechanically (core size, cable type, terminations) and in performance rating.

For new installations SANTA CRUZ CITY SCHOOL DISTRICT has standardized on General Cable brand plenum rated indoor/outdoor, tight-buffered, armored cable to be used both between telecommunications room within buildings, and in campus backbone connections between buildings.

The connections within buildings (intrabuilding) are to be OS1 - singlemode as distance requires for the transmission of 10GBase-SR 10 gigabit ethernet.

- Backbone under 300 M will use OS1.
- Distances beyond 300 M will be singlemode. The connections between buildings (inter-building) are to be various strand counts of singlemode cable in all cases unless the project documentation calls out something else.
- Confirmation of the glass type used per distance traveled is the responsibility of the Engineer.

11.2 Fiber Cable Types

SANTA CRUZ CITY SCHOOL DISTRICT made the decision to standardize on plenum rated indoor/outdoor, tight-buffered, armored cable to simplify optical distribution design and implementation. In particular this decision had the following advantages:

- Reduced part numbers and simplified design
- Outside plant fiber may skip the transition to inside type fiber since it is already inside rated.
- Using only plenum rated fiber cable allows the cable to be routed anywhere in the building, including air return spaces.
- The corrugated armor eliminates the needs to contain in conduit or innerduct within buildings.

11.3 Backbone Cabling - Intrabuilding

All fiber backbone connections within buildings should be made with General Cable OS1 singlemode, indoor/outdoor, plenum-rated, tight-buffered cable with a corrugated armor.

All fiber backbone connections within buildings should be done with General OS1 singlemode, indoor/outdoor, plenum-rated, tight-buffered cable with a corrugated armor. Contractor is responsible for bringing to the attention of the SANTA CRUZ CITY SCHOOL DISTRICT project manager any indoor fiber links that are an concern.

These intrabuilding fiber backbones should be installed in the following strand counts:

- 12, 24 and 48 strand.

See "Appendix A - Materials" for approved cable part numbers. Consult project documentation for strand counts on specific jobs.

11.4 Backbone Cabling - Inter-building

All fiber connections between buildings should be made using General Cable singlemode, plenum rated, indoor/outdoor tight-buffered cable with corrugated armor jacket unless project documentation calls out something else between buildings.

These inter-building fiber backbones should be installed in the following strand counts:

- 12, 24, 48 strand.

See "Appendix A - Materials" for approved cable part numbers. Consult project documentation for strand counts on specific jobs.

11.5 Fiber Terminations

Backbone fiber terminations should be done with Panduit duplex LC OptiCam connectors. Singlemode OS1 OptiCam factory pre-polished connectors should be used to terminate Singlemode OptiCam pre-polished for singlemode backbone terminations. These connectors must have the following properties:

Note: Pre-polished connectors should not be done in the field.

11.5.1 LC OPTICAM SINGLEMODE FIBER CONNECTORS

SANTA CRUZ CITY SCHOOL DISTRICT fiber terminations and connectors should meet the following requirements:

- TIA/EIA-604 FOCIS-10 compatible connectors.
- Exceed TIA/EIA-568-B.3 requirements.
- Connector backbone and boot colors follow TIA/EIA-568-C.3 suggested color identification scheme.
- Insertion loss: 0.3dB average (multimode and singlemode).
- Return loss: >26dB (10Gig ™multimode), >20dB (multimode), >50dB (singlemode).
- Spring-loaded “Senior” rear pivot latch LC connector.
- Quick installation; provide field termination in less than half the time of field polish connectors.
- Patented re-termination capability provides yield rates approaching 100%.
- Factory pre-polished fiber end-face eliminates time-consuming field polishing to reduce installation costs labor, scrap and the number of tools required.
- Cam activated fiber and buffer clamp mechanisms provide superior fiber and buffer retention – less sensitivity to fiber tensile loading.
- OptiCam® Termination Tool simplifies tooling and termination, and virtually eliminates operator error by providing visual indication of proper termination after the cam step has been completed.
- Cable retention boot assemblies consistently provide higher than industry standard cable retention.
- Non-optical disconnect maintains data transmission under tensile loads for jacketed cable.
- Fiber cable size: accept 900µm tight-buffered fiber with included boot(s); accept 1.6mm – 2.0mm and 3.0mm jacketed cable with available OptiCam ®Cable Retention Boot Assemblies (ten per package).

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12 Telecommunications Rooms

12.1 General

All telecommunications rooms should be designed and constructed per all TIA guidelines:

- Entrance Facilities - per guidelines contained in TIA 569-C, including all additions, addenda and revisions at the time of installation.
- Equipment Rooms - per guidelines contained in TIA 569-C, including all additions, addenda and revisions at the time of installation.

- Horizontal Telecommunications Rooms - per guidelines contained in TIA 569-C, including all additions, addenda and revisions at the time of installation.

Details of mandatory attributes of telecommunications spaces (rooms) follow.

12.2 Entrance Facilities

The Entrance Facility is the location where outside communications services enter the building and are transitioned to SANTA CRUZ CITY SCHOOL DISTRICT owned cabling.

Contractor should follow all guidelines contained with TIA 569-C, Contractor should pay particular attention to the following details on all TRs and related Telecommunications Spaces:

- Locate the entrance facility in a dry area as close as practicable to the building entrance point and next to the electrical service room in order to reduce the length of bonding conductor to the electrical grounding system.
- Size the Entrance Facility according to present and expected future equipment requirements.
- Cover one wall with 3/4" A-C plywood that is 8' high, fire retardant and kiln dried to a maximum moisture content of 15%. Plywood should be painted with two coats white fire-retardant paint. Any penetrations through IDF fire-rated walls should use ETI easy path.
- Minimum ceiling height is 8' with 10' preferred.
- The floor, walls, and ceiling should be sealed to reduce dust. Finishes should be light in color to enhance room lighting. Floors should have anti-static properties.
- Lighting should be powered by separate circuits than the communications equipment and provide brightness not less than 500 lx (50 foot-candles) as measured 3 ft. above the finished floor.
- Entrance door should be lockable, not less than 36' wide and should be without a doorsill.
- Power should provide a minimum of two dedicated 120 V nominal, non-switch, ac duplex electrical receptacles, each on a separate branch circuit receptacles. Outlets should be rated at 20 A and be connected to 20 A branch circuit. Consult project documentation for specific power requirements.
- All equipment and infrastructure should be grounded according to the grounding section of this document.
- For server room design, refer to TIA 942A, section 6.4.4.4 Lighting.

12.3 Equipment Rooms

An Equipment Room may serve any or all of the functions of a telecommunications room or entrance facility, and is distinguished by the presence of active networking equipment.

An Equipment Room's contents should be restricted to only that which pertains directly to the telecommunications equipment and support features. The Equipment Room should further meet the following requirements:

- Location for an Equipment room should avoid locations restricted by building/architectural components or places holding equipment that generates large amount of electro-magnetic interference.
- Thorough-fare areas used to provide access to other part of the building should be avoided so the Equipment Room is secure and accessed only by authorized personnel.
- Locate the Equipment Room to have ready access to the main HVAC system.
- The following is a general guideline for sizing Equipment Rooms according to the number of work areas served:

Work areas	Area m^2 (ft^2)
Up to 100	14 (150)
101 to 400	37 (400)
401 to 800	74 (800)
801 to 1200	111 (1200)

- Consult project documentation for details of room sizing for that project.
- Power systems up to 100 kVA may be located within the equipment room. Power systems above 100 kVA should be located in a separate room.
- Cover one wall with 3/4" A-C plywood that is 8' high, fire retardant and kiln dried to a maximum moisture content of 15%. Plywood should be painted with two coats white fire-retardant paint.
- Minimum ceiling height is 8' with 10' preferred.
- The floor, walls, and ceiling should be sealed to reduce dust. Finishes should be light in color to enhance room lighting. Floors should have anti-static properties.
- Lighting should be powered by separate circuits than the communications equipment and provide brightness not less than 500 lx (50 foot-candles) as measured 3 ft. above the finished floor.
- Doors should be lockable, not less than 36" wide 80" high, without doorsill and hinged to open outward if local codes permit. Doors could also slide side-to-side, or be removable.
- An ideal door solution is double doors with a removable center-post.
- The equipment room should be designed for a minimum distributed floor load rating of at least 4.8 kPa (100 lbf/ft_2) and a minimum concentrated load rating of

at least 8.8 kPa (182 lbf/ft2). If unusually heavy equipment is expected, the floor specifications should be increased to accommodate.

- HVAC should be continuously available 24/7, 365 days a year.
- HVAC should be outfitted with a standby power source.
- Temperature ranges should be 64 to 75 degrees F with a relative humidity of 30% to 55%.
- The Equipment Room should be powered by a separate circuit terminated in its own electrical panel. Required electrical provisioning is dependent upon equipment and supporting facilities. Consult project documentation for exact power needs.
- All equipment and infrastructure should be grounded according to the grounding section of this document.

12.4 Horizontal Telecommunications Rooms

Horizontal Telecommunications Rooms are located minimally one per floor and are the areas where backbone cable and horizontal cables are terminated and administered. Modern Telecommunications Rooms necessarily also contain a considerable amount of active equipment and in such cases also qualify as an "Equipment Room" and must be designed accordingly.

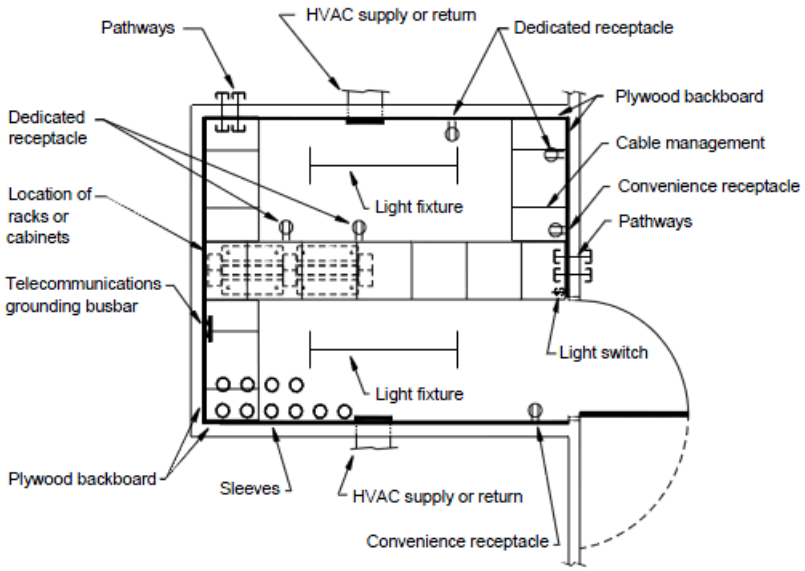
Telecommunications Rooms must meet the following requirements:

- Locate the TR (Telecommunications Room) as close as possible to the horizontal area to be served.
- Size the TR according to the following table.

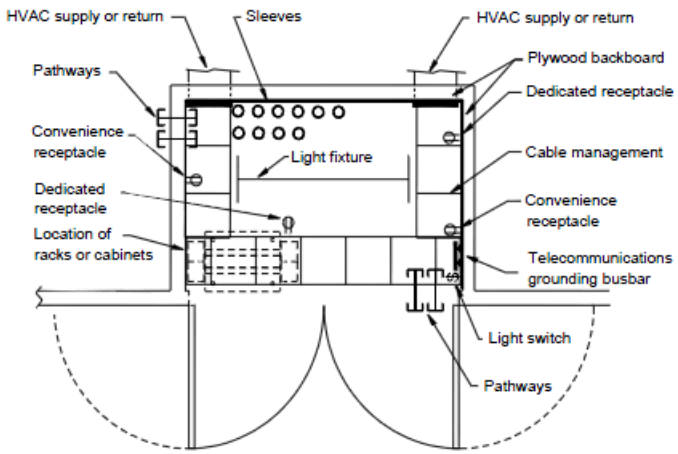
Serving area m^2 (ft^2)	Room size mm (ft)
1000 (10 000)	3000 x 3400 (10 x 11)
800 (8000)	3000 x 2800 (10 x 9)
500 (5000)	3000 x 2200 (10 x 7)

- Cover one wall with 3/4" A-C plywood that is 8' high, fire retardant and kiln dried to a maximum moisture content of 15%. Plywood should be painted with two coats white fire-retardant paint.
- Lighting should be powered by separate circuits than the communications equipment and provide brightness not less than 500 lx (50 foot-candles) as measured 3 ft. above the finished floor.
- For maximum flexibility TRs should not have a drop ceiling.

- Minimum floor loading should be minimally 2.4 kPa (50 lbf/ft2). If unusually heavy equipment is expected, floor loading requirements may need to be increased accordingly.
- HVAC should be provided and maintain the same temperatures as adjacent office areas.
- HVAC should be provides 24/7, 365 days a year, even if this means an HVAC system exclusively provided to the TR. If there is a standby power source available, the TR HVAC will be connected to it.
- A positive pressure should be maintained with a minimum of one air change per hour, or as required by applicable code.
- A minimum of two dedicated 120 V nominal, non-switched, ac duplex electrical receptacles, each on a separate branch circuit, should be provided for equipment power.
- These receptacles should be rated at 20 A and be connected to a 20 A branch circuit.
- Identified and marked "convenience" fourdex outlets should be placed at 6' intervals around the perimeter walls, at a height of 6" above the floor.
- Specific outlets for equipment and convenience along with their locations should be coordinated with the telecommunications system designers. See project documentation for details.
- All equipment and infrastructure should be grounded according to the grounding section of this document.



TIA 569 Common Telecommunications Room – Example 1



TIA 569 Common Telecommunications Room – Example 2

13 Racks, Cabinets and Cable Managers

13.1 General

In new installations, all data and voice (VoIP) traffic should utilize Category 6 / 6A cabling and terminations.

Cables are to be terminated one cable per device. Splitting out pairs from one cable to multiple devices is not allowed and will not be accepted.

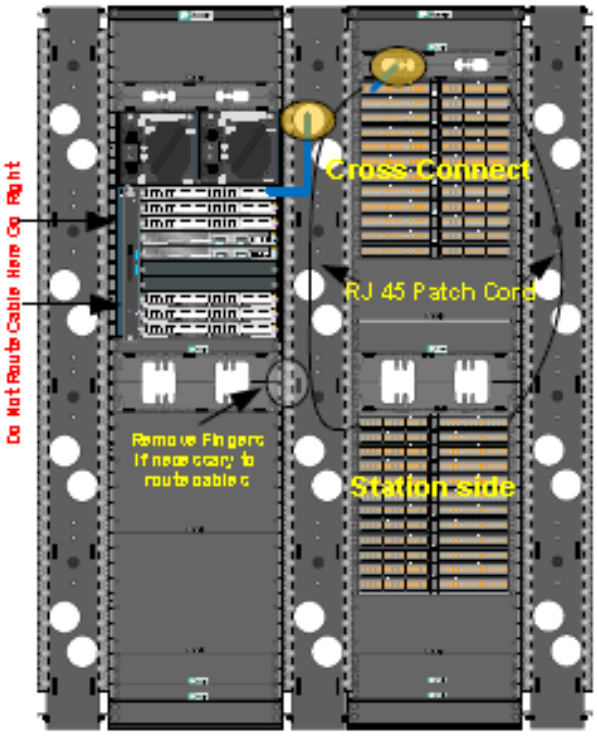
TRs where Category 6 horizontal cable is terminated fall into two types according to available space:

13.1.1 Normal or non-space restricted horizontal TRs

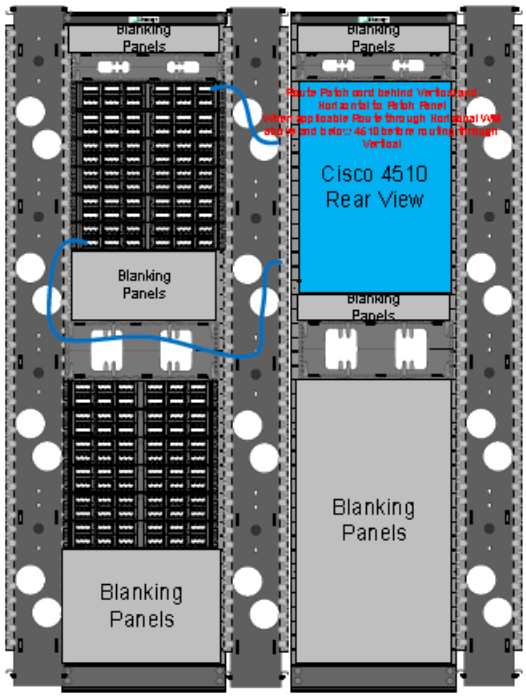
- Where space allows all modular Cat 6 / 6A panels will be angled to save space and eliminate horizontal managers.
- In such telecommunications rooms, racks should be standard 19", black aluminum with high capacity Panduit PatchRunner vertical managers on both sides. R2P
- PatchRunner high-capacity vertical managers should be sized to be no more than 35% upon installation according to manufacturer's calculations (fill charts).
- Racks should have interbay routing paths available at the top, middle and bottom of 19" racks to provide a shortest path between any two points when TR racks are ganged together.

See illustration below for properly configured 19" rack in a "normal" (non-space restricted TR:

Typical Rack Configuration



Rear View



Route cables through vertical behind adjacent cabinet.

13.1.2 TYPICAL RACK CONFIGURATION FOR EDGE SWITCHES

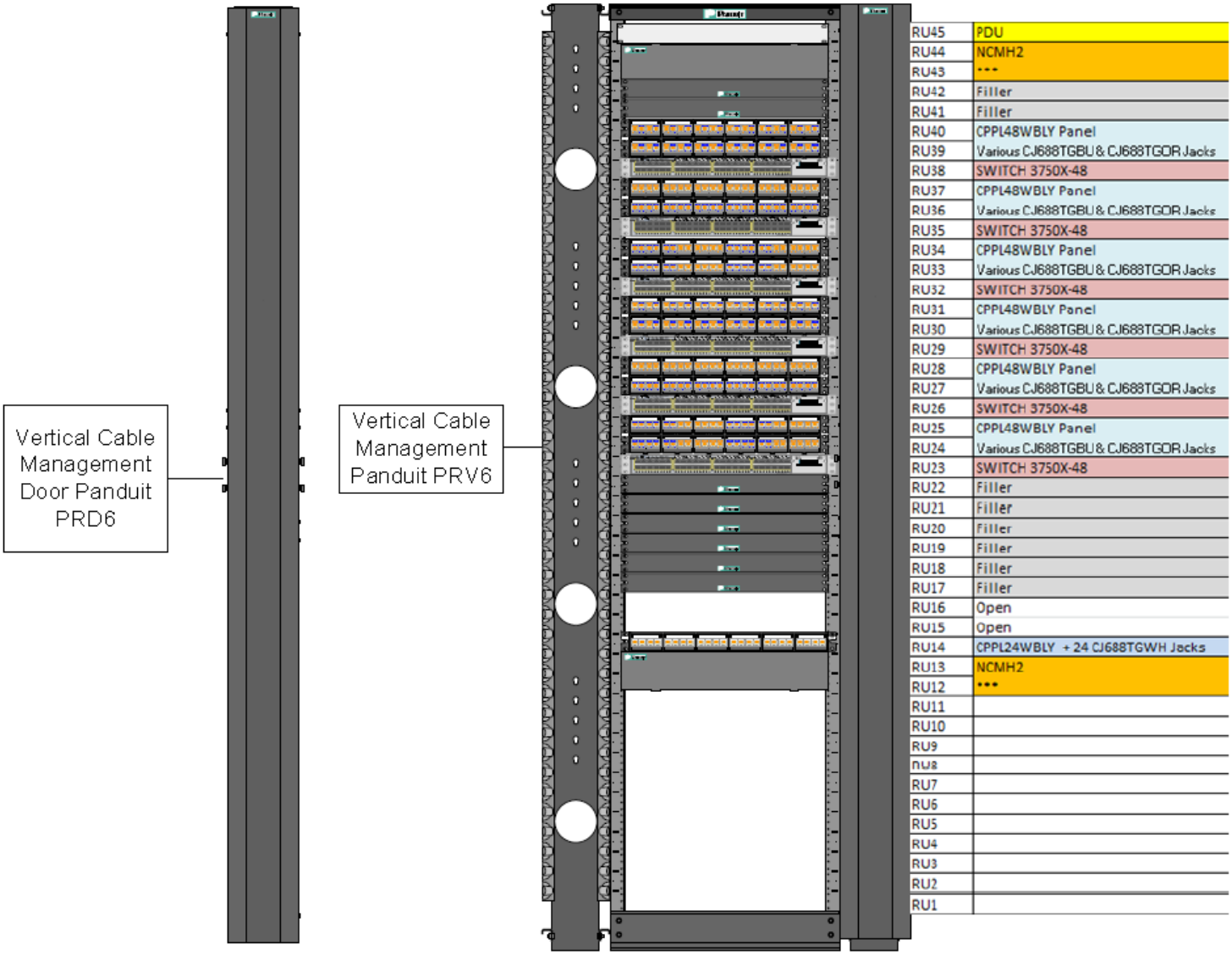
- CAT 6 / 6A Horizontal UTP cable shall be terminated on flat Cat 6 /6A modular panels as prescribed in the elevations provided in this section.
- All patching shall be done using the “One-To-One” patching methodology demonstrated below and at: http://www.panduit.com/heiler/ProductBulletins/D-COCB20--WW-ENG-OneToOneSwitchPatchn-W.pdf. *Horizontal cable managers are NOT used in this design.*





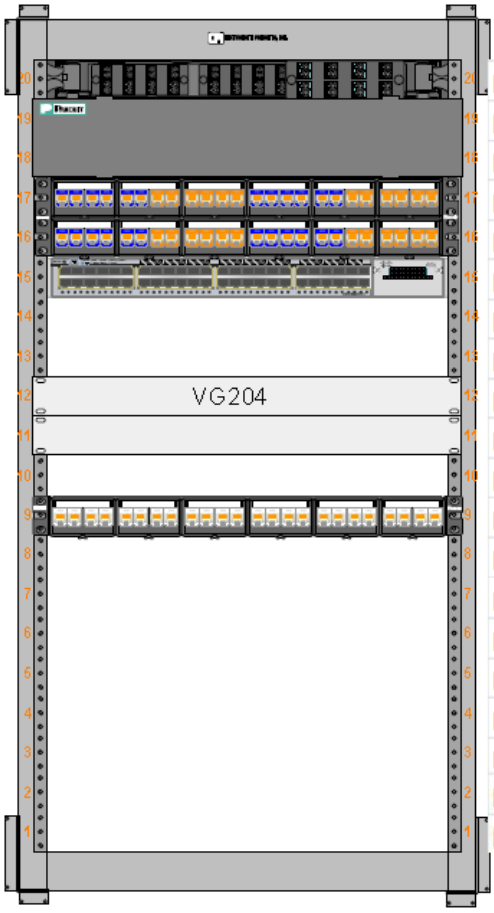
- All patch cords shall be Panduit Small Diameter Category 6 / 6A patch cords. These patch cords are 0.150 in, (3.8mm) nominal cable diameter and occupy less than half the space of traditional patch cords. http://www.panduit.com/en/landing-pages/small-diameter-patch-cords
- Racks in space restricted TRs shall have integrated vertical managers on one side only. See illustrations below for another comparison of rack configurations for normal-sized and space-restricted telecommunications rooms.

Typical Rack Elevation For Edge Switch Using One-To-One Patching



Rack Panduit R2P

Wall Rack Elevation for Edge Switch Using One-To-One Patching



RU20	FRME1U/FAP8WAQDLCZ
RU19	NCMH2
RU18	***
RU17	CPPL48WBLY Panel
RU16	Various CJ688TGBU & CJ688TGOR Jacks
RU15	2960S-XX
RU14	Open
RU13	Open
RU12	VG204
RU11	Shelf
RU10	Open
RU9	CPPL24WBLY + 24 CJ688TGWH Jacks
RU8	
RU7	
RU6	
RU5	
RU4	
RU3	
RU2	
RU1	

CPI Part #15320-724

13.2 Cable Managers

13.2.1 General

- The Cable Management System should be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures.
- The system should be a complete cable management system comprised of vertical cable managers, horizontal cable manager and cable management accessories used throughout the cabling system.

- The system should protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.
- Cable managers size should be selected according to projected port density when the rack is fully loaded and should not in any case exceed a 35% fill per manufacturers calculations (fill charts) upon installation.

13.2.2 HORIZONTAL CABLE MANAGERS

The horizontal cable managers are needed only in space restrictive TRs where there is not sufficient room to use angled patch panels. If horizontal managers are needed, they should meet the following criteria:

- Adjustable depth for pathway utilization or fan avoidance.
- Manage cables on switches with vertical cards.
- Can be used to create cable pathways for routing cable between bays.
- Have steel hinged covers to provide easy access to the pathway.
- Panduit part number PEHF2, 3 and 4 (last number corresponds with rack units). .

13.2.3 VERTICAL CABLE MANAGEMENT

SANTA CRUZ CITY SCHOOL DISTRICT approved vertical cable managers are Panduit PatchRunner High Capacity type and should have the following properties:

- The Vertical cable managers should include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment.
- Managers should protect network equipment by controlling cable bend radius and providing cable strain relief.
- Managers should be a universal design mounting to EIA racks. The manager should be constructed with a base that possesses pass through holes and molded cable management fingers.
- The fingers should incorporate integral bend radius control and be spaced so that the gaps between them align with the EIA rack spaces.
- The vertical manager should have a dual hinged cover that can be opened to the left or right to allow easy access to the pathway speeding moves, adds and changes.
- High density minimizes area required for network layout, freeing up valuable floor space.
- Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.
- Ventilated side walls provide maximum airflow for equipment cooling.
- Snap on finger sections can be removed to improve airflow, and break away fingers allow routing of large cable bundles.
- Large finger spacing accommodates up to 48 Cat 6 / 6A cables.

- Optional "sure close" dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.
- Available in 7 foot version.

13.3 Equipment Cabinets

13.3.1 General

In large equipment rooms, data centers and areas requiring lockable equipment mounting, SANTA CRUZ CITY SCHOOL DISTRICT should use communications cabinets to house critical network equipment. These cabinets should be of two basic types depending on the equipment to be mounted.

13.3.2 Switch Cabinets

SANTA CRUZ CITY SCHOOL DISTRICT approved switch cabinets are Panduit "N-series" and should have the following properties:

- Welded and assembled steel frame construction.
- Easy maintenance powder coat finish.
- Adjustable rear equipment rails with infinite positioning
- Internal equipment space (max) 1070mm Cabinet – 995mm (39.1")
- Internal equipment space (max) 1200mm Cabinet – 1147mm (45.1")
- Doors include keyed swing handles.
- Split, hinged side panels.
- Dual hinge door for maximum accessibility between adjacent cabinets.
- Cabinet supplied with high density cable management fingers.
- Cable entry holes are equipped with plastic sealing plugs.
- Static Load of 1,364kg (3,000 lb.).
- Rolling Load of 1,136kg (2,500 lb.).
- Cabinet ships assembled, one per pallet
- Dynamic/Shock Pallet (1,250 & 2,000 lb.) ratings.
- Include hardware kit: #12-24 screws, or M6 screws and cage nuts.
- Labels minimum label 1” white on black should be placed on the outside of the door and on inside door.

13.3.3 Server Cabinets

SANTA CRUZ CITY SCHOOL DISTRICT approved server cabinets are Panduit "S-series" and should have the following properties:

- Welded and assembled steel frame construction.
- Easy maintenance powder coat finish.
- Adjustable front and rear equipment rails with infinite positioning.
- Doors include keyed swing handles.
- Side panels include keyed quarter-turn latches.
- Large cable entry/cable access.
- Cabinet supplied with standard density cable management fingers.
- Cable entry holes are equipped with plastic sealing plugs.
- UL Listed Static Load of 1,364kg (3,000 lb.).
- UL Listed Rolling Load of 1,136kg (2,500 lb.).
- Cabinet ships assembled, one per pallet.
- Dynamic/Shock Pallet (1,250 and 2,000 lb.) ratings.
- S-Type Cabinets include hardware kit: M6 screws, and cage nuts.
- Casters are pre-installed.

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14 Copper Patch Panels and Cords

14.1 General

- Mini-Com® Modular Patch Panels should be designed with snap in four position and six position molded faceplate frames.
- The patch panels shall be modular accepting all Mini-Com® modules.
- Patch Panel Jack Color Standards:

Blue	Data 1
Orange	Data 2
White	VOIP
Yellow	WAP
Red	AV

- The faceplate frames should be releasable from the front to provide access to the modules and terminated cable. Modules should be mounted to the patch panel using Mini-Com® mounting features for added strength.
- Patch panels should be available with and without labels.

- Angled patch panels that allow cable to flow to each side of the rack eliminating the need for horizontal cable managers should be used on all SANTA CRUZ CITY SCHOOL DISTRICT telecommunications rooms having the depth to mount them.
- All patch panels should allow for a labeling scheme and port identification to be visible at all times.
- Refer to Appendix A - Materials at the end of this document for part numbers.

14.2 Single Data Cable Patch Panel Example



14.3 Two Data Cable Patch Panel Example



14.4 Patch Cord Details

- Modular patch cords should be Panduit Category 6 / 6A.
- Patch cords should be Panduit factory terminated with modular plugs featuring a tangle-free latch design and clear strain-relief boots to support easy moves, adds and changes.
- Each Panduit patch cord should be 100% performance tested at the factory to the appropriate ANSI/TIA 568 C.2 cable standard.
- The Panduit patch cords should come in standard lengths of 3', 5', 7', 10', 14', and 20'.
- Panduit patch cords should be labeled according to the labeling section in this document.

14.4.1 Panduit Cord Color Standards

SANTA CRUZ CITY SCHOOL DISTRICT patch cord color coding is as follows:

- Red – Network backbone Router to Switch.
- Green – Serial connections & other telecommunications equipment.
- Blue – Patch Panel to Switch.
- Blue – Computer to work station jack.

*For patch cord part numbers see Appendix A - Materials at the end of this document.

**Check project documentation for other color conventions that may be used on that

installation.

15 Fiber Patching and Fiber Jumpers

15.1 Fiber Enclosures

SANTA CRUZ CITY SCHOOL DISTRICT approved fiber enclosures are Panduit FRME type. All fiber terminations should be contained in these rack mount enclosures built to that purpose and having the following properties:

- Mount to standard 19" or 23" EIA rack or cabinet • Hold QuickNet ™ or Opticom ® Fiber Adapter Panels.
- Have front and rear access on all models via durable molded-hinge doors.
- Have integral bend radius control and cable management for fiber patch cords.
- Have multiple trunk cable entry locations.
- Include fiber optic cable routing kit (grommets, cable ties, saddle clips, strain relief bracket, and ID/caution labels) for various cable management solutions.

15.1.1 SINGLEMODE FIBER ADAPTER PANELS

Singlemode fiber adapter panels should be LC with 8 ports per FAP and meet the following:

- LC FAP loaded with eight LC duplex singlemode fiber optic adapters (Blue).
- Have zirconia ceramic split sleeves.
- Panduit Part number FAP8WBUDLCZ.

15.1.2 FIBER PATCH CORDS

Single-mode fiber patch cords should be manufactured by Panduit and meet the following conditions:

- Be terminated in duplex LC connections.
- Be available in both singlemode.
- Available in riser (OFNR) or plenum (OFNP) flame ratings.
- Be 100% pre-tested for insertion and return loss.
- Support speeds up to 10 Gb/s for link lengths up to 300 (OM3) meters with an 850nm source per IEEE 802.3ae 10 GbE standard.
- Pass all TIA/EIA-568-B.3 performance requirements.
- LC and SC connector housing and boot colors follow TIA/EIA-568-C.3 suggested color identification scheme.
- Typical insertion loss per connection: 0.25dB for singlemode.

See Appendix A - Materials for fiber jumper part numbers.

16 Cable Pathways

16.1 Overhead Metallic Pathways

Overhead metallic pathways should be Panduit Wyr-Grid and have the following properties:

- Be available four widths: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm).
- Incorporate non-integral snap-on sidewalls to minimize specification requirements and be offered in three different heights: 2" (50mm), 4" (102mm), and 6" (152mm).
- Utilize splice connectors have an integral bonding screw that creates a mechanical-electrical bond between cable tray pathway sections.
- Have bend radius control waterfalls in two different configurations that attach to all pathway sections 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm).
- Have available a full complement of support brackets that are offered in various widths to accommodate pathways: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm).
- Incorporate integral quick-clip retention to accommodate 1/2" or 12 mm threaded rod.

16.2 Overhead Fiber Pathways

Overhead non-metallic fiber pathways should be Panduit FiberRunner and have the following properties:

- Be comprised of fittings, channel, couplers and brackets designed to segregate, route, and protect fiber optic and high performance copper cabling.
- Be available in sizes 24x4, 12x4, 6x4, 4x4, and 2x2.
- Have hinged channel cover and split fitting covers for 12x4, 6x4, and 4x4 systems protect cabling and provide easy access for future cabling revisions and additions.
- Feature QuikLock ™ assembly features that have built-in bend radius control and that eliminates or minimizes the need for tools to assemble the system.
- QuikLock ™ Couplers and Brackets require less than
- Have available multiple spillout options to provide versatility in making transitions to various equipment and rack configurations.

- Be part of an integrated system compatible with Panduit ® Fiber-Duct ™ 4x4 and 2x2 Routing Systems, CabRunner®, and Wyr-Grid ® Overhead Routing Systems, cable management and racks.

17 Substitution Policy

17.1 General

Any Contractor wishing to offer structured cabling products or associated hardware other than those specified should submit a request for product substitution in writing no less than one week in advance of bid.

- Written requests for substitution should be accompanied by all drawings, specification sheets and engineering documents, as well as third party laboratory performance test results proving equivalency in transmission performance and mechanical function.
- This written documentation should be accompanied by three (3) each samples of the substitution product being offered for evaluation by SANTA CRUZ CITY SCHOOL DISTRICT.
- Equal product acceptance must be received from SANTA CRUZ CITY SCHOOL DISTRICT in writing.
- Contractor shall be responsible for and assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs should include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.
- All requests for substitution must be submitted in writing and approved by SANTA CRUZ CITY SCHOOL DISTRICT

18 Communications Structured Grounding

18.1 General

Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.

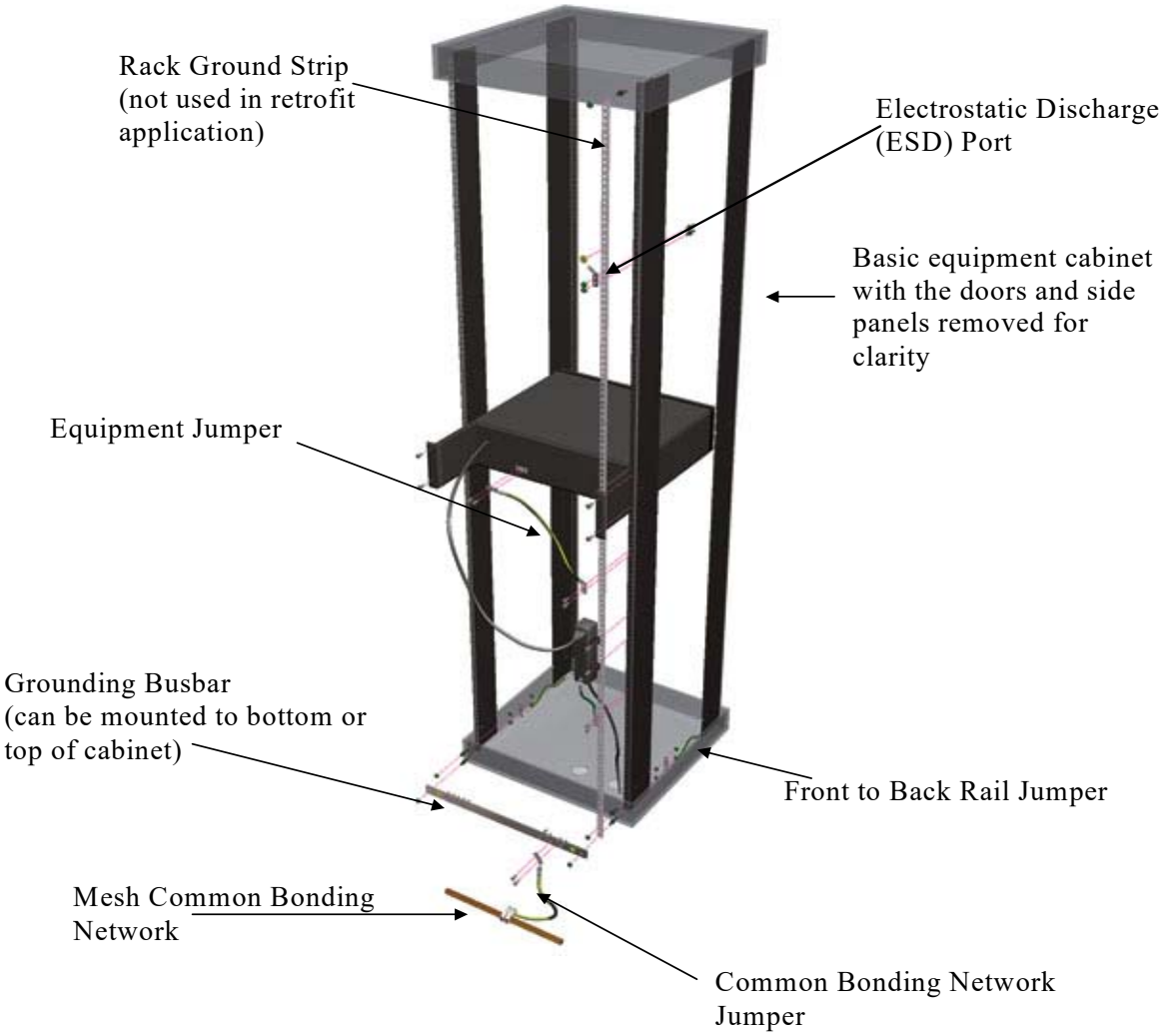
18.2 Details

- All newly installed racks and cabinets should have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
- Smaller equipment without an integrated grounding pad should be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

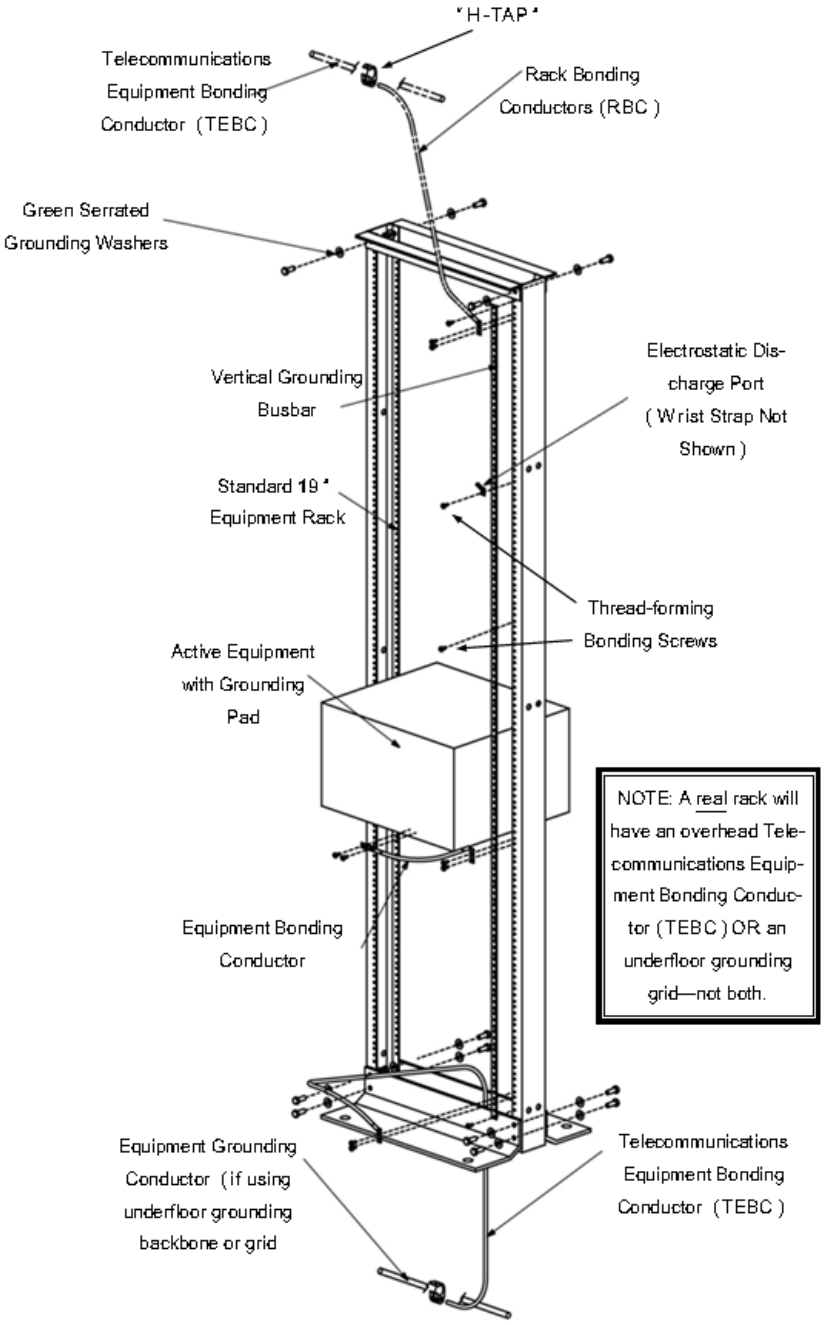
- Larger equipment (chassis switches) with a designated grounding terminal should be bonded to the vertical busbar with and EBC (equipment bonding conductor) kit built to that purpose.
- Contractor should take care to clean (wire brush, scotch brite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
- All bonding lugs on racks and busbars should be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and should be removed and replaced at Contractor's expense.
- Every rack or cabinet should have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
- Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
- A minimum of every other rack or cabinet should be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps should be provided on front and back to be accessible and able to reach any active equipment needing servicing.
- Armored cables should be properly bonded to the earthing system with a kit built to that purpose.

For examples of rack and cabinet grounding refer to the illustrations below:

Properly Bonded Cabinet


Rack Ground Strip
(not used in retrofit
application)
Electrostatic Discharge
(ESD) Port
Basic equipment cabinet
with the doors and side
panels removed for
clarity
Equipment Jumper
Grounding Busbar
(can be mounted to bottom or
top of cabinet)
Front to Back Rail Jumper
Mesh Common Bonding
Network
Common Bonding Network
Jumper

Properly Bonded Two-post Rack



For complete list of bonding materials see "Appendix I - Materials" at the end of this document.

19 Communications Labeling

19.1 General

Within SANTA CRUZ CITY SCHOOL DISTRICT, each location has adopted local naming conventions for communications circuit designation and labeling. For exact instructions of how one project will be designated, consult the attached project specifications for that job.

19.2 Universal Guidelines

The following are general labeling guidelines that will apply to all facilities:

- When making additions to legacy systems, Contractor should adopt the circuit designation and labeling strategy of the existing systems unless instructed otherwise in project documentation.
- In new installations, Contractor should develop and submit for approval a labeling strategy based on the TIA 606-B Circuit Designation and Labeling Standard.
- This labeling scheme should, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.
- The labeling system should designate the cable origin and destination with a unique identifier for the cable within the system.
- Racks and patch panels should be labeled to identify the location within the cable system infrastructure.
- All labeling information should be recorded on the as-built drawings and all test documents should reflect the appropriate labeling scheme.
- All label printing will be machine generated by either hand-held labeling systems or computer generated using programs and materials built specifically for communications labeling.
- Hand written labels will not be accepted and must be remedied at Contractors expense.
- Such labels should utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.
- Cable labels should be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.
- Outlet, patch panel and wiring block labels should be installed on, or in, the space provided on the device.
- Machine-generated labels should be installed behind the clear lens or cover on any device that provides such an option.

- All Bays should be labeled with Bay Designation at the end of Bay on side of cabinet.
- All cabinets should be labeled on outside door and on the inside so identification can be made when door is open.
- Labeling information will be supplied to the Communications Contractor by the SANTA CRUZ CITY SCHOOL DISTRICT Telecommunications Engineer in the project documentation.
- All labels will be permanently affixed to cables, patch panels, racks, cabinets, and enclosures.
- Labels should be legible and placed in a position that insures ease or visibility. Label type must be as listed in Appendix A - Materials.
- Conduit should be marked indicating the identification of the cable within.
- Backbone cabling should be labeled on each end designating the cable identification, FROM (origin), and TO (destination).

For a complete listing of communications labeling products see Appendix A – Materials.

20 Testing and Documentation

20.1 General

- Contractor should test all cables and termination hardware for defects in installation and to verify cabling system performance prior to system acceptance.
- Testing should be done in accordance with this document, the ANSI/TIA Standards, the Pan/Gen Certification Plus System Warranty guidelines and best industry practice.
- If any of these are in conflict, the Contractor should bring any discrepancies to the attention of SANTA CRUZ CITY SCHOOL DISTRICT Project Manager for clarification and resolution.
- Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks should be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
- Contractor is responsible for supplying all of the required test equipment used to conduct acceptance tests.
- SANTA CRUZ CITY SCHOOL DISTRICT reserves the right to be present during any or all of testing.
- All cabling not tested strictly in accordance with these procedures should be re-tested at no cost to SANTA CRUZ CITY SCHOOL DISTRICT.

20.1.1 COPPER TESTING

- All twisted-pair copper cable links should be tested in compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for Category 6 & 6A compliance using a test unit meeting a minimum IEC level of accuracy.
- All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
- Contractor should set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.

20.1.2 FIBER TESTING

- All installed fiber should be tested for link-loss in accordance with ANSI/TIA 568-C.0 and should be within limits specified within ANSI/TIA 568-C.3
- For horizontal cabling system using multimode optical fiber, attenuation should be measured in one direction at either 850 nanometer (nm) or 1300 nm using a light source and power meter.
- Backbone multimode fiber cabling should be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for single mode) in both directions.
- Test set-up and performance should be conducted in accordance with ANSI/568-C.0 Standard, Method B.
- Attenuation testing should be performed with a stable launch condition using two-meter reference grade fiber test leads (jumpers) to attach the test equipment to the cable plant.
- The light source should be left in place after calibration and the power meter moved to the far end to take measurements.
- Contractor should use reference grade fiber test leads built and sold specifically for fiber testing. Testing performed with standard fiber jumpers will not be accepted.
- Where links are combined to complete a circuit between devices, the Contractor should test each link from end to end to ensure the performance of the system. Only basic link loss testing is required.
- The values for calculating acceptable loss should be those defined in the ANSI/TIA 568-C.3 Standard.
- SANTA CRUZ CITY SCHOOL DISTRICT reserves the right to conduct, using Communications Contractor equipment and labor, a random re-test of up to five (5) percent of the cable plant to confirm documented results.
- Random re-testing, if performed, should be at the expense of SANTA CRUZ CITY SCHOOL DISTRICT, using standard labor rates. Any failing cabling should be re-tested and restored to a passing condition.

- In the event more than two (2) percent of the cable plant fails during a re-test, the entire cable plant should be re-tested and restored to a passing condition at no additional cost to SANTA CRUZ CITY SCHOOL DISTRICT.

20.2 Documentation

- Test reports may be submitted in hardcopy or electronic format. Hand-written test reports are not acceptable.
- Invoice will not be paid until final test results and as-built drawing(s) are received.
- Hardcopy reports are to be submitted in labeled 3 ring binders and signed off by the Communications Contractor's Project Manager, verifying passing execution of all tests. For large installations electronic reports with hardcopy summaries are preferred.
- Hardcopy summary reports should contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.
- Electronic documentation should be submitted in tester native format (not Excel). This is inclusive of all test results and draft as-built drawings.
- Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings should be submitted within 30 working days of the completion of each testing phase.
- At the request of SANTA CRUZ CITY SCHOOL DISTRICT, the telecommunications Contractor should provide additional copies of the original test results.
- The all report media should be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year).
- Test results should include the date of testing, a record of test frequencies (or wavelengths), cable type, conductor pair (or fiber strand if fiber) and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s).
- The test equipment name, manufacturer, model number, serial number, software version and last calibration date should also be provided at the end of the document.
- Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
- The test document should further detail the test method used and the specific settings of the equipment during the test.
- When repairs and re-tests are performed, the problem found and corrective action taken should be noted, and both the failed and passed test data should be documented.

- The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document should identify outlet locations.
- Numbering, icons, and drawing conventions used should be consistent throughout all documentation provided. SANTA CRUZ CITY SCHOOL DISTRICT will provide floor plans in paper and electronic (DWG, AutoCAD) formats to which as-built construction information can be added.
- The Contractor should annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form

20.3 Final Inspection and Acceptance

- Final project walk-though will occur within 7 working days of testing completion. The Contractor will have up to 7 days to correct any “punch item” issues identified during the walk down.
- Once all work has been completed, test documentation has been submitted, and the SANTA CRUZ CITY SCHOOL DISTRICT Project Manager is satisfied that all work is in accordance with the Scope of Work documents, SANTA CRUZ CITY SCHOOL DISTRICT should notify the Communications Contractor in writing of formal acceptance of the system.
- The Project Manager completes the Cabling Certification Signoff form, obtains the signatures and uploads it to the Cabling Test and Signoff Documents folder on SharePoint.
- Following completion and/or compliance with the requirements listed above, SANTA CRUZ CITY SCHOOL DISTRICT will issue a Notice of Completion confirming that the project is complete. A 45 day Acceptance Period will begin immediately following the issuance of the Notice of Completion.
- During this Acceptance Period, the wiring system is to be up and operational. If there is a major system failure, the Acceptance Period will begin once the problem is resolved and the system is back up and running.
- The Acceptance Period is considered to be outside the warranty period. Once the Acceptance Period has passed, the Warranty will begin.
- Major system failures are defined as any event which deleteriously impacts 25% or more of the users in any one telecommunications closet.
- Failures, both major and minor, will be reported to the Communications Contractor by phone or fax, followed by written communications describing the problem, time and date of the occurrence, etc.
- Major failures should be responded to by the Communications Contractor personnel within four hours. Minor failures should be responded to at SANTA CRUZ CITY SCHOOL DISTRICT’s discretion or within one business day.

20.4 Panduit® CERTIFICATION PLUS™ System Warranty

- A **CERTIFICATION PLUS** System Warranty shall provide a complete system warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include cable and connectivity components and have one point of contact for all cabling system issues. The system shall be warranted for a period of 25 years.
- The Certification Plus Warranty may be applied only if the cabling channel links are comprised of Panduit connectivity and cable.
- Upon acceptance of Warranty, Panduit will mail a notification letter to the installer and a notification letter and warranty certificate to SANTA CRUZ CITY SCHOOL DISTRICT.

20.5 Contractor Warranty Commitments

- Installation firm must be a current certified Panduit ONE Partner in good standing and should include a copy of the company Panduit ONE Partner certification with the bid.
- Contractor should name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training and according to all Standards cited in the Regulatory References section of this document.
- Contractor liaison should have a current, up-to-date Panduit ONE Partner Certified Technician (PCT) certificate in both copper and fiber. Copies of the copper and fiber certificates of the Panduit liaison should be submitted with the bid.
- Contractor agrees all components comprising active links should be of the same copper Category or fiber OM designation as the system being installed. Contractor should under no circumstances mix different Categories or OM classes of cable or termination devices (connectors) within the same link or system.
- Contractor should install all racking and support structures according to cited TIA Standards in such fashion as to maintain both Standards and Manufacturer recommendations for uniform support and protection, segregation of different cable types, maintenance of maximum pulling tensions, minimum bend radius, approved termination methods as well as adhering to industry accepted practices of good workmanship.
- Contractor is responsible for understanding and submitting to Panduit all documents required prior to project start to apply for this warranty. These include but are not limited to the project information form and SCS warranty agreement.

- Contractor is responsible for understanding and submitting to Panduit all documents required at project end. These include completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested.
- Test results should be delivered in the tester native format (not Excel) and represent the full test report. Summaries should not be accepted. Contact Panduit for a current list of approved testers, test leads and latest operating systems.
- The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to SANTA CRUZ CITY SCHOOL DISTRICT for the entire warranty period. The warranty period should commence following the acceptance of the project by SANTA CRUZ CITY SCHOOL DISTRICT and written confirmation of Warranty from Panduit.

21 Contractor Qualifications

The following guidelines must be adhered to when work is bid to outside Contractors.

21.1 General

- Contactor should be a current Panduit Certified Installer. A copy of corporate certificate must be included with quote.
- At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate to install Panduit Copper Distribution Systems.
- At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate to install Fiber Distribution Systems.
- Contractor should employ at least one BICSI Registered Communication Distribution Designer (RCDD). A copy of the RCDD certificate must be attached to the proposal.
- Contractor should design and provide all materials in order to install a complete structure cabling solution supporting voice and data. Only one Contractor (no subs) should be responsible for providing a complete and functional infrastructure including the procurement of products, installation of cabling infrastructure, pathways and spaces, bonding and grounding, fire stopping, verification of performance, and documentation.
- Contractor must possess a valid C-7 California State Contractor’s license. This license must have been issued 2-years prior to the date of the bid.
- Contactor must have been in telecommunications business for a period of at least 2 years. Contractor must submit at least 3 project references (of similar size and scope to this project).
- This installation must provide a 25-year extended warranty on the UTP cabling solutions by Panduit and General Cable. The extended warranty should include (but not limited to), product, performance, and application guarantees.

- Contractor should visit the work site before their proposal will be accepted. No allowances should be made to the Contractor for any extra expense, due to failure or neglect to discover unforeseen conditions affecting the work.
- Contractor employees should act in a professional manner, and be dressed appropriately for the task. No person should bring alcoholic beverages, controlled substances, firearms, or animals to the job site.
- Contractor should clear the work area every evening. If available space exists, Contractor equipment and materials may be stored at the facility with approval of SANTA CRUZ CITY SCHOOL DISTRICT. All packing material should be disposed of at the end of each day. SANTA CRUZ CITY SCHOOL DISTRICT will not be responsible for the loss, theft, or damage of any equipment or material.
- Contractor should follow the security policies and procedures defined by SANTA CRUZ CITY SCHOOL DISTRICT. This may include providing key access, creating access badges, and escorts for restricted areas.
- Contractor should take all precautions necessary to protect existing structures and furniture. Any items that are damaged during the course of the work should be repaired or replaced by the Contractor at no cost to SANTA CRUZ CITY SCHOOL DISTRICT.
- SANTA CRUZ CITY SCHOOL DISTRICT will provide the Contractor with reasonable access to the job site Monday-Friday 8-5 (Federal / State holidays excluded). SANTA CRUZ CITY SCHOOL DISTRICT must approve any work that requires access outside of these parameters.
- Contractor will provide a high-level project plan. This project plan should identify the tasks, timelines, and a completion date. Any changes to the schedule will be emailed to SANTA CRUZ CITY SCHOOL DISTRICT weekly. Attached files can be formatted in Adobe Acrobat.
- Contractor should assign a Project Manager. The Project Manager should email a weekly update status report to the project team members. A central off-hours emergency contact number should also be available for evenings and weekends.
- Contractor should take special precautions to ensure a safe work environment for the employees, contractors, and visitors.
- Contractor will make a reasonable effort to not be disruptive to other Contractors, or working staff at the job site.
- Contractor will install only material that is new and undamaged. Refurbished or used material is not acceptable.
- Contractor will dispose of all removed copper cable in a SANTA CRUZ CITY SCHOOL DISTRICT recycling bin designated for “copper” (located at most SANTA CRUZ CITY SCHOOL DISTRICT Service Centers) or recycled at a licensed recycling facility. If a non-SANTA CRUZ CITY SCHOOL DISTRICT recycling site is used then Contractor will provide SANTA CRUZ CITY SCHOOL DISTRICT with the official recycling receipt providing the recycler’s name, address, phone number, weight of copper recycled and the amount paid. The money received for removed cable will either be applied as a credit to the project or refunded to SANTA CRUZ CITY SCHOOL DISTRICT in the form of a check.

- SANTA CRUZ CITY SCHOOL DISTRICT expects the workmanship to be of high quality. All equipment should be plumb and true with the structure. All materials should be firmly secured in place, adequately supported, and permanent.
- Install and coordinate this work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner accepted by the General Contractor/Engineer.
- All repairs or changes required in the work of the Contractor, caused by his/her neglect, should be made by the Contractor at his own expense.
- The locations of ladder racks and other equipment indicated on the drawings or the specification are approximately correct and are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed. Detailed information is to be discussed and agreed upon by the Contractor, or Contractor's representative, and SANTA CRUZ CITY SCHOOL DISTRICT Engineer and/or Project Manager.
- Exercise particular caution with respect to the location of cable termination frames, and have precise and definite locations accepted by SANTA CRUZ CITY SCHOOL DISTRICT/Engineer before proceeding with the installation.
- Keep all items protected before and after installation. Clean up all debris daily
- If in the event the Contractor and SANTA CRUZ CITY SCHOOL DISTRICT disagree technically during the execution of this project, both parties agree to be bound by the decision of a 3rd party. This person should be an RCDD in good standing with BICSI. He/she should be retained by SANTA CRUZ CITY SCHOOL DISTRICT, and should not be an employee. A decision will be provided within 2-business days.
- SANTA CRUZ CITY SCHOOL DISTRICT will consider the project complete when all work has been completed when all stipulations in the Testing and Acceptance section of this document have been satisfied and signed-off on.
- Contractor agrees to replace or repair within 2 business days, any defective work or materials identified by SANTA CRUZ CITY SCHOOL DISTRICT within 12 months of final payment.

22 SANTA CRUZ CITY SCHOOL DISTRICT / PanGen Certificated Contractors

23 Bid Guidelines

23.1 General

The presentation of the cost to do the work described in this specification should be broken out with the following headings and information. The bid specification will allow for up to a +/- 10% variance to the total cable counts before a change order and/or scope revision is required.

23.2 Labor

- Labor costs to install, terminate and test all vertical and/or horizontal cabling specified by the project scope document.

23.3 Prevailing Wage

- Contractor will be performing work normally performed by IBEW represented SANTA CRUZ CITY SCHOOL DISTRICT employees. To meet SANTA CRUZ CITY SCHOOL DISTRICT contractual requirements in the IBEW Physical contract, Contractor should pay wages to the Contractor employees which meets or exceed prevailing wages. Prevailing wages should be as defined by California Labor Code Part 7, Chapter 1, Article 2 Section 1770, 1773, and 1773.1.

23.4 Material

- Contractor should provide unit cost details, including materials list, for the project including an addendum for changes or additions to the original job scope.
- Total project cost with the following cost breakdowns:
- Total material costs with detailed material list with all parts and estimated quantities identified
- Total labor costs with estimated man-hours for project completion
- Cost per additional station with one Cat6 cable pulled to the station 100 feet from the communications room.

Appendix A. Materials Lists

Part Number / GBE P/N	Description
7131900 / xxxxxxxxxxx	Example of Manufacture's P/N and Graybar's P/N

COPPER CONNECTIVITY

Part Number	Description
7131900/25054167	GenSpeed 6000E Enhanced Category 6E U/UTP Copper Cable, CMP, Blue
7141819/ 26029173	

CJ6X88TGxx-/ **25002033 blue** **25012348 ivory** **25002036 green** **25002015 int'l gray** **25002004 int'l white** **25001979 orange** **25002010 white** **25002031 yellow** **25012347 brown** **25002061 violet** **25002000 red**	Mini-Com TX6A UTP Jack Module Graybar part number varies depending on color
CJ688TGxx/ **25046157 black** **25042005 blue** **25046152 electrical ivory** **25046160 green** **25046156 int'l gray** **25046151 int'l white** **25046158 orange** **25046159 red** **25046162 violet** **25046161 yellow** **25046153 white**	Mini-Com TX6 UTP Jack Module Graybar part number varies depending on color
FP6X88MTG/ 25962349	TX6A™ Category 6A UTP Field-Term RJ45 Plug
CJUDCAPBU/ 25887410	Cat. 6A Up / Down 45° Angle Caps
CJLRCAPBU/ 25887409	Cat. 6A Left / Right 45° Angle Caps
CJUDCAPIW/26035590	Cat. 6 Up / Down 45° Angle Caps
CJLRCAPIW/ 25889262	Cat. 6 Left / Right 45° Angle Caps
DPA246X88TGY/25067749	24-port, angled, Category 6A, patch panel with 24 RJ45, 8-position, 8-wire ports
DPA486X88TGY/25067780	48-port, angled, Category 6A, patch panel with 48 RJ45, 8-position, 8-wire ports
DPA24688TGY/25067746	24-port, angled, Category 6, patch panel with 24 RJ45, 8-position, 8-wire ports
DPA48688TGY/25067778	48-port, angled, Category 6, patch panel with 48 RJ45, 8-position, 8-wire ports
DP12688TGY/ 25067727	12-port, Category 6, patch panel with twelve RJ45, 8-position, 8-wire ports. Mounts to 89D wall mount bracket.

DP246X88TGY/ 25067729	24-port, Category 6A, patch panel with 24 RJ45, 8-position, 8-wire ports
DP486X88TGY/ 25067741	48-port, Category 6A, patch panel with 48 RJ45, 8-position, 8-wire ports
DP24688TGY/ 25067598	24-port, Category 6, patch panel with 24 RJ45, 8-position, 8-wire ports
DP48688TGY/ 25067599	48-port, Category 6, patch panel with 48 RJ45, 8-position, 8-wire ports
UTP28X*xx/ COMMONLY USED BY SANTA CRUZ CITY SCHOOL DISTRICT **25704179 10 ft blue** **25841472 8 in blue**	Category 6A/Class E, UTP, small diameter patch cords should be constructed of 28 AWG, unshielded, twisted pair, stranded copper cable with high performance modular plugs. * = length xx = color
UTP28SP*xx/ COMMONLY USED BY SANTA CRUZ CITY SCHOOL DISTRICT **25456946 3 FT BLUE** **25456950 5 FT BLUE** **25460091 7 FT BLUE** **25456957 10 FT BLUE** **25628023 8 INCH BLUE**	Category 6/Class E, UTP, small diameter patch cords should be constructed of 28 AWG, unshielded, twisted pair, stranded copper cable with high performance modular plugs. * = length xx = color
CJS6X88TGY/ 25069741	Category 6A, RJ45, 8-position, 8-wire universal shielded module with integral shield
CJS688TGY/ 25069777	Category 6, RJ45, 8-position, 8-wire universal shielded module with integral shield
UICMPPA24BLY/ 25097240	24-port angled patch panel with six UICPPL4BL Mini-Com® Ultimate ID® Faceplates
UICMPPA48BLY/ 25076107	48-port angled patch panel with six UICPPL4BL Mini-Com® Ultimate ID® Faceplates
UICMPP24BLY/ 25093173	24-port patch panel with six UICPPL4BL Mini-Com®Ultimate ID® Faceplates
UICMPP48BLY/25093174	48-port patch panel with twelve UICPPL4BL Mini-Com® Ultimate ID® Faceplates
UZPRBU*/ COMMONLY USED BY SANTA CRUZ CITY SCHOOL DISTRICT **25814457 20 FT** **25814735 50 FT** **25814456 100 FT**	Category 6A UTP, solid, riser cable with TX6 PLUS Modular Plugs on each end for Hand Off Cables * = length
UPRBU*/COMMONLY USED BY SANTA CRUZ CITY SCHOOL DISTRICT **25925374 10 FT** **25925375 15 FT** **25925376 20 FT** **25814775 45 FT** **25809396 50 FT** **25628493 70 FT**	Category 6 UTP, solid, riser cable with TX6 PLUS Modular Plugs on each end for Hand Off Cables * = length

25814776 75 FT **25628494 80 FT** **25809397 100 FT** **25814273 120 FT** **25814274 140 FT** **25814275 160 FT** **25814276 180 FT** **25814277 200 FT**	
SRBWCY/25096141	Strain relief bar with integrated adjustable clips; supports, manages, and provides proper bend radius protection for up to 24 cables.
CFPL4IWxxY/ 25085862	4 Port Single gang, vertical faceplate accepts four Mini-Com® Modules
CBXJ2IW-A/96012760	Mini-Com® 2-port surface mount box accepts up to two Mini-Com® Modules. Includes built-in removable blank to add a second module.
CBXC4IW-A/ 98415468	Mini-Com® surface mount box accepts four Mini-Com® Modules
CMBxx-X/ **96045475 BL** **96012780 EI** **96045474 IG** **96018238 IW** **96018273 WH**	Mini-Com® 1-port blank module, reserves space for future use xx = color
*	*For lengths 1 to 20 feet (increments of one foot), and 25, 30, 35, 40, 45, 50 feet, change the length designation in the part number to the desired length.
xx	To designate color, add suffix IW (Off White), replace IW suffix with EI (Electric Ivory), IG (International Gray), AW (Arctic White), BL (Black), BU (Blue), RD (Red),YL(Yellow), GR (Green), OR (Orange), or VL (Violet). BL (Black), BU (Blue),RD (Red), YL (Yellow), GR (Green), or OR (Orange

FIBER CONNECTIVITY

Part Number	Description
BE0121ANU-ILPA/25406763	General Cable Indoor / Outdoor 12 strand tight buffer Multimode 50/125um / OM3 distribution interlock armored plenum cable.
BE0241ANU-ILPA/25474185	General Cable Indoor / Outdoor 24 strand tight buffer Multimode 50/125um / OM3 distribution interlock armored plenum cable.
BE0481ANU-ILPA/26035515	General Cable Indoor / Outdoor 48 strand tight buffer Multimode 50/125um / OM3 distribution interlock armored plenum cable.
AP0121ANU-ILPA/25691598	General Cable Singlemode 9/125um Indoor / Outdoor 48 strand tight buffer Multimode 50/125um / OM3 distribution interlock armored plenum cable.
AP0241ANU-ILPA/25691598	General Cable Singlemode 9/125um Indoor / Outdoor 48 strand tight buffer Si/125um / OM3 distribution interlock armored plenum cable.
AP0481ANU-ILPA/26035516	General Cable Singlemode 9/125um Indoor / Outdoor 48 strand tight buffer Multimode 50/125um / OM3 distribution interlock armored plenum cable.

	DESCRIPTION
FRME1U/ 25190397	Rack Mount Enclosure 1 RU, Holds up to three FAP or FMP adapter panels or FOSM splice modules. Bidirectional sliding drawers provides front and rear access to fibers. Dimensions: 1.74"H x 17.00"W x 14.20"D (44.0mm x 432.0mm x 361.0mm)
FRME2U/25190398	Rack Mount Fiber Enclosure 2 RU, Holds up to six FAP or FMP adapter panels or FOSM splice modules. Bidirectional sliding drawers provides front and rear access to fibers. Dimensions: 3.48"H x 17.00"W x 14.20"D (88.0mm x 432.0mm x 361.0mm)
FRME4/ 22049098	Rack Mount Fiber Enclosure 4 RU, Holds up to 12 FAP or FMP adapter panels or FOSM splice modules. Provides front and rear access to fibers. Dimensions: 7”H x 17"W x 12"D
FWME4/ 22052266	Opticom Wall Mount Fiber Enclosure. Good for containing Fan-out transitions from outdoor loose-tube cable to indoor-type tight-buffered cable. Holds up to four QuickNet™ Cassettes, FAP, or FMP panels. Dimensions: 16.11"W x 12.25"H x 3.52"D. (409.2mm x 311.0mm x 89.4mm). For sizes holding 2 or 8 adapter panel, replace "4" in part number with 2 or 8.
FAPB/ 96090620	Blank fiber adapter panel for filling space in fiber enclosures for future use.
FWME4/ 22052266	Opti-com wall mount fiber enclosure. Holds up to four QuickNet™ Cassettes, FAP, or FMP panels. Dimensions: 16.11"W x 12.25"H x 3.52"D (409.2mm x 311.0mm x 89.4mm). For containing outdoor/indoor fiber fan-out transitions in entrance facilities.
FAP8WBUDLCZ/ 25117157	LC FAP loaded with eight LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.
F92ERQ1Q1SNMxxx **25700215 1 mtr** **25700216 2 mtr** **25700218 3 mtr** **25700219 4 mtr** **25700186 5 mtr** **25700187 6 mtr** **25815250 7 mtr** **25815251 8 mtr** **25815252 9 mtr** **25815253 10 mtr** **25813599 15 mtr** **25813604 20 mtr** **25813609 25 mtr** **25813610 30 mtr**	LC to LC Push-Pull singlemode duplex patch cord, 1.6mm jacketed cable (one duplex LC connector on each end) – 9/125µm. 1 meter length. Patch cords are available in 1 – 10 meter lengths in 1 meter increments, and 15, 20, 25 and 30 meter lengths. For other lengths, replace the "1" in part number with desired length.
FLCDSCBUY/ 25126957	LC OptiCam® Singlemode Duplex Fiber Optic Connector for 900µm tight-buffered fiber installation, or for use with fan-out kits when transitioning outdoor loose-tube to inside type tight buffered cable.

FCE1U/25180696	Holds up to four QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules.
FCE2U/ 25180697	Holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules.
FCE4U/ 25180698	Holds up to twelve QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules.
F9TRP5N5NANFxxx/COMMONLY USED BY SANTA CRUZ CITY SCHOOL DISTRICT **26006914 3 ft** **25682389 4 ft** **25867026 15 ft** **25925514 20 ft** **25638411 25 ft** **25813624 30 ft** **25813625 35 ft** **25511489 40 ft** **25511496 45 ft** **25842778 50 ft**	QuckNet Singlemode Female MTP* to female MTP* twelve strand fiber optic cable assembly (one female MTP* connector on each end on ribbon interconnect cable) 9/125µm. X = For lengths 1 to 20 feet (increments of one foot), and 25, 30, 35, 40, 45, 50 feet, change the length designation in the part number to the desired length.

RACKS, CABINETS AND CABLE MANAGERS

Part Number	Description
R2P/ 25367212	19" EIA rack, aluminum. Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
PRV8/ 22120406	Vertical cable manager, includes four PRSP7 slack spools. Dimensions: 83.9"H x 8.0"W x 16.4"D (2131mm x 203mm x 417mm)
PRD8/ 22120404	Vertical Dual Hinge, 8" wide Door
R2PPEVWF/ 25643482	Waterfall Trough for 2 Post Rack and PatchRunner ™ High Capacity Vertical Cable Managers. Use on top each 2 post rack for high interbay pathway.
CMUT19/ 22024499	Cable Management Cable Trough. Placed at bottom of racks for lower interbay pathway. Not needed end of row.
NMF4/ 25117090	Horizontal Cable Manager High Capacity Front Only 4 Rack Units. Place in middle of racks for mid-level interbay pathway. Not needed on end of row unless shown on elevations.
NM2/ 25117084	Horizontal Cable Manager High Capacity Front and Rear 2 rack spaces.
EWMW242825/ 25231633	Hoffman 24” High AcessPlus II Double-Hinge Wall Mount Cabinet with Window Door / 12 Rack Units
EWMW362825/ 25231634	Hoffman 36” High AcessPlus II Double-Hinge Wall Mount Cabinet with Window Door / 19Rack Units
EWMW482825/ 25231635	Hoffman 48” High AcessPlus II Double-Hinge Wall Mount Cabinet with Window

	Door / 29 Rack Units
E19SWM12U20/ 22078154	Hoffman 25” High Swing-Out Wall Mount Rack / 12 Rack Units
E19SWM20U20/ 22078155	Hoffman 40” High Swing-Out Wall Mount Rack / 20 Rack Units
E19SWM25U20/ 22078156	Hoffman 48” High Swing-Out Wall Mount Rack / 25 Rack Units
E19SWM32U20/ 22078157	Hoffman 60” High Swing-Out Wall Mount Rack / 32 Rack Units

PATHWAYS AND CABLE

Part Number	Description
Fiber Duct	Panduit 4X4" and 6X4"FiberRunner fiber channel. Mounts alongside ladder rack. See Panduit website or catalog for fittings and mounting hardware.
LD5EI8-A/ 96095857	LD5 Raceway - 8 foot sections - for surface mounting work area cable where concealed routing not possible only. Priced per foot
LD10EI8-A/ 97112731	LD10 Raceway - 8 foot sections - for surface mounting work area cable where concealed routing not possible only. Priced per foot
PLT2S-C702Y/ 25057008	Red (Maroon) plenum cable ties for use in ceiling spaces - 7.4"
PLT3S-C702Y/ 25057013	Red (Maroon) plenum cable ties for use in ceiling spaces - 11.6"
HLS-75R6/ 99713840	75 foot continuous roll ***blue*** hook and loop ties - to be used on cable bundles in telecom rooms
EZ Path Series 22/ 22119963	Low cable volumes
EZ Path Series 33/ 22073693	Moderate cable
EZ Path Series 44+/ 25834670	High cable volume

BONDING AND GROUNDING

Part Number	Description
LCC series	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.
HTCT series	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
CLRCVR series	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.
RGS134-1Y/ 25068985	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm)thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGS134B-1/ 25097460	Grounding strip for newly installed racks or cabinets with cage nut rails: 78.70" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker, three cage nut bonding studs, eight #12-24 bonding nuts and three strip clips.

RGCBNJ660P22/ 25106267	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* **for connecting to a #6 to #2 awg sized bonding backbone**.
RGCBNJ660PY/ 25068971	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP*** for connecting to a #2 awg to 250 kcmil bonding backbone.**
GJ672UH/ 25439348	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.
RGESD2-1/ 25113364	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGESDWS/ 25180699	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap.
RGTBSG-C	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).
CNB4K/ 25280034	Green bonding cage nut, includes 4 #12-24 bonding cage nuts (.06 – .11 thick panel) and 4 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket). Ideal for patch panel applications and bonding smaller equipment not equipped with a built-in grounding terminal.
CNBK/ 25308360	Green bonding cage nut, includes 50 #12-24 bonding cage nuts (.06 – .11 thick panel) and 50 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket).
RGW-100-1Y/ 25068987	100 paint piercing bonding washers for 3/8" (M8) stud size; .875" (22.2mm) O.D.; provided with .16 oz. (5cc) of antioxidant. NOTE: Panduit racks come supplied with these. This is needed to construct non-Panduit racks.
RGEJ1024PHY/ 25068973	24" long pre-terminated equipment grounding jumper#10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.
RGEJ1036PFY/ 25068974	36" long pre-terminated equipment grounding jumper#10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.
GB2B0514TPI-1/ 25236094	Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.
GB4B1028TPI-1/ 25264500	Wall mounted telecommunications busbar suitable for larger telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 24" in size.
ACGK/ 25237871	Armored cable grounding kit. Contains one grounding terminal for #6 AWG grounding conductor, and one #10 mechanical clamp for cable diameters in 9/16" – 1 1/16" diameter range.
ACG24K-500/ 25466854	#6 AWG (16mm2) jumper for armored cable diameter 0.85" (21.3mm) to 1.03" (26.2mm); 24" (609.6mm) length; factory terminated on one end with LCC6

	two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
ACG24K/ 25229665	#6 AWG (16mm2) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
LTYK/ 25079191	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.

LABELS & LABELING EQUPIMENT

Part Number	Description
PROG-EM2GO/ 25238993	Easy-Mark Labeling Software for PC, supplied on USB Flash Drive.
LS8EQ-KIT-ACS/ 25361785	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual.
C195X040Y1J/ 25027048	Faceplate label for use with Easy-Mark labeling software and laser printer.
C261X035Y1J/ 25027049	Faceplate label for use with Easy-Mark labeling software and laser printer - horizontal sloped faceplates.
C195X040Y1C/25063582	Faceplate label for use with PanTher LS8E hand-held printer
C261X035Y1J/ 25027049	Component Labels for Mini-Com® Modular Faceplate Patch Panels for use with Easy-Mark software and laser printer.
C261X035Y1C/ 25101088	Component Labels for Mini-Com® Modular Faceplate Patch Panels for use with PanTher LS8E hand-held printer.
S100X150YAJ/ 25025305	Self-laminating cable labels for Category 6A cable for use with Easy-Mark software and laser printer. DUPLICATE OR CORRECT PART NUMBER?
S100X150YAJ/25025305	Cable label for indoor non-armored 6 or 12 strand fiber cable. For use with Easy-Mark software and laser/inkjet printer. DUPLICATE OR CORRECT PART NUMBER?
S100X150VAC/ 25049372	Cable label for indoor non-armored 6 or 12 strand fiber cable. For use with PanTher™ LS8E Hand-Held Label Printer
S100X400YAJ/ 25115732	Cable label for 24 or 36 strand single-mode, armored inter-building fiber backbone. For use with Easy-Mark software and laser/inkjet printer.
S100X400VAC/ 25114243	Cable label for 24 or 36 strand single-mode, armored inter-building fiber backbone. For use with PanTher™ LS8E Hand-Held Label Printer
S100X150VAC/ 25049372	Self-laminating cable labels for Category 6A cable for use with PanTher LS8E hand-held printer.
S100X650YAJ/ 25115734	Label for indoor armored 12 and 24 str cable - for use with Easy-Mark software and laser printer.
S100X650VAC/ 25097651	Label for indoor armored 12 and 24 str cable - for use with PanTher LS8E handheld printer.
S100X400YAJ/ 25115732	Label for outdoor armored 24 str cable - for use with Easy-Mark software and laser printer.
S100X400VAC/ 25114243	Label for outdoor armored 24 str cable - for use with PanTher LS8E handheld printer.
S100X160YAJ / 25115710 and NWSLC-3Y/ 25061336	Laser printable fiber jumper self-laminating labels with rotating sleeve for FZE/FXE multimode and singlemode fiber jumpers

S100X160VAC/ 25114230 and NWSLC-3Y/ 25061336	Fiber jumper self-laminating labels with rotating sleeve for FZE/FXE multimode and singlemode fiber jumpers. For use with PanTher LS8E handheld printer.
S100X220YAJ/ 25115713 and NWSLC-7Y/ 25061338	Laser printable fiber jumper self-laminating labels with rotating sleeve for FZD/FXD jumpers.
S100X220VAC/ 25068362 and NWSLC-7Y/ 25061338	Fiber jumper self-laminating labels with rotating sleeve for FZD/FXD jumpers for PanTher LS8E handheld printer.
S100X150YAJ/ 25025305	Label for copper patch cords for use with laser printer.
S100X150VAC/ 25049372	Label for copper patch cords for use with PanTher hand-held labeler.
T100X000VPC-BK/ 25052263	1" high, continuous black on white, vinyl tape labels for labeling racks and cabinets with PanTher LS8E handheld labeler.
C400X100YJT/ 25080402	1" by 4" white, polyester label for labeling racks and cabinets that prints from laser printer using Easy-Mark software.

Appendix B. Bill of Materials

BoM Cabling template:

Appendix C. Definitions of Terms

Word or Phrase	Meaning
°C	degrees Celsius
°F	degrees Fahrenheit
A	Ampere
AC	Alternating Current
Access floor	A system consisting of completely removable and interchangeable floor panels that are supported on adjustable pedestals or stringers (or both) to allow access to the area beneath.
Access provider	The operator of any facility that is used to convey telecommunications signals to and from a customer premises.
ANSI	American National Standards Institute
AP	Access Provider
ASTM	American Society for Testing and Materials
ATIS	Alliance for Telecommunications Industry Solutions
AWG	American Wire Gauge
Backbone	A facility (e.g., pathway, cable or conductors) between any of the following spaces: telecommunications rooms, telecommunications enclosures, common telecommunications rooms, floor serving terminals, entrance facilities, equipment rooms, and common equipment rooms.
Backbone cable	See backbone.
BICSI	Building Industry Consulting Service International
Blended floor system	A combination of cellular floor units with raceway capability and other floor units with raceway capability, systematically arranged in a modular pattern.
BOCA	Building Officials and Code Administrators
BOMA	Building SANTA CRUZ CITY SCHOOL DISTRICTs Managers Association
Buried cable	A cable installed under the surface of the ground in such a manner that it cannot be removed without disturbing the soil.
Cabinet	A container that may enclose connection devices, terminations, apparatus, wiring, and equipment.
Campus	The buildings and grounds having legal contiguous interconnection.
CCITT	International Telegraph and Telephone Consultative Committee
Cell	A single raceway of a cellular or under floor duct system.
CER	common equipment room
Common telecommunications room	An enclosed space used for backbone interconnections for more than one tenant in a building, which may also house equipment.
Conduit	(1) A raceway of circular cross-section. (2) A structure containing one or more ducts. Editorial note - For the purposes of this Standard, the term conduit includes electrical metallic tubing (EMT) or electrical non-metallic tubing (ENT)
Consolidation point	A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
CTR	common telecommunications room
Customer premises equipment (CPE)	Telecommunications equipment located on the customer's premises.
dB	decibel
Demarcation point	A point where the operational control or ownership changes.
Direct-buried cable	A telecommunications cable designed to be installed under the

	surface of the earth, in direct contact with the soil.
Distribution duct	A raceway of rectangular cross-section placed within or just below the finished floor and used to extend the wires or cables to a specific work area.
Duct	(1) A single enclosed raceway for conductors or cables. See also conduit, raceway. (2) A single enclosed raceway for wires or cables usually used in soil or concrete. (3) An enclosure in which air is moved. Generally part of the HVAC system of a building.
EF	entrance facility
Elastomeric firestop	A firestopping material resembling rubber (See also firestopping).
Electromagnetic interference	Radiated or conducted electromagnetic energy that has an undesirable effect on electronic equipment or signal transmissions.
Embedded duct	A duct fully enclosed inside a floor or a wall.
EMT	electrical metallic tubing
Enclosure, telecommunications	A case or housing for telecommunications equipment, cable terminations, and cross-connect cabling.
End user	SANTA CRUZ CITY SCHOOL DISTRICT or user of the premises cabling system.
ENT	electrical nonmetallic tubing
Entrance facility (telecommunications)	An entrance to a building for both public and private network service cables (including wireless) including the entrance point of the building and continuing to the entrance room or space.
Entrance point (telecommunications)	The point of emergence for telecommunications cabling through an exterior wall, a floor, or from a conduit.
Entrance room or space (telecommunications)	A space in which the joining of inter or intra building telecommunications backbone facilities takes place. Editorial note - An entrance room may also serve as an equipment room.
EP	entrance point
Equipment room (telecommunications)	An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect.
False ceiling	See suspended ceiling.
FCC	Federal Communications Commission
Firestop system	A specific construction consisting of the material(s) (firestop penetration seals) that fill the opening in the wall or floor assembly and any items that penetrate the wall or floor, such as cables, cable trays, conduit, ducts, pipes, and any termination devices, such as electrical outlet boxes, along with their means of support.
Firestop	A fire-rated material, device, or assembly of parts installed in a penetration of a fire-rated barrier.
Floor slab	That part of a reinforced concrete floor which is carried on beams below.
ft.	feet, foot
Furniture cluster	A contiguous group of work areas, typically including space divisions, work surfaces, storage, and seating.
g	gram
grounding	The act of creating a ground.
Horizontal cabling	1) The cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. 2) The cabling between and including the building automation system outlet or the first mechanical termination of the horizontal connection point and the horizontal cross-connect. 3) in a data center, horizontal cabling

	is the cabling from the horizontal cross-connect (in the main distribution area or horizontal distribution area) to the outlet in the equipment distribution area or zone distribution area.
Horizontal connection point	A location for connections between horizontal cables that extend from building pathways and horizontal cables that extend to building automation systems devices and equipment.
HVAC	heating, ventilation and air conditioning
IDF	Intermediate Distribution Frame
IEEE	The Institute of Electrical and Electronics Engineers
in	inch
Infrastructure (telecommunications)	A collection of those telecommunications components, excluding equipment, which provide the basic support for the distribution of all information within a building or campus.
innerduct	A nonmetallic raceway, usually circular, placed within a larger raceway.
ISO	International Organization for Standardization
junction box	A location in the pathway system that allows transition of pathways and access to cables.
kg	kilogram
km	kilometer
m	meter
Multi-user telecommunications outlet assembly	A grouping in one location of several telecommunications outlet/connectors.
MUTOA	multi-user telecommunications outlet assembly
N	Newton
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NIST	National Institute for Standards and Technologies
Plenum cable	A cable with flammability and smoke characteristics that meets the safety requirements of the National Electrical Code® (NEC®) allowing it to be routed in a plenum area without being enclosed in a conduit.
Plenum	A designated area used for transport of environmental air as part of the air distribution system. Because it is part of the air distribution system, cables installed in this space require a higher fire rating.
Power Over Ethernet (PoE)	Power Over Ethernet. Usually referring to the IEEE 802.3af standard that provides a means to supply low voltage power to end equipment using network cable and devices.
Power Sum Attenuation-to-Crosstalk Ratio (PSACR)	The difference between attenuation and power sum crosstalk measured in dB at a given frequency. This difference is critical to ensure that the signal sent down the twisted-pair cable is stronger at the receiving end of the cable than any interference signals (crosstalk) from other cable pairs.
Power Sum Equal Level Far-End Crosstalk (PSELFEXT) Loss	A computation of the unwanted signal coupling from multiple transmitters at the near end into a pair measured at the far end and normalized to the received signal level.
Power Sum Near-End Crosstalk (PSNEXT) Loss	A computation of the unwanted signal coupling from multiple transmitters at the near end into a pair measured at the near end.
ppm	parts per million
Propagation delay	The time interval required for a signal to be transmitted from one

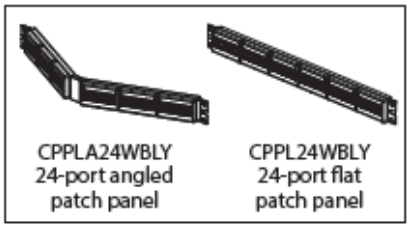
	end of the circuit to the other.
pull box	A housing located in a pathway run used to facilitate the placing of wire or cables.
PVC	polyvinyl chloride
Raceway	Any enclosed channel designed for holding wires or cables.
RoHS	Restriction of Hazardous Substances. This directive was adopted by the European Union in an effort to restrict hazardous materials in the manufacture of various types of electronic and electrical equipment.
RoIP	Radio over IP
Return loss	A ratio of the power of the outgoing signal to the power of the reflected signal, expressed in dB.
RF	radio frequency
Riser	Term applied to vertical sections of cable, such as changing from underground or direct-buried plant to aerial plant. Term also applies to the space used for cable access between floors.
Service entrance	See entrance facility (telecommunications).
Service provider	The operator of any service that furnishes telecommunications content (transmissions) delivered over access provider facilities.
Signal-to-Noise Ratio (SNR)	The ratio between the detected signal power and noise in a receiver, expressed in dB. The prime determining factor in bit error rate. See Bit Error Rate.
Sleeve	An opening, usually circular, through the wall, ceiling, or floor to allow the passage of cables.
Slot	An opening through a wall, floor, or ceiling, usually rectangular, to allow the passage of cables.
SP	service provider
Splice box	A box, located in a pathway run, intended to house a cable splice.
Splice closure	A device used to protect a splice
Structural Return loss	A measure of reflected energy of a transmitted signal due to impedance variations along the length of the cable, expressed in dB.
Suspended ceiling	A ceiling that creates an area or space between the ceiling material and the structure above.
TE	telecommunications enclosure
Telecommunications room	An enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling.
TIA	Telecommunications Industry Association
TLA	Three Letter Acronym
TR	telecommunications room
TS	telecommunications space
UL	Underwriters Laboratories Inc.
Underfloor raceway	A pathway placed within the floor and from which wires and cables emerge to a specific floor area.
Uninterruptible power supply	A buffer between utility power or other power source and a load that requires continuous precise power.
UPS	uninterruptible power supply
V	volt
Vac	volts alternating current
Vdc	volts direct current
Velocity of propagation	The speed of transmission along a cable relative to the speed of light in a vacuum.
Voice over IP (VoIP)	A term used in IP telephony for voice delivered using the Internet Protocol.

YABA	Yet Another Bloody Acronym
WEEE	Waste Electrical and Electronic Equipment Directive. A European Union directive that set collection, recycling and recovery targets for all types of electrical goods.
WiFi	WiFi is the trade name for the popular wireless technology used in home networks, mobile phones, video games and other electronic devices that require some form of wireless networking capability. In particular, it covers the various IEEE 802.11 technologies (including 802.11n, 802.11b, 802.11g, and 802.11a).
Wireless	The use of radiated electromagnetic energy (e.g., radio frequency and microwave signals, light) traveling through space to convey information.
Work area	A building space where the occupants interact with telecommunications terminal equipment.
Zone box	An enclosure used to house one or more of the following; a) a consolidation point, b) a horizontal connection point, c) building automation system outlets.

Appendix D.

Appendix E. Labeling a Patch Panel for Analog Gateway Wiring

Labeling a Patch Panel for Analog Gateway Wiring



CPPLA24WBLY
24-port angled
patch panel

CPPL24WBLY
24-port flat
patch panel

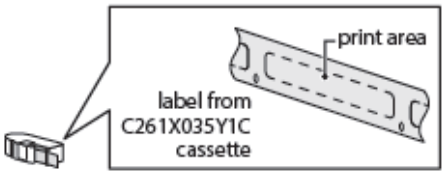
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.



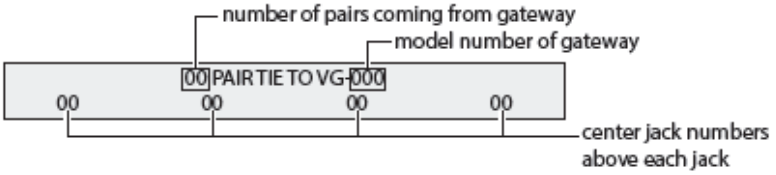
C261X035Y1C label cassette



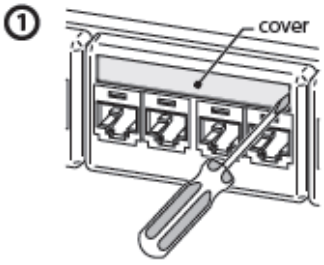
a small flathead screwdriver

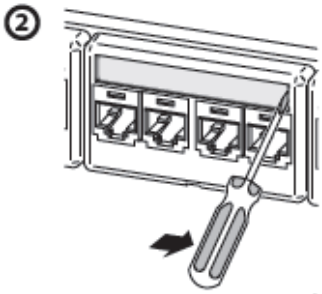
Making Labels

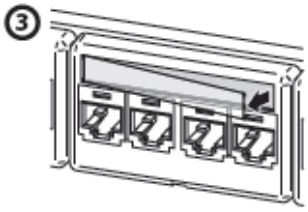
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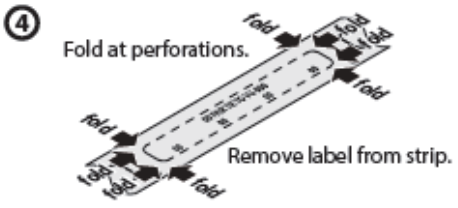


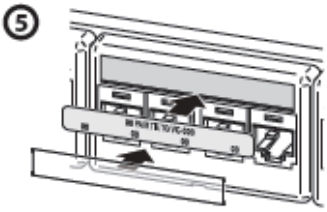
Applying Labels





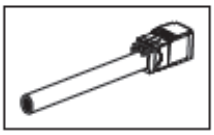






Revision 2014-03-19

Labeling a Copper Backbone Cable



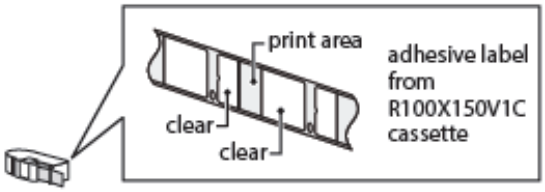
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

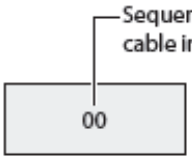
Only black on white labels are allowed.



R100X150V1C label cassette

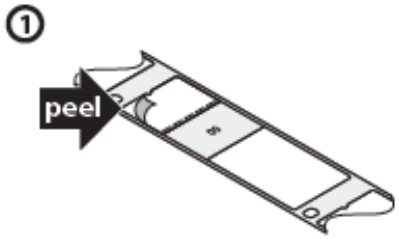
Making Labels

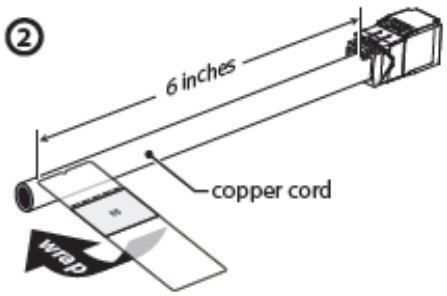
Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.

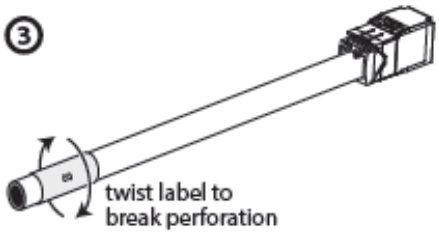


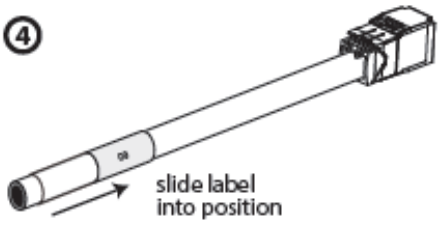
Print a label for each end of the cable.

Applying Labels



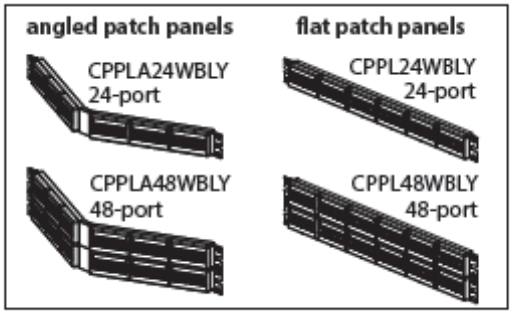






Revision 2014-03-13

Labeling a Patch Panel for Copper Backbone Cabling



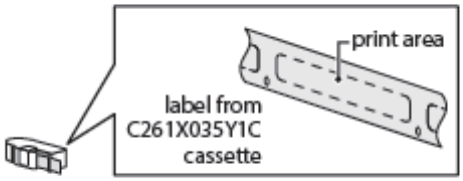
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.



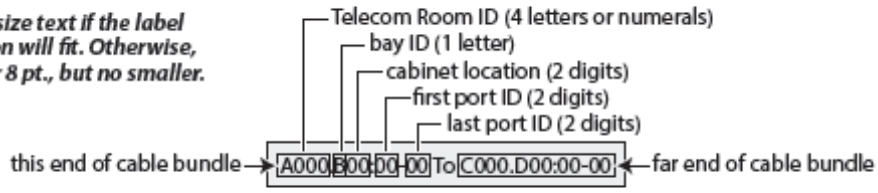
C261X035Y1C label cassette



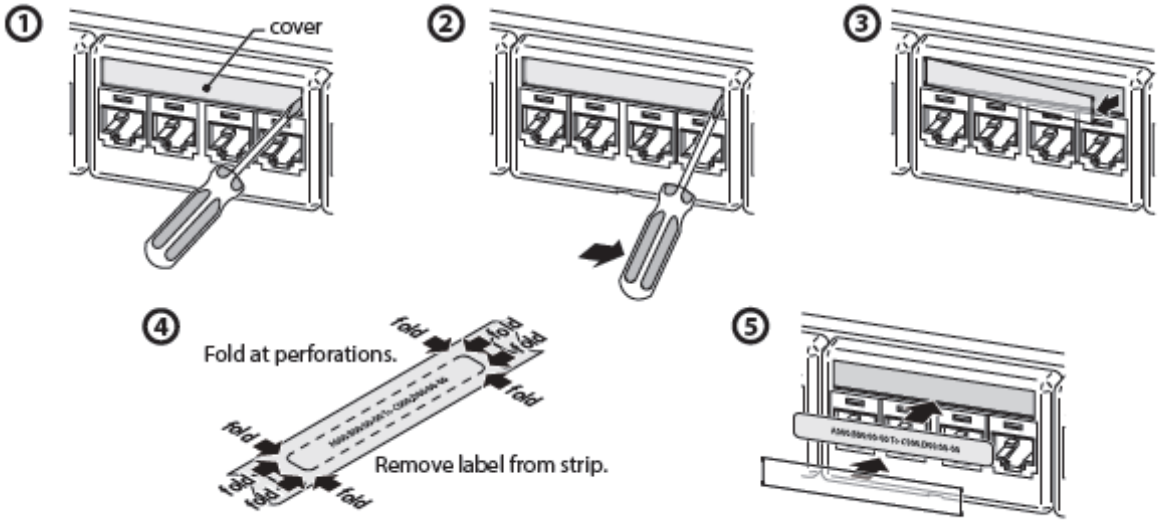
a small flathead screwdriver

Making Labels

Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.

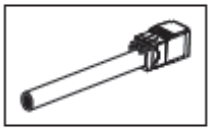


Applying Labels



Revision 2014-07-29

Labeling a Horizontal Cable



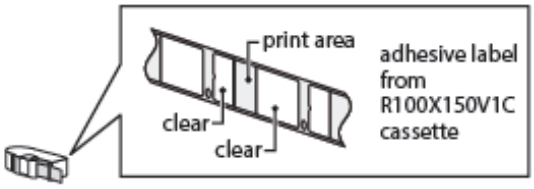
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.

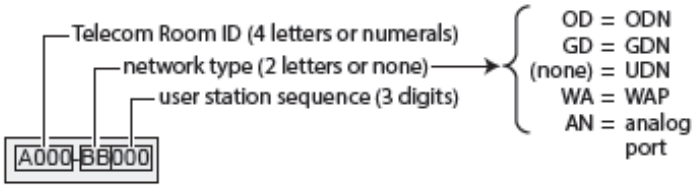


R100X150V1C label cassette

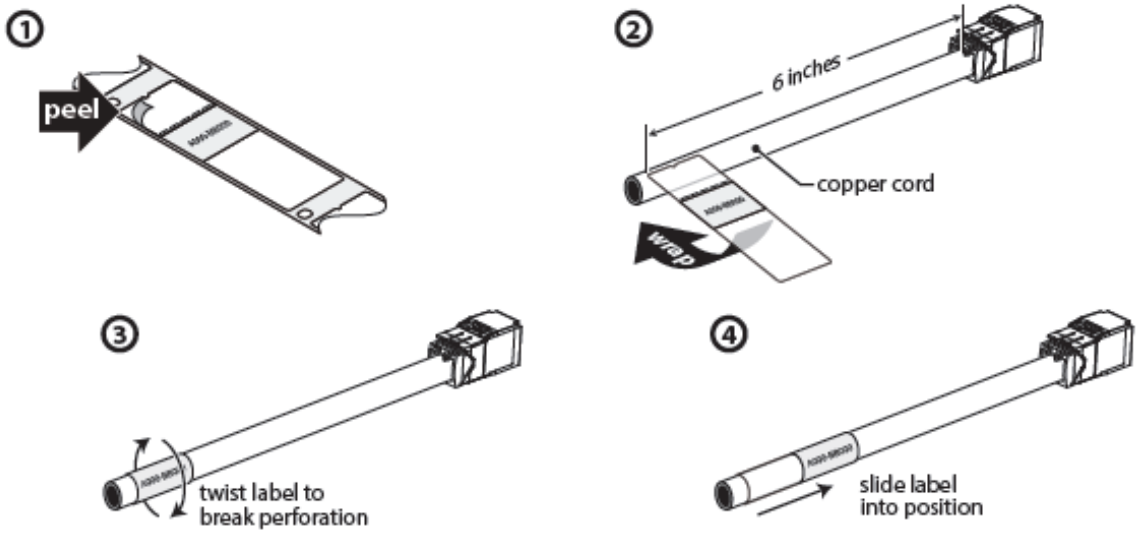
Making Labels

Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.

Print a label for each end of the cable.



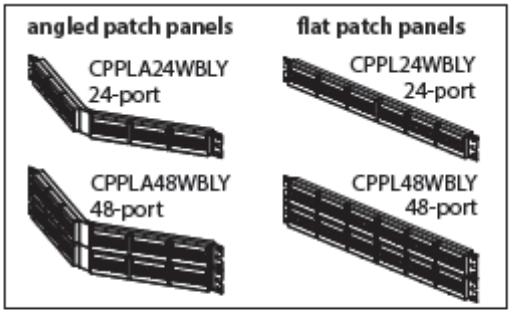
Applying Labels



Revision 2014-07-29

Appendix I. Labeling a Patch Panel for Horizontal Cabling

Labeling a Patch Panel for Horizontal Cabling



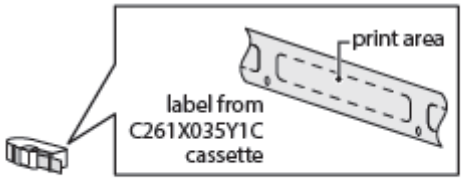
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.



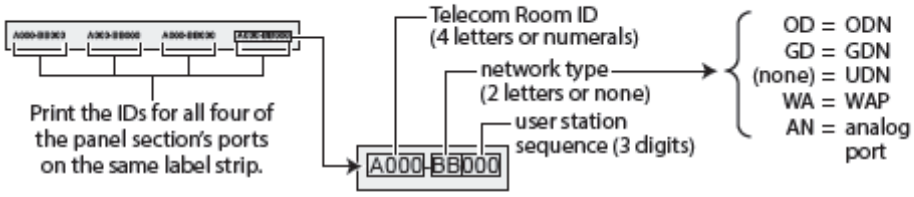
C261X035Y1C label cassette



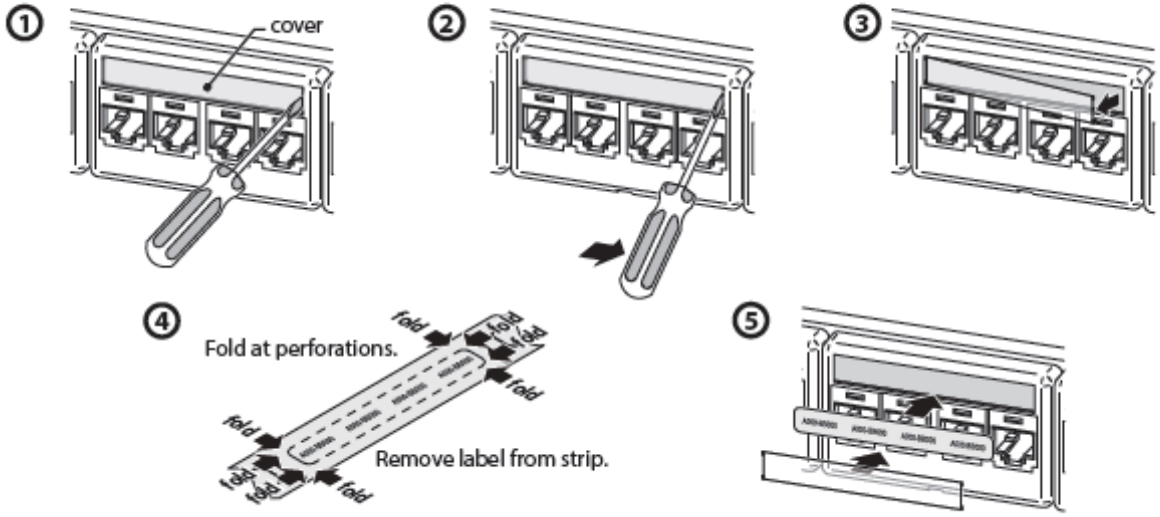
a small flathead screwdriver

Making Labels

Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.



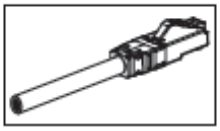
Applying Labels



Revision 2014-07-29

Appendix J. Labeling a Copper Patch Cord

Labeling a Copper Patch Cord



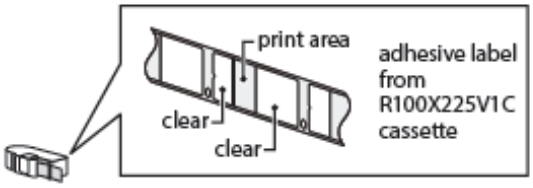
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.

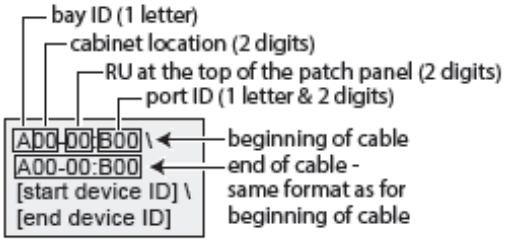


R100X225V1C label cassette

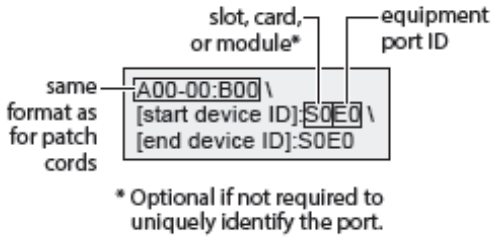
Making Labels

Print a label for each end of the cord.
Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.

For a Patch Cord



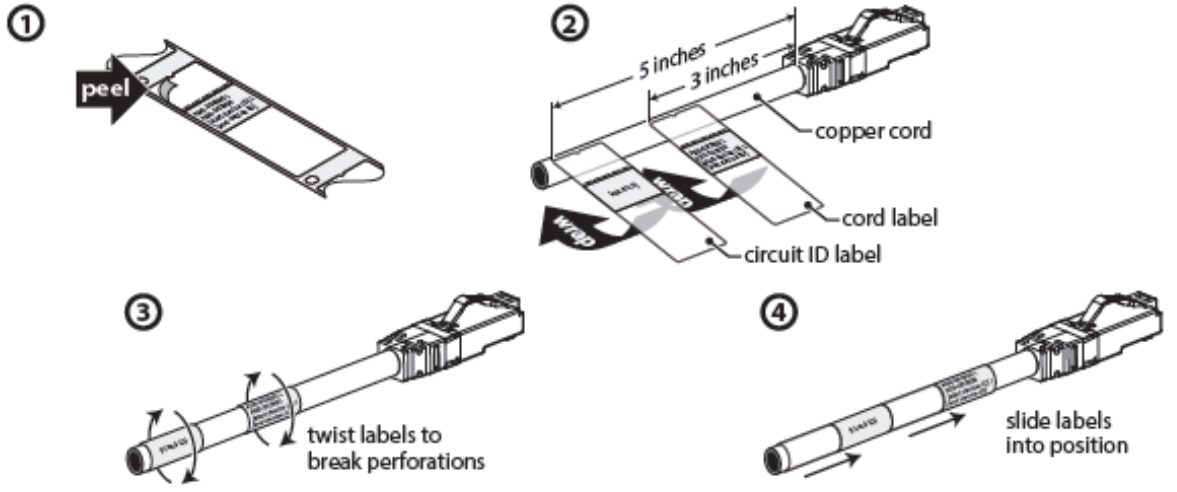
For an Equipment Cord



* Optional if not required to uniquely identify the port.

If there is a circuit ID, also print labels with the ID for each end of the cord.

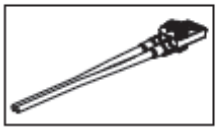
Applying Labels



Revision 2014-06-24

Appendix K. Labeling a Fiber Optic Patch Cord

Labeling a Fiber Optic Patch Cord



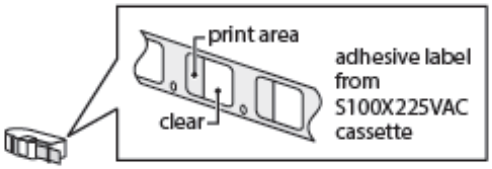
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

Only black on white labels are allowed.



S100X225VAC label cassette

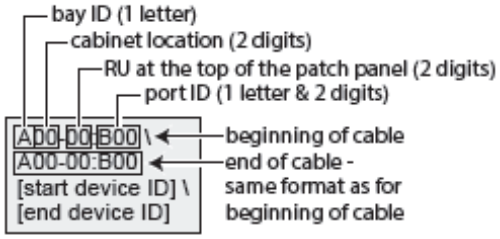


NWSLC-7 label cores

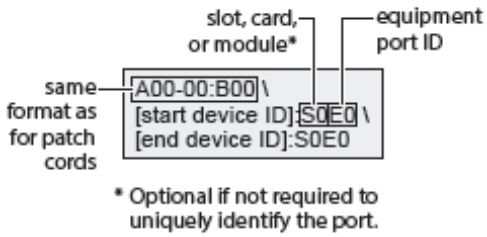
Making Labels

Print a label for each end of the cord.
Use 10 pt. size text if the label information will fit. Otherwise, use 9 pt. or 8 pt., but no smaller.

For a Patch Cord

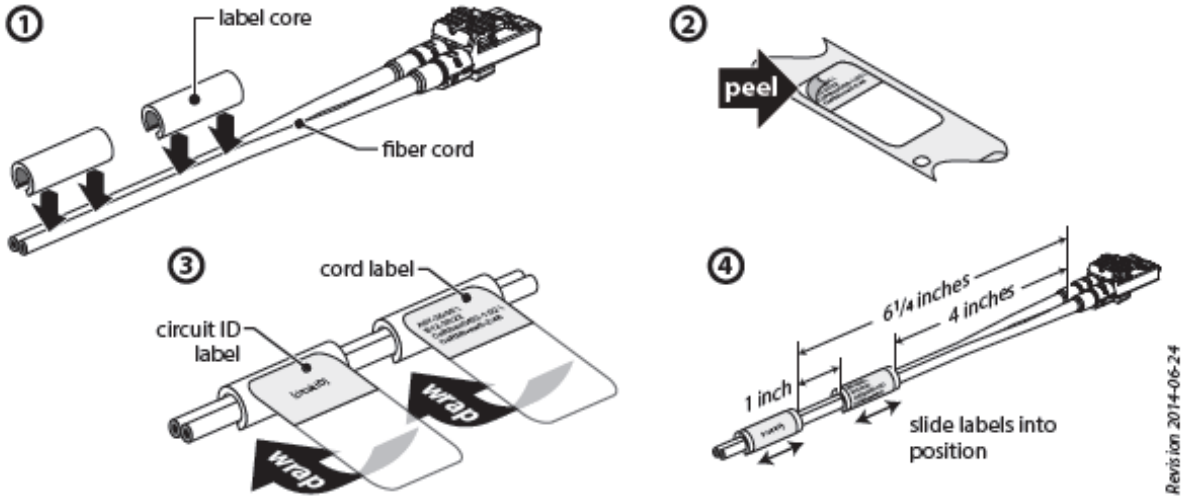


For an Equipment Cord



If there is a circuit ID, also print labels with the ID for each end of the cord.

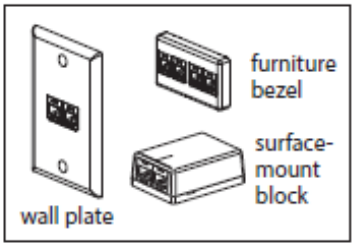
Applying Labels



Revision 2014-06-24

Labeling a GDN, WAP, or Analog Telecommunications Outlet

(See separate instructions for labeling ODN or UDN TOs.)



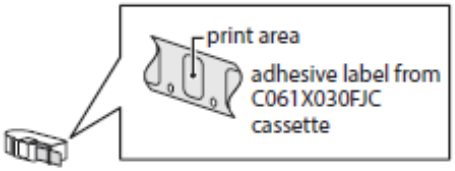
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

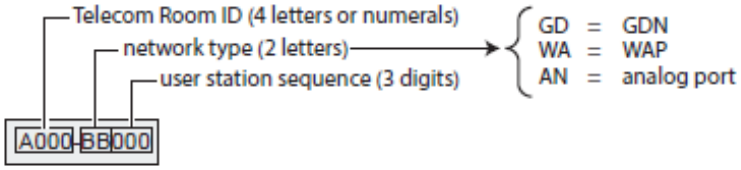
Only black on white labels are allowed.



C061X030FJC label cassette

Making Labels

Use 8 pt. size text.

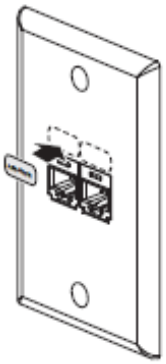


Applying Labels

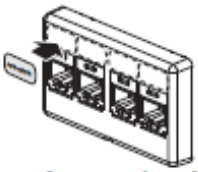
①



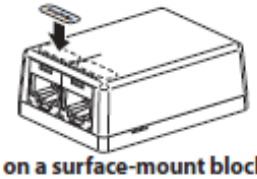
② ***Apply the label above the appropriate jack.***



on a wall plate



on a furniture bezel



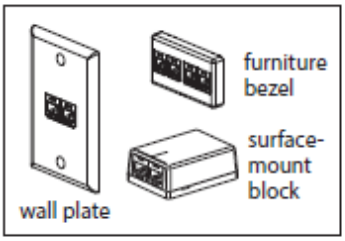
on a surface-mount block

Revision 2014-07-29

Appendix M. Labeling a UDN Telecommunications Outlet

Labeling a UDN Telecommunications Outlet

(See separate instructions for labeling ODN, GDN, WAP, or Analog TOs.)



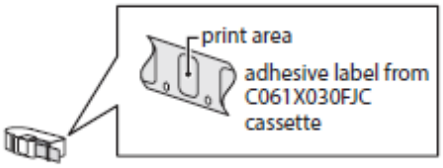
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

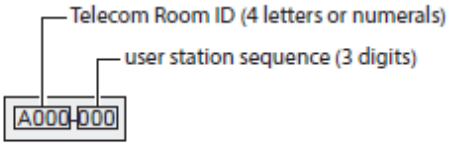
Only black on white labels are allowed.



C061X030FJC label cassette

Making Labels

Use 10 pt. size text.

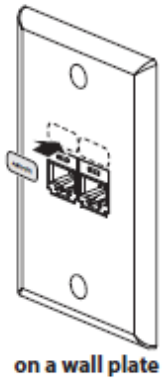


Applying Labels

①



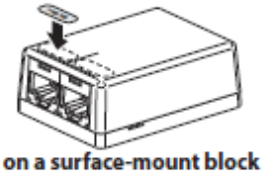
② ***Apply the label above the appropriate jack.***



on a wall plate



on a furniture bezel



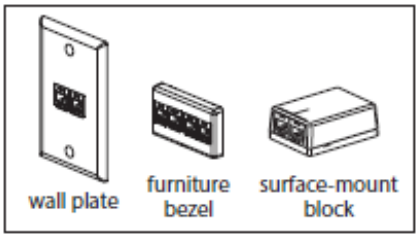
on a surface-mount block

Revision 2014-07-29

Appendix N. Labeling an ODN Telecommunications Outlet

Labeling an ODN Telecommunications Outlet

(See separate instructions for labeling UDN, GDN, WAP, or Analog TOs.)



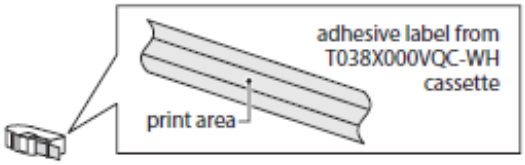
What You Will Need



For more information, see the instructions that come with the printer.

LS8EQ Hand-Held Thermal Transfer Printer

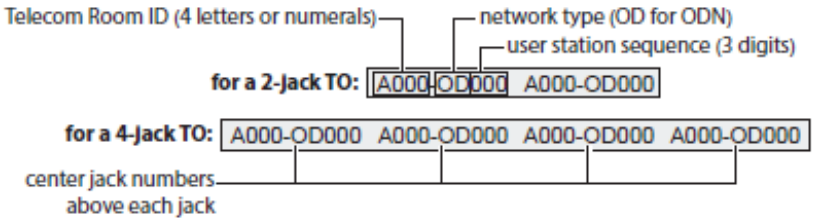
Only white on blue labels are allowed.



T038X000VQC-WH label cassette

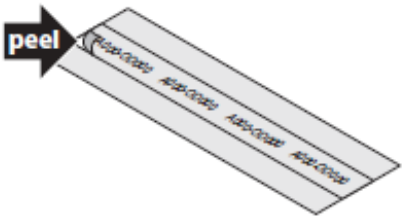
Making Labels

Use 8 pt. size text.

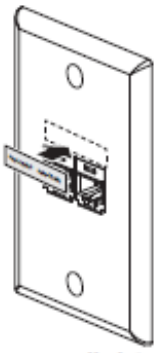


Applying Labels

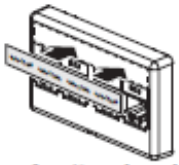
① peel



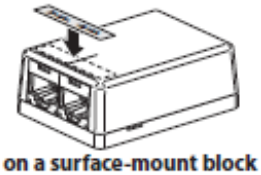
② ***Apply the label above the appropriate jack.***



on a wall plate



on a furniture bezel



on a surface-mount block

Revision 2014-07-29

Appendix A

Fire Alarm Cutsheets

Indoor Selectable-Output Speaker Strobes and Dual Voltage Evacuation Speakers for Ceiling Applications

System Sensor L-Series selectable-output speaker strobes and dual-voltage evacuation speakers can reduce ground faults and enable faster installation with lower current draw and modern aesthetics.



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 on ceiling units: 15, 30, 75, 95, 115, 150, and 177
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Rotary switch simplifies field selection of speaker voltage (25 and 70.7 Vrms) and power settings (¼, ½, 1 and 2 watts)
- Speakers offer high fidelity and high volume sound output
- 520 Hz +/- 10% square wave tone capable with compatible FACP
- Compatible with System Sensor synchronization protocol
- Electrical compatibility with existing SpectrAlert and SpectrAlert Advance products
- Tamper-resistant construction
- Updated modern aesthetics

Agency Listings

SIGNALING UL LISTED
S4048

FM APPROVED
FM approved except for ALERT models 3057493

7320-1653:0505

System Sensor L-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 7 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 still offering high volume sound output for use in high ambient noise applications.

L-Series makes installation easy

- Attach a universal mounting plate to a 4 × 4 × 2⅛ 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. Hinge 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.

L-Series Speaker and Speaker Strobe Specifications

Architectural/Engineering Specifications

General

L-Series speaker and speaker strobes shall mount to a 4 × 4 × 2 1/8-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, L-Series 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 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 and 33 volts. Indoor L-Series 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, 30, 75, 95, 115, 150, 177.

Speaker

The speaker shall be a System Sensor L-Series 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 L-Series 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 MDL3 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 11/16 × 4 11/16 × 2 1/8-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	**Diameter**	**Depth**
SPC Speaker	6.8 in, 173 mm	1.0 in, 25 mm
With Surface Mount Back Box	6.9 in, 176 mm	3.5 in, 89 mm
SPSC Speaker Strobe	6.8 in, 173 mm	2.8 in, 73 mm
With Surface Mount Back Box	6.9 in, 176 mm	5.37 in, 136 mm

*When using 12AWG, 14 AWG, or adding extra wires in the box, a deeper box or extension ring is recommended.

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 VDC or regulated 24 VDC/FWR [1,2]
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 MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Frequency Range	400 to 4,000 Hz[3]
Power	¼, ½, 1, 2 watts

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. Strobe products will operate at 12 V nominal only for 15 and 30 cd.
3. 520 Hz +/- 10% square wave tone capable with compatible FACP.

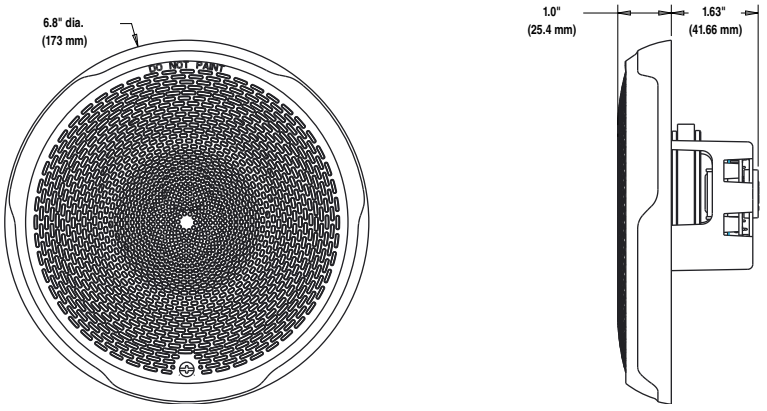
UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)			
	8 to 17.5 Volts	16 to 33 Volts	
Candela	DC	DC	FWR
15	87	41	60
30	153	63	86
75	NA	111	142
95	NA	134	164
115	NA	158	191
150	NA	189	228
177	NA	226	264

Ceiling-Mount Speaker Sound Output		
Setting	UL Reverberant (dBA @10 ft)	UL Anechoic (dBA @10 ft)
1/4 W	79	79
1/2 W	82	82
1 W	85	85
2 W	88	88

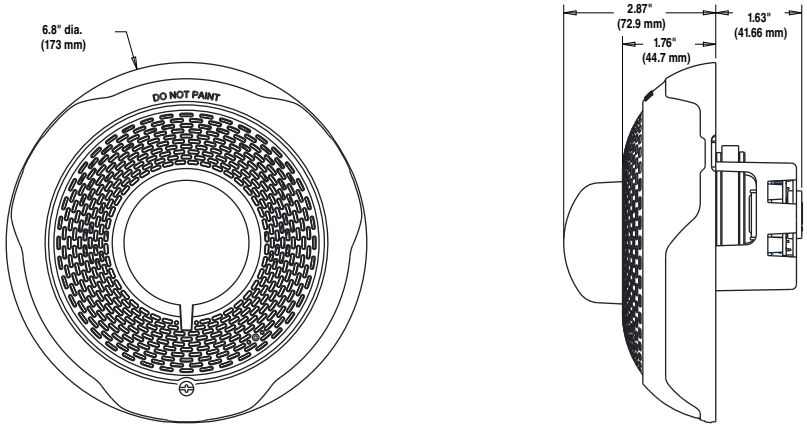
Ceiling-Mount Speaker Strobe Sound Output		
Setting	UL Reverberant (dBA @10 ft)	UL Anechoic (dBA @10 ft)
1/4 W	77	77
1/2 W	80	80
1 W	83	83
2 W	86	86

L-Series Dimensions



A0543-00

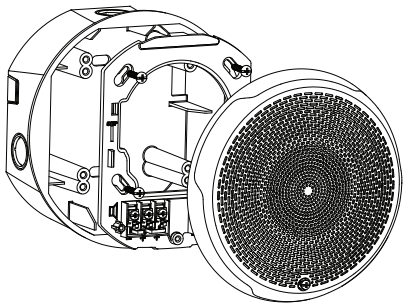
Ceiling Speaker



A0544-00

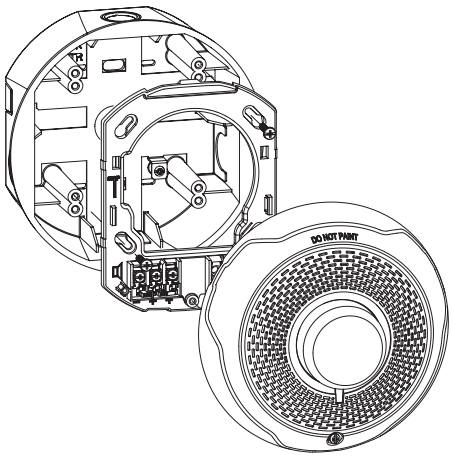
Ceiling Speaker Strobe

Surface Mounting



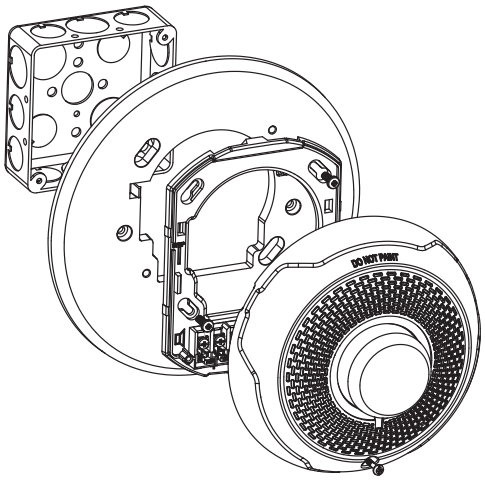
A0504-01

Ceiling Speaker with Surface Mount Back Box



A0520-01

Ceiling Speaker Strobe with Surface Mount Back Box



A0542-00

Ceiling Speaker Strobe with Trim Ring and 4" Square Electrical Box

L-Series Ordering Information

Ceiling Mount		
White	**Red**	**Description**
SPCWL	SPCRL	Speaker only
SPSCWL	SPSCRL	Speaker Strobe
SPSCWL-P	—	Plain, Speaker Strobe
SPSCWL-SP	—	Fuego, Speaker Strobe
SPSCWL-CLR-ALERT	—	Alert, Speaker Strobe, Clear Lens

Accessories		
White	**Red**	**Description**
SBBCWL	SBBCRL	Universal Ceiling Surface Mount Back Box
TRC-2W	TRC-2	Universal Ceiling Trim Ring

SYSTEM SENSOR®

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AVDS866-03 • 03/23/2018

NFS2-3030

Intelligent Addressable Fire Alarm System

NOTIFIER® by Honeywell

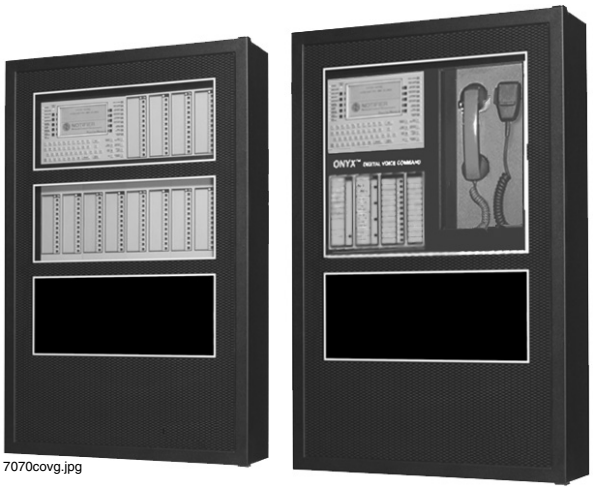
Intelligent Fire Alarm Control Panels

General

The NFS2-3030 is an intelligent Fire Alarm Control Panel (FACP) designed for medium- to large-scale facilities. Fire emergency detection and evacuation are extremely critical to life safety, and the NFS2-3030 is ideally suited for these applications. The NFS2-3030 is part of the ONYX® Series of products from NOTIFIER. The NFS2-3030 is ideal for virtually any application because it features a modular design that is configured per project requirements. With one to ten Signaling Line Circuits (SLCs), the NFS2-3030 supports up to 3,180 intelligent addressable devices.

Information is critical to fire evacuation personnel, and the NFS2-3030's large 640-character Liquid Crystal Display (LCD) presents vital information to operators concerning a fire situation, fire progression, and evacuation details.

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.



7070covg.jpg

NFS2-3030 (left)
and NFS2-3030 with DVC audio option (right)

Features

- Certified for seismic applications when used with the appropriate seismic mounting kit.
- Approved for Marine applications when a marine-listed version is used with marine-listed compatible equipment. *See DN-60688.*
- Complies with UL 2572 Mass Notification Systems (NFS2-3030 version 20 or higher).
- One to ten isolated intelligent Signaling Line Circuits (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/3,180 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.
- Large 16 line, 640 character LCD backlit display or use display-less as a network node.
- Network options:
  - High-speed network for up to 200 nodes (NFS2-3030, NFS2-640, NFS-320(C), NFS-320SYS, NCA-2, DVC-EM, ONYXWorks, 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, ONYXWorks, 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.
- Built-in Alarm, Trouble, Security, and Supervisory relays.
- VeriFire® Tools online/offline program option.
- With built-in Degraded Mode operation, the system is capable of general alarm if a fire alarm condition is present even if the central processing unit (CPU) fails.
- Weekly Occupancy Schedules allow changing sensitivity by time of day and day of week.
- EIA-485 annunciators, including custom graphics.
- History file with 4000-event capacity in nonvolatile memory, plus separate 1000-event alarm-only file.
- Advanced history filters allow sorting by event, time, date, or address.
- Alarm Verification selection per point, with automatic counter.
- Autoprogramming and Walk Test reports.
- Multiple central station communication options:
  - Standard UDACT
  - Internet
  - Internet/GSM
- Positive Alarm Sequence (PAS) Presignal.
- Silence Inhibit and Auto Silence timer options.
- Field-programmable on panel or on PC, with VeriFire Tools program, also check, compare.
- Non-alarm points for lower priority functions.
- Remote ACK/Signal Silence/System Reset/Drill via monitor modules.
- Up to 1000 powerful Boolean logic equations.
- Supports SCS Series smoke control system in both HVAC and FSCS modes.
- FM6320 approved Gas Detection System with FMM-4-20 module and any FM listed gas detector.
- EIA-232 printer port.
- EIA-485 annunciator port.

640-Character Display Features

- Backlit, 640-character display.
- Program keypad: full QWERTY keypad.
- Up to nine users, each with a password and selectable access levels.
- **11 LED indicators:** Power; Fire Alarm; Pre-Alarm; Security; Supervisory; System Trouble; Other Event; Signals Silenced; Point Disabled; CPU Failure; Controls Active.
- **Membrane Switch Controls:** Acknowledge; Signal Silence; Drill; System Reset; Lamp Test.
- **LCD Display:** 640 characters (16 lines x 40 characters) with long-life LED backlight.

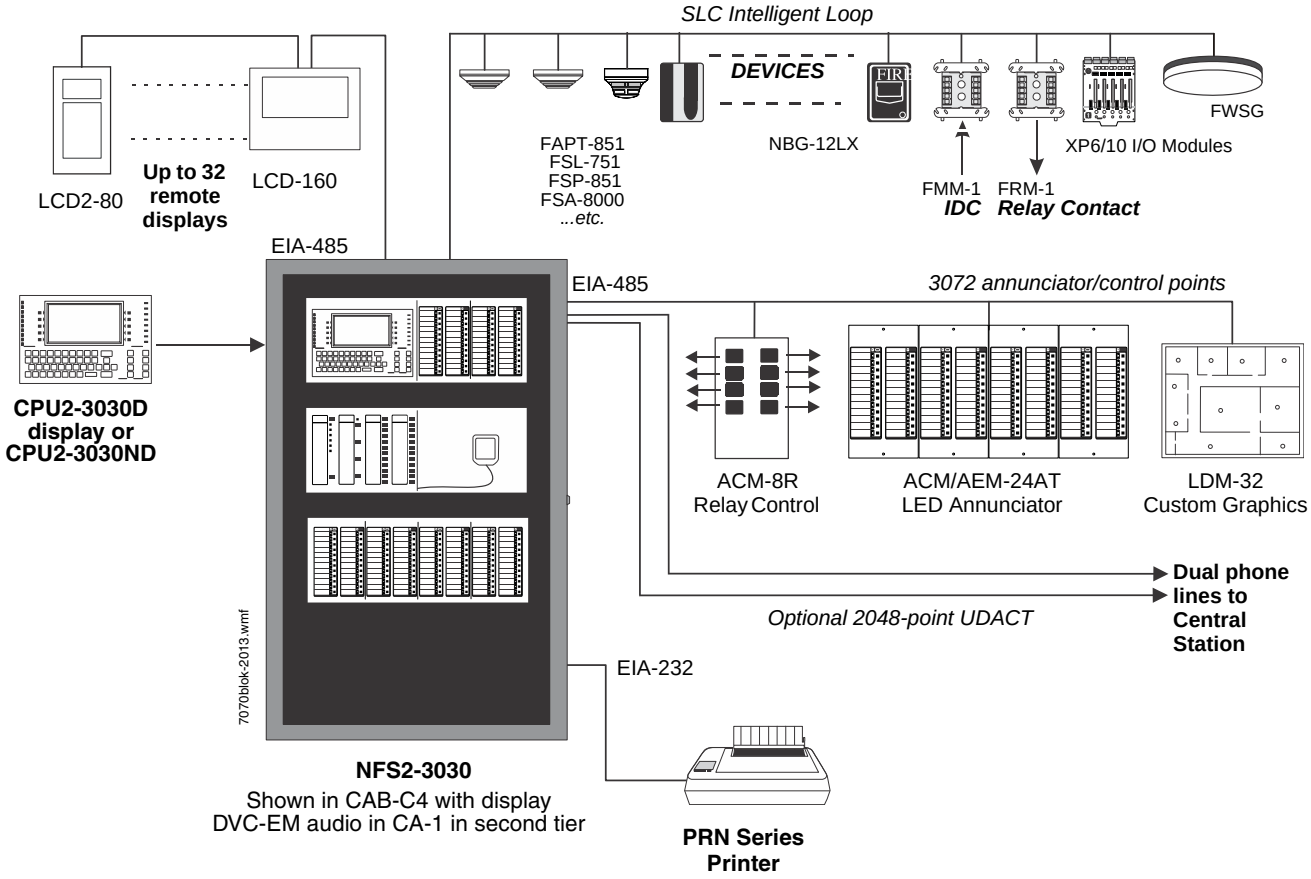
FlashScan® Intelligent Features

- Polls up to 318 devices on each loop 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.
- Sensitivity levels:
  - **– 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).
- 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.
- Programmable activation of sounder/relay bases during alarm or pre-alarm.
- Read Status displays the level of detector cleanliness.

FSL-751 VIEW® (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.

Sample System Options



NOTE: *CPU2-3030 firmware version 14.0 (and higher) can support LCD-160 on the RDP port, or LCD2-80 in terminal mode, but not both at the same time.*

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 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.
- FSA-20000P covers 28,800 square feet through one to four addressable 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.

FMM-4-20 GAS DETECTION MODULE

- Interface to industry-standard linear scale 4-20 mA sensors.
- Five programmable thresholds.
- FM Approved, Class 6320 (Stationary Gas Sensors/ Detectors).

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).

VOICE AND TELEPHONE FEATURES

- Up to eight channels of digital audio.
- 35 watt, 50 watt, 75 watt, and 100/125 watt digital amplifiers (DAA2/DAX series and DS series).
- Solid state message generation.
- Hard-wired voice control module options.
- Firefighter telephone option.
- 30- to 120-watt analog amplifiers (AA Series).
- Backup tone generator and amplifier option.

FlashScan® Exclusive World-Leading Detector Protocol

At the heart of the NFS2-3030 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.

As well as giving 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 NFS2-3030 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

ONYX Intelligent Sensing is a set of software algorithms that provide the NFS2-3030 with industry-leading smoke detection capability. These complex algorithms require many calculations on each reading of each detector, and are made possible by the very high-speed microcomputer used by the NFS2-3030.

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 transient noise signals, usually 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. The NFS2-3030, 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 NFS2-3030 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 NFS2-3030 simultaneously monitors other (already installed) points for alarm conditions.

VeriFire® Tools

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 NFS2-3030 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.

Product Line Information

- "Configuration Guidelines" on page 4
- "Main System Components" 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 single-FACP systems (one NFS2-3030D), the display option is the CPU2-3030D. On network systems (two or more networked fire panel nodes), at least one NCA-2, NCS, or ONYXWorks annunciation device is required. Options listed as follows.

Main System Components

CPU2-3030D: NFS2-3030 Primary Display. CPU2-3030D ships with keypad/display installed; includes 640-character backlit LCD display, QWERTY programming and control keypad. CPU2-3030 is a central processing unit and requires an AMPS-24(E) power supply. For English ULC applications, use CPU2-3030DC. Non-English versions are available: CPU2-3030D-FR, CPU2-3030D-HE, CPU2-3030D-KO, CPU2-3030D-PO, CPU2-3030D-SC, CPU2-3030D-SP, CPU2-3030D-TC, and CPU2-3030D-TH. For English Marine applications order CPU2-3030D-M; for non-English Marine applications order CPU2-3030D-M and the appropriate KP-KIT-XX. (See DN-60688.)

CPU2-3030ND: CPU2-3030 without display. Non-English versions are available: CPU2-3030ND-FR, CPU2-3030ND-HE, CPU2-3030ND-KO, CPU2-3030ND-PO, CPU2-3030ND-SC, CPU2-3030ND-SP, CPU2-3030ND-TC.

LCM-320: Loop Control Module. Provides one SLC. NFS2-3030 supports up to five LCM-320s and five LEM-320 expanders for a total of ten SLCs. *See DN-6881.*

LEM-320: Loop Expander Module. Expands an LCM-320. *See DN-6881.*

SAMPLE SYSTEM: *Four-loop* NFS2-3030 *with display:* CPU2-3030*D, DP-DISP, two BMP-1s, CHS-M3, two LCM-320s, two LEM-320s, AMPS-24, SBB-A4,* DR-A4*, BP2-4, BB-100, batteries.*

Networking Options

NCA-2: Network Control Annunciator, 640 characters. An alternate primary display for CPU2-3030 can be provided by the NCA-2, NCS, or ONYXWorks. Using NCA-2 as primary display enables non-English languages. On network systems (two or more networked fire panel nodes), one network display (either NCA-2, NCS, or ONYXWorks) is required for every system. On network systems, the NCA-2 connects (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-DISP, ADP-4B, or in an annunciator box, such as the ABS-2D. In CAB-4 top-row applications, a DP-DISP and two BMP-1 blank modules are required for mounting. Non-English versions are available: NCA-2-FR, NCA-2-HE, NCA-2-KO, NCA-2-PO, NCA-2-SC, NCA-2-SP, NCA-2-TC, NCA-2-TH. For English ULC applications, order NCA-2C; for marine applications, order NCA-2-M; for non-English marine applications order NCA-2-M and appropriate KP-KIT-XX. *See DN-7047.*

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, ONYXWorks GUI 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

AMPS-24(E): One required for each NFS2-3030. Addressable power supply and battery charger with two 24 VDC outputs. Addressable by any FlashScan® or CLIP mode FACP. Charges 7 to 200 AH batteries. Occupies up to five addresses on an SLC, depending on configuration. Primary input power for panel. *See DN-6883.*

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*.

ACPS-610: 6.0 A or 10.0 A addressable charging power supply. *See DN-60244.*

FCPS-24S6/-24S8: Remote 6 A and 8 A power supplies with battery charger. *See DN-6927.*

BAT Series: Batteries. AMPS-24 uses two 12 volt, 7 to 200 AH batteries. *See DN-6933*.

Audio Options

NOTE: *See "Enclosures, Chassis, and Dress Plates" on page 6 for mounting hardware.*

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. *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 distribuition 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 DAA2/DAX Series amplifiers. *See DN-60633.*

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: Microphone used with DVC/DVC-EM. Included with CA-2 chassis assembly. *See DN-7045.*

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. AA-120 is 120 watts, 25 Vrms. AA-100 is 100 watts, 70.7 Vrms. The amplifier contains an integral chassis for mounting to a CAB-B4, -C4, or -D4 backbox (consumes one row). Includes audio input and amplified output supervision, backup input, and automatic switchover to backup tone. *See DN-3224.*

DAA Series Digital Audio Amplifiers: Legacy DAA Series amplifiers are compatible with DVC 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.

Compatible Devices, EIA-232 Ports

PRN-7: 80-column printer. *See DN-60897*

VS4095/5: Printer, 40-column, 24 V. Order from Keltron, Inc. *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*.

LCD-160: Liquid Crystal Display annunciator, 160-character backlit. Can store character sets for multiple languages. LCD-160C is used for ULC applications. *See DN-6940.*

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 LCD2-80 (DN-60548).*

SCS Series: Smoke control station; eight (expandable to 16) circuits. *See DN-4818*.

TM-4: Transmitter Module. Includes three reverse-polarity circuits and one municipal box circuit. Mounts in panel module position (as in single-address mode applications) or in CHS-M3 position. *See DN-6860.*

UDACT-2: Universal Digital Alarm Communicator Transmitter, 636 channel. *See DN-60686*.

UZC-256: Programmable Universal Zone Coder provides positive non-interfering successive zone coding. Microprocessor-controlled, field-programmable from IBM®-compatible PCs *(requires optional programming kit)*. Mounts on a CHS-4 series chassis within NFS2-3030.

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 FAAST® 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 FAAST® 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 FAAST® 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 FAAST® 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-6985.*

FSP-851(A): Low-profile FlashScan photoelectric detector. *See DN-6935.*

FSP-851R(A): Low-profile intelligent photoelectric sensor, remote test capable. For use with DNR(W). *See DN-6935.*

FSP-851T(A): Low-profile FlashScan photoelectric detector with 135°F (57°C) thermal. *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 multisensor 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-851 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 sychronization 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.*

FMM-4-20: FlashScan 4-20 mA protocol monitor module. *See DN-60411.*

FCM-1(A): FlashScan control module. *See DN-6724.*

FCM-1-REL(A): FlashScan releasing control module. *See DN-60390.*

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.*

FRM-1(A): FlashScan relay module. *See DN-6724.*

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: NFS2-3030 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. Order CPU2-3030D-M; for non-English marine applications order CPU2-3030D and appropriate KP-KIT-XX. Also order **BB-MB** for systems using 100 AH batteries. For a full list of required and optional equipment, see *DN-60688.*

CHS-M3: Mounting chassis for CPU2-3030. One required for each CPU2-3030D/3030ND.

CA-2: Chassis for FACP control panel when DVC-EM is used with firefighter's telephone. Mounts in the top two rows of a CAB-4 series enclosure.

DP-DISP: Dress panel for top row in cabinet with CPU2-3030D installed.

DP-1B: Blank dress panel. Provides dead-front panel for unused tiers; covers DAA2/DAX series or AA-series amplifier. *See DN-7046.*

CHS-BH1: Battery chassis; holds two 12.0 AH batteries. Mounts on 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 NFS2-3030 or 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).

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.*

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-2: Dress Panel used with the CA-2 chassis assembly.

DPA-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.*

ADP-4B: Annunciator dress plate. Mounts in rows 2, 3 or 4 of a CAB-4 series enclosure. Used with ACS series annunciators.

BMP-1: Blank module for unused module positions.

DP-1B: Blank dress panel. Provides dead-front panel for unused tiers; covers DAA2/DAX series or AA-series amplifier.

BP2-4: Battery plate, required.

CHS-4L: Low-profile four-position Chassis. Mounts two AA-30 amplifiers.

CHS-4N: Chassis for mounting up to four APS-6Rs.

CHS-6: Chassis used with the XP6 and XP10 Multi-Modules. Mounts up to six modules in any CAB-4 series row.

NFS-LBB: Battery Box. The NFS-LBB is used to mount up to two 55 AH batteries. Dimensions: Box: 24" (610 mm) wide x 14" (356 mm) high x 7.75" (197 mm) deep. Door: 24.125" (613 mm) wide x 14.25" (362 mm) high; door adds 0.0625" (approx. 1.6 mm) to depth.

BACKBOXES

NOTE: "C" suffix indicates ULC-Listed model.

BB-100: Backbox for batteries and power supplies. The BB-100 is used to mount up to two 100 AH batteries and power supply, if needed. 30" (76.20 cm) wide x 25" (63.50 cm) high x 7.5" (19.05 cm) deep; depth includes door.

BB-200: Backbox for batteries and power supplies. Holds up to four 100 AH batteries (200 AH capacity) and power supply. 30" (76.20 cm) wide x 36" (91.44 cm) high x 7.5" (19.05 cm) deep; depth includes door.

BB-UZC: Backbox for housing the UZC-256 for applications where the UZC will not fit in panel enclosure. Black; for red, order BB-UZC-R. *See DN-3404.*

ABF-1B(C) Annunciator Flush Box

ABF-1DB(C) Annunciator Flush Box with Door. UL/ULC Listed.

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

SEISKIT-CAB: Seismic mounting kit. Required for seismic-certified applications with NFS2-3030 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.

OTHER OPTIONS

411: Slave digital alarm communicator. *See DN-6619.*

411UDAC: Digital alarm communicator. *See DN-6746.*

IPDACT-2, 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 10
- Intelligent detectors ..... 159 per loop
- Addressable monitor/control modules ..... 159 per loop
- Programmable software zones..... over 2000
- ACS annunciators
  per CPU2-3030 .....32 address x 64 or 96 points

  ***NOTE:** The CPU2-3030 can support up to 96 annunciator address points per ACM-24AT/-48A.*

SPECIFICATIONS

Primary Input Power:

– AMPS-24: 110-120 VAC, 50/60 Hz, 4.5 A maximum.

– AMPS-24E: 240 VAC, 50/60 Hz, 2.25 A maximum.

DC Output:

– Main 24 VDC: Up to 5.0 A

– Aux 24 VDC: Up to 5.0 A

– 5 VDC: Up to 0.15 A.

Current draw (Standby/Alarm):

– CPU2-3030D board: 0.340 A.

– CPU2-3030ND board: 0.120 A.

– LCM-320: 0.130 A.

– LEM-320: 0.100 A.

– AMPS-24(E)*: 0.13 A.
(Draws power from secondary power source only.)

NOTE: *See AMPS-24(E) Manual 51907 for a complete current draw calculation sheet and details of input and output values.*

Battery charger range: 7 AH – 200 AH. Use separate cabinet for batteries over 26 AH.

Float Rate: 27.6 V.

Shipping Weight

- CPU2-3030D: 5.95 lb (2.70 kg).
- CPU2-3030ND: 2.90 lb (1.32 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

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.
- **ULC Listed:** S527-11.
- **MEA:** 232-06-E.
- **Fire Dept. of New York:** COA#6211.
- **CSFM:** 7165-0028:0224 (Commercial).
- **FM Approved.**
- **FM6320 Approved.** Class 6320 for Gas Detection.
- **City of Chicago.**
- **City of Denver.**
- **Singapore Productivity and Standards Board (PSB).**
- **CCCF listed.**
- **Fire Services Department (Hong Kong).**

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** 161.002/55/0 (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 NFS2-3030 complies with the following UL Standards and NFPA 72, International Building Code (IBC), and California Building Code (CBC) Fire Alarm Systems requirements:

- **UL 864** (Fire).
- **UL 1076** (Burglary).
- **UL 2572** (Mass Notification Systems). (NFS2-3030 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, Waterflow and Sprinkler Supervisory). *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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ISO 9001 CERTIFIED
ENGINEERING & MANUFACTURING
QUALITY SYSTEMS

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

LISTING SERVICE

LISTING No. 7165-0028:0224

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@honeywell.com

DESIGN: Model NFS-3030, NFS-3030E, NFS2-3030, NFS2-3030E fire alarm control units. Local, auxiliary, remote station (PPU), proprietary (PPU), central station (PPU), automatic, manual, waterflow and sprinkler supervisory services. Suitable for use as a releasing service, Emergency Voice/Alarm Communication System and Process/Energy Management Equipment. Refer to listee's data sheet for detailed product description and operational considerations. System components:

AA-30/-100/-120; Amplifiers
ACM-8R/-16AT/-24AT/-32A/-48A; Annunciator Control Modules
ACPS-610; Addressable/Charger Power Supply
ACPS-2406; Addressable Charger/Power Supply
ACT-1/-2/-4/-25/-70; Audio Coupling Transformer
ADDR-B4/-B4R/-C4/-C4R/-D4/-D4R; Doors
AEM-16AT/-24AT/-32A/-48A; Annunciator Expander Modules
AFM-16A/-16AT/-32A; Annunciator Fixed Modules
AKS-1B; Annunciator Key Switch
AMG-1/-E; Audio Message Generator
AMPS-24, CPS-24; Addressable Main Power Supply
APS-6R, APS2-6R; Auxiliary Power Supply
ARM-4; Auxiliary Relay Module
BDA-25V/-70V; Backup Digital Audio Amplifiers
BGRA-SCS, BGRB-SCS, CEF-SCS, RSA-SCS, RSB-SCS, RSC-SCS, RSD-SCS, RSE-SCS; Smoke Control Station
BB-17/-25/-100/-200; Battery Box
BMP-1; Blank Module
BP-4; Battery Panel
BP2-4; Dress Panel
CA-1/-2; Chassis
CAB-3/4 Series, EQ Series; Enclosures
*CAB-RP, CAB-RPR; Cabinets
CHG-120; Battery Charger
CHS-4L/-4MB/-4N/-6/-M3/-PS/-BH1; Chassis
CMIC-1, CMIC-RP*; Microphone Assembly
CPU2-3030D/CPU2-3030ND; CPU Board

*Rev. 05-08-12 gt

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Date Issued: **July 01, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

CRE-4; Control Relay Expander
CRM-4RK; Control Relay Module
CRT-2; Display Terminal
DAA-5025/-5070; Digital Audio Amplifiers
DAA-5025F/DAA-5025SF; Digital Audio Amplifiers, Fiber Mode
DAA-5070F/DAA-5070SF; Digital Audio Amplifiers, Fiber Mode
DAA2-5025/-5070/-7525; Digital Audio Amplifiers
DAA-7525, DAA-7525F, DAA-7525SF Series; Digital Audio Amplifiers
DAA-PS; Power Supply
DAX-3525/-3570/-5025/-5070; Digital Audio Amplifiers
DCM-4RK; Dual Channel Module
DP-1B; Blank Panel
DP-DISP; Display Dress Panel
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
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
DPDW-1B, DPSW-1B, XPDP; Dress Panels
VP-2B, DPA-1/-1A4/-2; Dress Panels
DPI-232; Direct Panel Interface
DVC-AO; Digital Voice Command
DVC-EM; Extended Memory
DVC-EMF/DVC-EMSF; Digital Voice Command/Ext Memory
DVC-KD; Keypad Board
*DVC-RPU; Remote Paging Unit
EQBB-B4, EQBB-C4, EQBB-D4; Backbox Assembly
EQDR-B4, EQDR-C4, EQDR-D4; Door Assembly
FCM-1-REL; Releasing Control Module
FCPS-24S6/S8; Field Charger/Power Supply
FFT-7/-7S; Fire Fighter's Telephones
FIRSTVISION-LCD; Interactive Firefighters' Display
FIRSTVISION-ENC; FirstVision Backbox Enclosure and Door
FMM-4-20; Analog Input Module
FHS; Fireman's Handset
FCM-1; Addressable control module
FDM-1; Dual monitor module
FDRM-1*; Dual Relay/Monitor Module
FMM-1; Monitor module
FMM-101; Miniature monitor module

*Rev. 05-08-12 gt

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Fire Engineering Division

FRM-1; Addressable relay module
FTM-1; Firephone Control Module
FPJ; Fireman's Phone Jack
FZM-1; Two-wire detector monitor module
HS-NCM-W/-MF/SF/-WMF/-WSF/-MFSF; High Speed Network Control Modules
ICE-4; Indicating Control Expander
ICM-4RK; Indicating Circuit Module
IPDACT-2/-2UD/IPENC; IP Digital Alarm Communicator
ISO-X; Isolator Module
IZE-A; Initiating Zone Expander
IZM-8RK; Initiating Zone Module
LCD-80, -160; Liquid Crystal Display Module
LCD2-80; Liquid Crystal Display
LCM-320; Loop Control Module
LDM-32/-E32/-R32; Lamp Driver Module
LEM-320; Loop Expander Module
MP-1B; Blank Panel
MPS-24B; Power Supply Module
NBG-12; Series Addressable Manual Pull Station
NBG-12LX; Manual pull station, addressable. See DN-6726
NCA/NCA-2; Network Control Annunciator
NCM-W/-F; Network Control Module
NCS4-W-ONYX, NCS4-F-ONYX; Network Control Station, Wire/Fiber
NCS5-W-ONYX, NCS5-F-ONYX; Network Control Station, Wire/Fiber
ONYXWorks-EW/-NW/NF/-HNW/-HNMF/-HNSF/-TS/-EW-TS/-NF-TS/-HW-TS/-HNMFT/
-HNSFT/- HNWT; Graphics PC workstation for NOTI-FIRE-NET Wire/Fiber/with Touch-screen monitors
N-ELR; End of Line Resistors
NFS-LBB/-LBBR; Battery Box
PRN-6; Printer
R-120/-2.2K/-27K/-470/-47K; End of Line Resistors
RA-400/-400Z; Remote Annunciators
RKS-S; Remote Security Keyswitch
RM-1/-1SA; Remote Microphone
RPJ-1; Remote Paging Jack
RPT-W/-F/-485W/-485WF; Repeater
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
SCS-8; Smoke Control Station
SCS-8L; Smoke Control Lamp Driver Station
SCE-8; Smoke Control Expander
SCE-8L; Smoke Control Expander Lamp
STS-1; Security Tamper Switch

*Rev. 05-08-12 gt

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Fire Engineering Division

TM-4; Transmitter Module
TR-A4/-B3N/-B4/-C4/-D3N/-D4; Trim Ring
UDACT, UDACT-2; Universal DACT
UZC-256/BB--UZC; Universal Zone Coder/Backbox
VCE-4; Voice Control Expander
VCM-4RK; Voice Control Module
VS4095/5; Keltron Remote Printer
XP5-C/-M; Transponder
XPC-8; Transponder Control Module
XPIQ; Transponder Quad Intelligent Audio Module
XPM-8/-8L; Transponder Monitor Modules
XPP-1; Transponder Processor
XPR-8; Transponder Relay Module

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 fire alarm control units suitable for high rise applications for use with separately listed compatible initiating and indicating devices. This control unit can generate the temporal code pattern fire alarm signal as required per NFPA 72, 2002 Edition. Refer to listee's Installation Instructions 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 Listing No. 7170-0028:223

*Rev. 05-08-12 gt

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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7320-1653:0505

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@honeywell.com

DESIGN: System Sensor Indoor Models:
SPRL and SPWL Wall Speakers;
SPCRL and SPCWL Ceiling Speakers;
SPSRL, SPSWL, SPSRL-P, SPSRL-SP, SPSWL-P, SPSWL-ALERT and SPSWL-CLR-ALERT Wall Speaker Stobes;
SPSCRL, SPSCWL, SPSCWL-P, SPSCWL-SP and SPSCWL-CLR-ALERT Ceiling Speaker Strobes.

Wall Bezel Parts:
BZSPR-P, BZSPR-AL, BZSPR-EV, BZSPR-AG, BZSPR-PG, BZSPR-F and BZSPR-SP, BZSPW-P, BZSPW-AL, BZSPW-EV, BZSPW-AG, BZSPW-PG, BZSPW-F and BZSPW-SP,

Ceiling Bezel Parts:
BZSPRC-P, BZSPRC-AL, BZSPRC-EV, BZSPRC-AG, BZSPRC-PG, BZSPRC-F and BZSPRC-SP,
BZSPWC-P, BZSPWC-AL, BZSPWC-EV, BZSPWC-AG, BZSPWC-PG, BZSPWC-F and BZSPWC-SP,

WallTrim Rings for Speaker Strobes:
TR2 and TR2W

CeilingTrim Rings for Speaker Strobes:
TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:
SBBSPRL and SBBSPWL,

Ceiling Surface Mounted Back Boxes:
SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-27-17 gt

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Fire Engineering Division

RATING: 25 or 70.7 VAC, 1/4, 1/2, 1, 2 Watt outputs.
Regulated 12 VDC and 24 VDC/FWR is for 2-wire strobe portion.

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 speakers and speaker-strobes when used with separately listed compatible fire alarm control units. Suitable for indoor use, dry and damp environments. *Listed with software code, S05-0048-001 for low temperature compensation. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-27-17 gt

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Date Issued: **July 01, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

FCM-1(A) & FRM-1(A) Series

Control and Relay Modules

NOTIFIER® by Honeywell

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 µA direct poll, 375 µA group poll with LED flashing, 485 µA 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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ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

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.

Made in the U.S. A.

For more information, contact Notifier. Phone: (203) 484-7161, FAX: (203) 484-7118.
www.notifier.com

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.



SPECTRAlert ADVANCE from System Sensor

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
- Listed for ceiling or wall mounting

Agency Listings

SIGNALING UL LISTED 75S0

7320-1653:201

MEA approved 10-08-E

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 ¾-inch top and bottom conduit entries and ¾-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 8.5 and 17.5 volts; 24-volt-rated notification appliance circuit outputs shall operate between 16.5 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	
Operating Temperature	–40°F to 151°F (–40°C to 66°C)
Dimensions, Wall-Mount	
SPS Speaker Strobe	6.0″L × 5.0″W × 4.7″D (including lens and speaker)
SP Speaker	6.0″L × 5.0″W × 2.9″D
Dimensions, Wall-Mount Weatherproof Back Box	6.5″L × 5.5″H × 2.9″D
Electrical/Operating Specifications	
Nominal Voltage (speakers)	25 V or 70.7 V (nominal)
Maximum Supervisory Voltage (speakers)	50 VDC
Strobe Flash Rate	1 flash per second
Nominal Voltage (strobes)	Regulated 12 VDC/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 MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Frequency Range	400 to 4,000 Hz
Power	¼, ½, 1, 2 watts

UL Current Draw Data

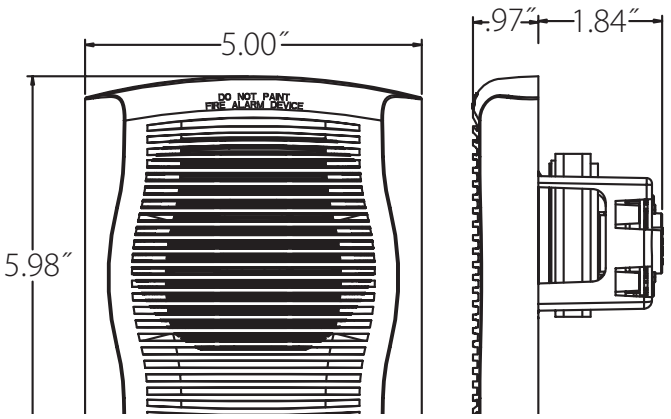
UL Max. Strobe Current Draw (mA RMS)					
		8 to 17.5 Volts		16 to 33 Volts	
	Candela	DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258
Sound Output					
UL Reverberant (dBA @ 10 ft.)		2W	1W	½ W	¼ W
Outdoor Speaker		90	87	84	81
Outdoor Speaker/Strobe		89	86	83	80

Candela Derating

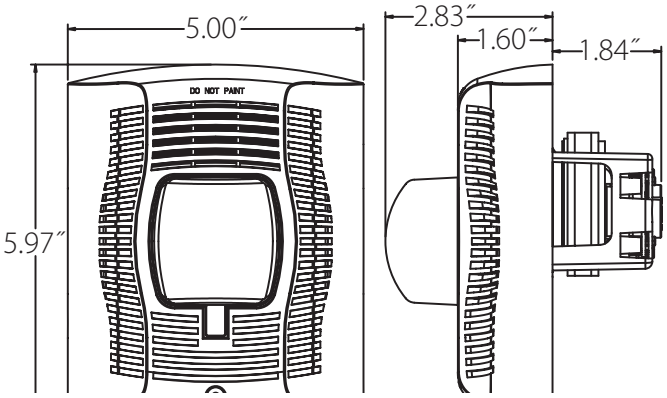
For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

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

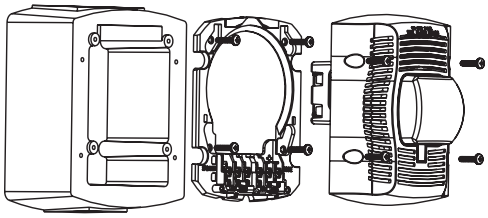


Wall-Mount Outdoor Speaker

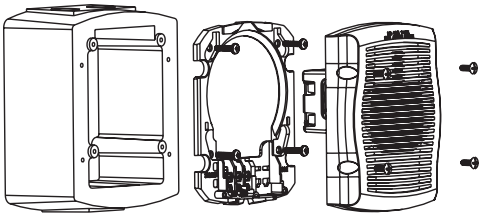


Wall-Mount Outdoor Speaker Strobe

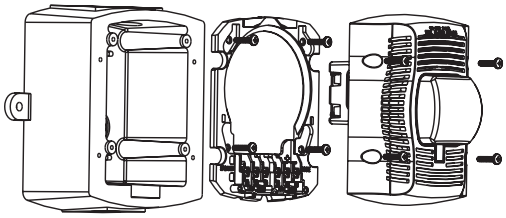
Surface Mounting



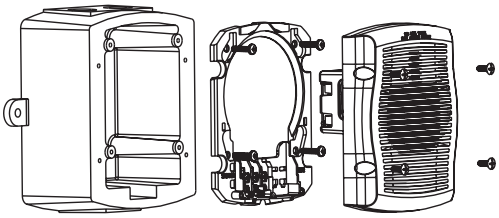
Wall-Mount Speaker Strobe with Plastic Weatherproof Back Box



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)
SPWK-R	SPRK-R	Outdoor Speaker (does not include plastic weatherproof back box)
SPSWK	SPSRK	Outdoor Speaker Strobe, Standard cd (includes plastic weatherproof back box)
SPSWK-P	SPSRK-P	Plain Outdoor Speaker Strobe, Standard cd(includes plastic weatherproof back box)
SPSWK-R	SPSRK-R	Outdoor Speaker Strobe, Standard cd(does not include weatherproof back box)
SPSWK-CLR-ALERT	—	Outdoor Speaker Strobe, Standard cd, Clear Lens, ALERT Printed (includes plastic weatherproof back box)
—	SPSRHK	Outdoor Speaker Strobe, High cd (135,150,177,185) (includes plastic weatherproof back box)
Accessories		
White	**Red**	**Description**
MWBBW	MWBB	Wall, Metal Weatherproof Back Box

Notes:

All -P models have a plain housing (no “FIRE” marking on cover)

“Standard cd” refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. “High cd” refers to strobes that include 135, 150, 177, and 185 candela settings. **When replacing standard outdoor units, both the device and back box must be replaced.**

SYSTEM SENSOR®

3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

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AVDS11301 • 09/12

FMM-1(A), FMM-101(A), FZM-1(A) & FDM-1(A)

Monitor Modules with FlashScan®

NOTIFIER® by Honeywell

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 0.65" (1.651 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 communication protocols.

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 (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 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) (Type H)

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: 375 µA (LED flashing), 1 communication every 5 seconds, 47k EOL.

Maximum IDC wiring resistance: 1500 Ohms.

Maximum IDC Voltage: 11 Volts.

EOL resistance: 47K Ohms.

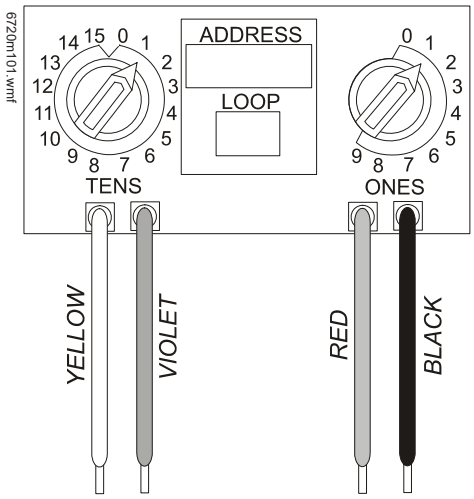
Temperature range: 32°F to 120°F (0°C to 49°C).

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 µA, 1 communication every 5 seconds, 47k EOL; 600 µA Max. (Communicating, IDC Shorted).

Maximum IDC wiring resistance: 1500 Ohms.

Maximum IDC Voltage: 11 Volts.

Maximum IDC Current: 450 µA.

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 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: 270 µA, 1 communication and 1 LED flash every 5 seconds, 3.9k eol.

EOL resistance: 3.9K Ohms.

External supply voltage (between Terminals T10 and T11):

- 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.

FDM-1(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 µA (LED flashing).

Maximum IDC wiring resistance: 1,500 Ohms.

Maximum IDC Voltage: 11 Volts.

Maximum IDC Current: 240 µA

EOL resistance: 47K 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 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

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, 7165-0028:0224, 7165-0028:0243.
- **MEA:** 457-99-E.
- **U.S. Coast Guard:** 161.002/50/0 (NFS2-640, NFS2-320, NFS2-3030).
- **Lloyd’s Register:** 11/600013 (NFS2-640, NFS2-320, NFS2-3030).
- **Fire Dept. of New York:** COA #6121 (NFS2-640, NFS-320), COA# 6114 (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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QUALITY SYSTEMS

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.

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. 7320-1653:0201

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

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

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@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, 2019** *Listing Expires* **June 30, 2020**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

FSP-851(A) Series

Intelligent Plug-In Photoelectric Smoke Detectors with FlashScan®

NOTIFIER® by Honeywell

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.



B210-2951.jpg

FSP-851(A) in B210LP(A) Base

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**

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^2). 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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OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7272-0028:0206

CATEGORY: 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

FST-851(A) Series

Intelligent Thermal (Heat) Detectors with FlashScan®

NOTIFIER® by Honeywell

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.



B210-2251.jpg

FST-851(A) in B210LP(A) Base

- 94-5V plastic flammability rating.
- Remote LED output connection to optional RA100Z(A) remote LED annunciator.
- Optional sounder, relay, and isolator bases.
- Optional flanced 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 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 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:** 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 (NFS2-640/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 mm²). 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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ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

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.

Made in the U.S. A.

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. 7270-0028:0196

CATEGORY: 7270 -- HEAT DETECTOR

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@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

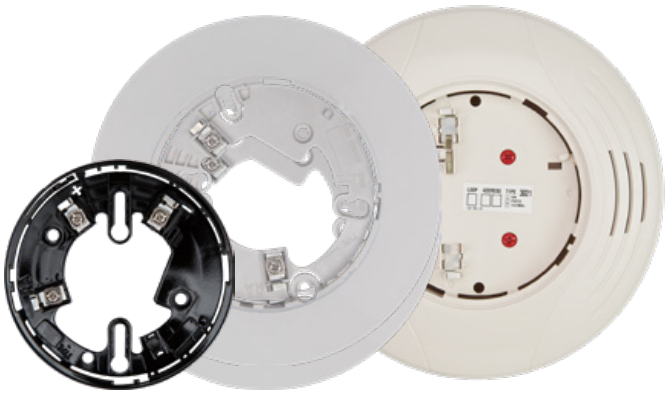
Date Issued: **July 01, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

Select Series Mounting Base Options

System Sensor mounting bases and kits provide a variety of installation options for detectors in any application.



Features

- Bases enable quick and secure detector plug-in
- SEMS screws provide easy wiring connection
- Support for 12-24 AWG provides installation flexibility
- Multiple base formats meet application requirements
- Standard white color with ivory and black options
- UL 268 compliant
- Mechanical locking feature restricts removal of attached sensor head

Specialty Base Features

- Pre-wired mounting plate simplifies installation
- Application driven feature sets
- Sounder bases both UL 268 and UL 464 compliant

Agency Listings

SIGNALING UL LISTED S911

FM APPROVED 3062622

4" & 6" bases: 7300-1653:0109
Relay & Isolator bases: 7300-1653:0126
Sounder bases: 7135-1653:0213
Low-frequency bases: 7300-1653:0238

To meet local code and application requirements, System Sensor offers **standard 4" and 6" bases**, as well as, specialty base designs including relay, isolator, sounder and low frequency sounder options for Select Series detectors.

The standard 4" and 6" bases offer a plug-in detector base intended for use in intelligent systems, with screw terminals provided for power (+ and –), and remote annunciator connections. Communication takes place over the power (+ and –) lines. The 4" base offers a compact design while the 6" base provides compatibility with a wider range of junction boxes.

The Select Series specialty bases support application driven requirements. The bases employ a separate mounting plate that installs on various junction box sizes to eliminate unsightly surface-mount boxes. The mounting plate enables pre-wiring of all connections to speed and simplify installation.

Relay bases (B224RB-WH/B224RB-IV) provide one form C contact relay for control of auxiliary functions, such as door closure and elevator recall. The relay can operate in two different modes (short and long delay). The activation time for the short delay is 60 ms to 100 ms, while the activation time for the long delay is 6 sec to 10 sec. A shunt with pin headers, located on the base PC board, is used to set the delay timing.

Isolator bases (B224BI-WH/B224BI-IV) allow the Signaling Line Circuit (SLC) loop to operate under fault conditions created from a short circuit preventing an entire communication loop from being disabled. The base isolates the section of the loop containing the short circuit from the remainder of the circuit and automatically restores when the fault is corrected.

The Select Series **sounder and low frequency sounder bases** are designed for new and existing dwelling unit applications. They offer maximum flexibility in installation, configuration, and operation to meet or exceed UL 268 and UL 464 requirements. The

† Consult your fire alarm control panel manufacturer for compatibility with the addressable model of the sounder base.

Select Series low frequency sounder bases are designed to meet the NFPA 72 sleeping space requirement to produce a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent. Studies show that a lower frequency, centered around 520 Hz, is the most ideal to wake sleeping occupants, even those with mild to severe hearing loss. The B200SR sounder and LF sounder bases (B200SR-WH/B200SR-IV/B200SR-LF-WH/B200SR-LF-IV) are fully compatible with existing B501BH-Series sounder base installations. The device enables users to select one of two B501-supported tones (ANSI Temporal 3 or Continuous) through a jumper.

The B200S sounder and LF sounder bases (B200S-WH/B200S-IV/B200S-LF-WH/B200S-LF-IV) adopt the same address as the detector, but use a unique device type on the loop. The Fire Alarm Control Panel (FACP) can use that address to command an individual sounder — or a group of sounders — to activate. The command set from the FACP can be tailored to multiple event-driven tone outputs allowing selection of volume (75 or 85 dBA), tone (ANSI Temporal 3, ANSI Temporal 4 or March Time) and group. In addition, some FACPs will enable custom tone patterns. The B200S series sounder bases recognize the System Sensor synchronization protocol. This enables it to be used as a component of the general evacuation signal — along with other System Sensor AV appliances — when connected to a power supply or FACP output capable of generating the System Sensor synchronization pulses.

Specifications – Select Series Bases

Physical Specifications	
Diameter	B501-WHITE, B501-IV, B501-BL: 4.0" (10.2 cm) B200S-WH, B200S-IV, B200S-LF-WH, B200S-LF-IV, B200SR-WH, B200SR-IV, B200SR-LF-WH, B200SR-LF-IV: 6.85" (17.4 cm) B300-6, B300-6-IV: 6.1" (155 mm) B224BI-WH, B224BI-IV, B224RB-WH, B224RB-IV: 6.85" (17.4 cm)
Base Height (without sensor)	B501-WHITE, B501-IV, B501-BL: 0.74" (18.8 mm) B200S-WH, B200S-IV, B200S-LF-WH, B200S-LF-IV, B200SR-WH, B200SR-IV, B200SR-LF-WH, B200SR-LF-IV: 1.6" (4.1 cm) B300-6, B300-6-IV: 0.76" (19 mm) B224BI-WH, B224BI-IV, B224RB-WH, B224RB-IV: 1.61" (4.1 cm)
Weight:	B501-WHITE 0.32 lb (145 gm) B200S-WH, B200S-IV, B200SR-WH, B200SR-IV: 0.50 lb (227 gm) B200S-LF-WH, B200S-LF-IV, B200SR-LF-WH, B200SR-LF-IV: Weight: 0.6 lb (272 gm) B300-6, B300-6-IV: 0.32 lb (145 gm) B224RB-WH, B224RB-IV, B224BI-WH, B224BI-IV 0.50 lb (227 gm)
Wire Gauge	B501-WHITE, B501-IV, B501-BL, B224BI-WH, B224BI-IV, B224RB-WH, B224RB-IV, B300-6, B300-6-IV: 18 AWG (0.823 mm^2) to 12 AWG (3.31 mm^2) B200S-WH, B200S-IV, B200S-LF-WH, B200S-LF-IV, B200SR-WH, B200SR-IV, B200SR-LF-WH, B200SR-LF-IV: 14 AWG to 12 AWG
Temperature Range	Refer to applicable sensor Operating Temperature Range using the Base/Sensor Cross Reference Chart at systemsensor.com
Humidity Range	10% to 93% RH non-condensing

Electrical Specifications: B501-WHITE, B501-IV, B501-BL (Includes base and detector)	
Operating Voltage	15 to 32 VDC
Standby Current	150 µA

Electrical Specifications: B300-6, B300-6-IV	
Operating Voltage	15 to 32 VDC
Standby Current	170 µA max.

Electrical Specifications: B224BI-WH, B22BI-IV	
Operating Voltage	15 to 32 VDC
Standby Current	450 µA max.
Isolation Current	15 mA max

Electrical Specifications: B224RB-WH, B22RB-IV	
Operating Voltage	15 to 32 VDC
Standby Current	170 µA max.
Set Time	Position 1, Short Delay: 60 to 100 ms Position 2, Long Delay: 6 to 10 sec
Reset Time	20 ms max.
Relay Characteristics	2 coil latching relay 1 Form C contact UL/ULC Rating:

CURRENT RATING	MAXIMUM VOLTAGE	LOAD DESCRIPTION	APPLICATION
2 A	25 VAC	PF = 0.35	Non-coded
3 A	30 VDC	Resistive	Non-coded
2 A	30 VDC	Resistive	Coded
0.46 A	30 VDC	(L/R = 20ms)	Non-coded
0.7 A	70.7 VAC	PF = 0.35	Non-coded
0.9 A	125 VDC	Resistive	Non-coded
0.5 A	125 VAC	PF = 0.75	Non-coded
0.3 A	125 VAC	PF = 0.35	Non-coded

Electrical Specifications: B200S-WH, B200S-IV	
External Supply Electrical Ratings	
External Supply Voltage	16 to 33 VDC (VFWR)
Standby Current:	500 µA maximum
Alarm Current:	35 mA maximum (at high volume setting); 15 mA maximum (at low volume setting)
SLC Electrical Ratings	
SLC Operating Voltage:	15 to 32 VDC
SLC Standby Current:	300 µA maximum
Sound Output	
High Volume:	Greater than 85 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)
Low Volume:	Greater than 75 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)

Electrical Specifications: B200S-LF-WH, B200S-LF-IV	
External Supply Electrical Ratings	
External Supply Voltage	16 to 33 VDC (VFWR)
Standby Current:	550 µA maximum VDC
Alarm Current, High-volume setting	70 mA maximum @ 33.0 VDC 90 mA maximum @ 24.0 VDC 140 mA maximum @16.0 VDC
Alarm Current, Low-volume setting	15 mA maximum @ 33.0 VDC 20 mA maximum @ 24.0 VDC 25 mA maximum @ 16.0 VDC
SLC Electrical Ratings	
SLC Operating Voltage:	15 to 32 VDC
SLC Standby Current:	300 µA maximum (base only, refer to applicable sensor specification)
Sound Output	
High Volume:	Greater than 85 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)
Low Volume:	Greater than 75 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)

Electrical Specifications: B200SR-WH, B200SR-IV	
External Supply Electrical Ratings	
External Supply Voltage	16 to 33 VDC (VFWR)
Standby Current:	500 µA maximum
Alarm Current:	35 mA maximum
SLC Electrical Ratings	
SLC Operating Voltage:	15 to 32 VDC
SLC Standby Current:	300 µA maximum
Sound Output	Greater than 85 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)

Electrical Specifications: B200SR-LF-WH, B200SR-LF-IV	
External Supply Electrical Ratings	
External Supply Voltage	16 to 33 VDC (VFWR)
Standby Current:	1 mA maximum VDC
Alarm Current	65 mA maximum @ 33.0 VDC 90 mA maximum @ 24.0 VDC 125 mA maximum @16.0 VDC
SLC Electrical Ratings	
SLC Operating Voltage:	15 to 32 VDC
SLC Standby Current:	Refer to applicable sensor specification.
Sound Output	Greater than 85 dBA minimum measured in a UL reverberant room at 10 feet, 24 Volts (in continuous tone)

Select Series Junction Box Selection Guide

Model	Single Gang	Double Gang	3.5" Octagonal	4" Octagonal	4" Square	4" Square with mud ring*	50 mm	60 mm	70 mm	75 mm
B501-WHITE, B501-IV, B501-BL	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
B200S-WH, B200S-IV, B200S-LF-WH, B200S-LF-IV, B200SR-WH, B200SR-IV, B200SR-LF-WH, B200SR-LF-IV	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B300-6, B300-6-IV	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
B224BI-WH, B224BI-IV	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B224RB-WH, B224RB-IV	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No

* with 3.0" mud ring
Note: Box depth contingent on base and wire size. Refer to National Electric Code or applicable local codes for appropriate recommendations.

Ordering Information

Model			Description
White	Ivory	Black	
B501-WHITE	B501-IV	B501-BL	4" Flangeless mounting base
B501-WHITE-BP	—	—	4" Flangeless mounting base bulk pack, white
B300-6	B300-6-IV	—	6" Flanged mounting base
B300-6-BP	—	—	6" Flanged mounting base bulk pack, white
B200S-WH	B200S-IV	—	Intelligent addressable sounder base
B200S-LF-WH	B200S-LF-IV	—	Intelligent addressable sounder base, low-frequency
B200SR-WH	B200SR-IV	—	Standard sounder base (compatible with B501BH series)
B200SR-LF-WH	B200SR-LF-IV	—	Low-frequency sounder base (compatible with B501BH series)
B224BI-WH	B224BI-IV	—	Isolator base
B224RB-WH	B224RB-IV	—	Relay base

Related Accessories			
White	Ivory	Black	
CK300	CK300-IV	CK300-BL	Color kit (includes cover and trim ring)
CK300-IR	CK300-IR-IV	CK300-IR-BL	PTIR Color kit (includes cover and trim ring)
TR300	TR300-IV	—	Trim ring
—	SMB600		Surface mounting kit (flanged), ivory
RA100Z	—	—	Remote LED annunciator
M02-04-00			Detector test magnet
M02-09-00			Test magnet with telescoping handle

Accessories

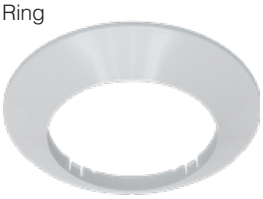
RA100Z
Remote LED Annunciator



CK300-BL
Color Kit



TR300
Trim Ring



SYSTEM SENSOR®
3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495
www.systemsensor.com

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
SPDS901-00 • 04/04/2018

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7300-1653:0109

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: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@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

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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

ISO-X(A)

Fault Isolator Module

NOTIFIER® by Honeywell

Intelligent/Addressable Devices

General

The Notifier ISO-X(A) Fault Isolator Module is used with Notifier Onyx and CLIP series Fire Alarm Control Panels (FACPs) to protect the system against wire-to-wire short circuits on the SLC loops.

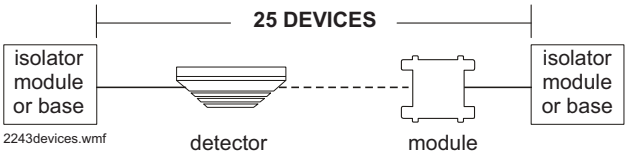
Features

- Powered by SLC loop directly, no external power required.
- Base mounts on standard junction boxes (4.0"/10.16 cm square by 2.125"/5.398 cm deep).
- Integral LED blinks to indicate normal condition. Illuminates steady when short circuit condition is detected.
- High noise (EMF/RFI) immunity.
- Wide viewing angle of LED.
- SEMS screws with clamping plates for ease of wiring.
- Opens SLC loop automatically on detection of short, preventing the short from causing failure of the entire loop.
- Automatically resets on correction of short.
- Supports Style 4, 6, or 7 wiring.

Applications

The Fault Isolator Modules should be spaced between groups of sensors in a loop to protect the rest of the loop. Use to isolate short circuit problems within a section of a loop so that other sections can continue to operate normally. The ISO-X(A) supports a maximum of 25 devices in-between isolators, except when using relay bases or legacy IPX multisensors.

NOTE: *ON LOADS PER RELAY BASE AND* LEGACY *MULTISENSOR DETECTORS/ISOLATORS/ISOLATOR BASES:* the maximum number of addressable devices between isolators (or B224BI isolator bases) is 25 devices.



B224RB relay bases and legacy IPX-751 multisensor detectors draw more current than all other intelligent devices. When calculating the 25-device maximum: B224RB.

- B224RB represents 2.5 devices.
- IPX-751 in a standard base represents 12 devices.
- IPX-751 in a relay base represents 14.5 devices.
- All other addressable devices represent 1 device.

See examples on page 2.

NOTE: *ON MAXIMUM NUMBER OF DEVICES:* See the SLC Manual (PN 51253) for information on loss of addresses due to current limitations. Each module or base added reduces the capacity of address positions in an SLC. All SLC field devices must have been purchased after February 1995 to meet the aforementioned requirements. If the SLC field devices were purchased prior to February 1995, each ISO-X(A) used reduces the capacity of an SLC by two address positions. Requirements differ as applied to relay bases (see note above).



ISO-X_left_rgb.jpg

ISO-X(A)

Construction

The face plate is made of off-white plastic. Includes yellow LED indicator that pulses when normal and illuminates steady when a short is detected.

Operation

Automatically opens circuit when the line voltage drops below four volts. Fault Isolator Modules should be spaced between groups of addressable devices (maximum 25, see notes on page 1) in a loop to protect the rest of the loop. If a short occurs between any two isolators, then both isolators immediately switch to an open circuit state and isolate the groups of sensors between them. The remaining units on the loop continue to fully operate.

In Style 4 loops, the ISO-X(A) is generally used at each T-tap branch, to limit the effect of short circuits on a branch to the devices on that branch. The LED indicator is on continuously during a short circuit condition.

The ISO-X(A) Fault Isolator Module automatically restores the shorted portion of the communications loop to normal condition when the short circuit condition is removed.

Installation

- Mount on a standard junction box (4.0"/10.16 cm square) which is at least 2.125"/5.398 cm deep.
- Terminal screws are provided for “in and out” wiring.
- Installation instructions are provided with each module.
- Surface-mount box is available as an option.

Specifications

Normal operating voltage: 15 – 32 VDC (peak).

Standby current: 450 µA (not isolating) .

Maximum current draw: 17 mA (device in isolation, LED latched in alarm).

Temperature range: 32°F to 120°F (0°C to 49°C).

Relative humidity: 10% to 93% (non-condensing).

Weight: 5 oz. (150 grams).

Dimensions: 4.5"H x 4.5"W x 0.25" D (11.43 cm H x 11.43 cm W x 0.635 cm D).

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 (UOXX); BP6480 (AMCX, APOU).
- **ULC:** S635 (OUOXXC, ISO-XA).
- **FM Approved.**
- **CSFM:** 7165-0028:0214; 7165-0028:0224; 7165-0028:0243.
- **MEA:** 17-96-E; 104-93-E Vol. VI; 290-91-E Vol. V; 317-01-E; 447-99-E.
- **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)).
- **BSA:** 578-81-SA.

Architectual/Engineering Specifications

Fault Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Fault Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. If a wire-to-wire short occurs, the Fault Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Fault Isolator Module shall automatically reconnect the isolated section of the SLC loop. The Fault Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Fault Isolator Module after its normal operation. The Fault Isolator Module shall mount in a standard 4.0" (10.16 cm) deep electrical box, in a surface-mounted backbox, or in the Fire Alarm Control Panel. It shall provide a single LED which 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.

Product Line Information

***NOTE:** "A" suffix indicates ULC Listed model.*

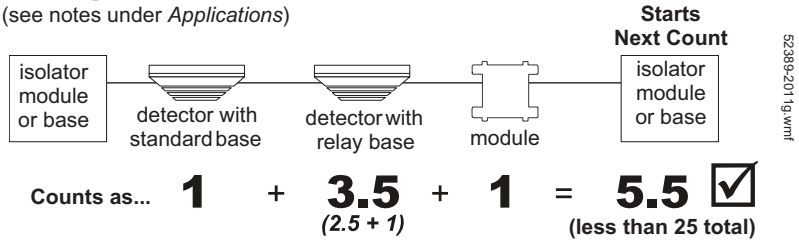
ISO-X: Isolator Module.

ISO-XA: Isolator Module. Canadian (ULC) version.

SMB500: Surface Mount Backbox

Examples of Device Counts

(see notes under *Applications*)



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ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

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.

Made in the U.S. A.

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. 7300-0028:0261

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@honeywell.com

DESIGN: Model ISO-X Fault Isolator Module. Refer to listee's data sheet for detailed product description and operational considerations.

RATING: 15-32 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 control unit accessories for use with separately listed Notifier Fire Alarm Control units. Refer to listee's Installation Instruction Manual for details.

NOTE: FORMERLY: 7300-1653:192

*Rev. 08-11-2009 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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

ACPS-610(E)

Addressable Charger/Power Supply

NOTIFIER® by Honeywell

Power Supplies

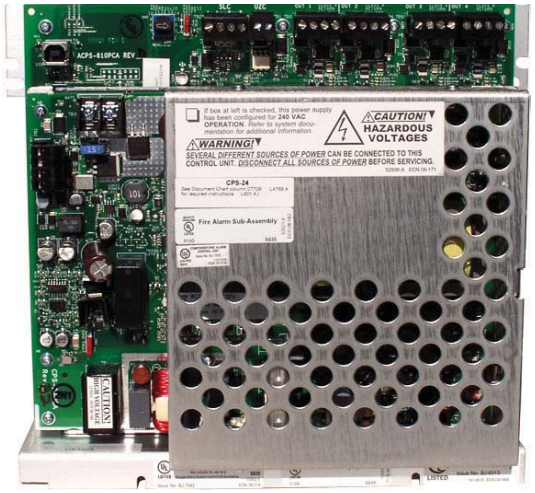
General

The ACPS-610(E) is an auxiliary power supply with a battery charging option and a host of special features. Selectable charging options allow the ACPS-610(E) to provide 6 amps of shared power to four outputs while charging batteries from 12 to 200 AH, or 10 amps of shared power when the unit is configured for use with an external battery charger. Four individually addressable outputs can be independently configured for auxiliary power or Notification Appliance Circuits (NAC). NAC outputs support notification appliance synchronization for devices manufactured by System Sensor®, Wheelock, and Gentex. An option to disable battery charging allows the system designer to use the four built-in circuits to distribute 10 amps of power for general purposes, excluding NAC applications.

The ACPS-610(E) is compatible with NOTIFIER intelligent fire alarm control panels using CLIP and FlashScan® protocol.

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).
- Provides 6.0 A of NAC power or 10 A of general purpose power.
- Four Class B (Style Y) or four Class A (Style Z) outputs, individually addressable by the FACP.
- When built-in outputs are configured for NAC operation, each circuit supports strobe synchronization with the following manufacturers' audio/visual devices: System Sensor® (SpectrAlert® and SpectrAlert Advance Series) or Wheelock or Gentex.
- Each circuit can be software-selected for use as: a Notification Appliance Circuit, general purpose 24 VDC power, four-wire detector power, or door holder.
- Steady, March Time (120 PPM), Two Stage, Temporal, or UZC Zone-Coded and Non-Coded devices - software-selectable by circuit.
- Universal Zone Coder (UZC-256) option supports for programmable coded outputs. Up to 256 different codes.
- Auxiliary Outputs: 24V @ 0.5A and 5V @ 0.15A.
- Charges 12 to 200 AH batteries with full supervision. The charger on the ACPS may be disabled via software. When disabled, a separate, external charger is required, for example a CHG-120.
- May be used to provide battery backup for multiple ACPS supplies.
- AC loss detection, brownout detection, and AC loss delay reporting.
- Power-limited outputs.
- Isolated Signaling Line Circuit (SLC) interface.
- Selectable ground fault detection.
- Canadian two stage operation.



60244cov.jpg

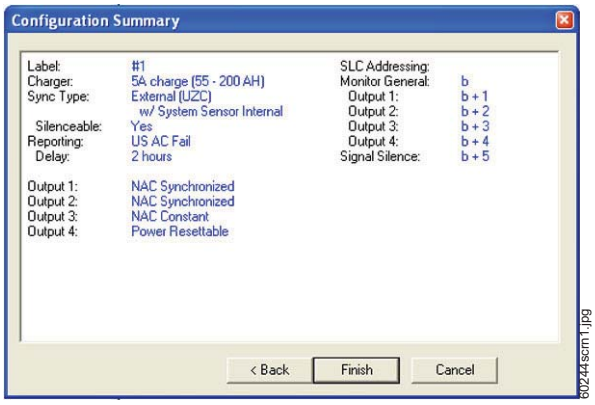
Specifications

- Primary (AC) power:
  - ACPS-610: 120 VAC, 50/60 Hz input, 5.0 A maximum.
  - ACPS-610E: 220/240 VAC, 50/60 Hz input, 2.5 A maximum.
- Output voltage: 24 VDC electrically regulated and power limited (under primary AC mains). Under secondary power, 20.4 to 26.4 VDC.
- Output circuits - TB3, TB4, TB5, TB6 on Main Board: 1.5 A maximum for any NAC output circuit. 2.5 A maximum for any Power output with battery charger disabled.
- Secondary power (battery) charging circuit - lead-acid battery charger which will charge 12 to 200 AH batteries. Maximum charger current - 5.0 A.
- Secondary power auxiliary outputs - TB2 on CPS-24 Board:
  - 24V @ 0.5A, power limited.
  - 5V @ 0.15A, power limited.
- Wiring: utilizes wire sizes 12 to 18 AWG (3.1 to 0.78 mm^2).
- SLC specifications: Average SLC current is 1.287 mA. SLC data is transmitted between 24.0 VDC, 5 VDC, and 0 VDC at approximately 3.33 Kbaud.
- Battery fuse (F2): 15A, Fast-acting.
- Weight: 4.5 lb.

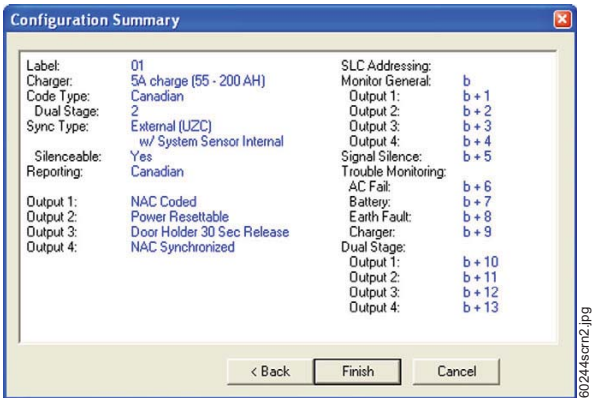
ACPS Programming

The ACPS-610(E) is programmable via the simple-to-use PK-PPS programming utility, which requires a Windows® PC with a USB port and cable. Programming may be performed during an on-line session with the ACPS-610(E), or previously saved programs may be downloaded to individual ACPS-610(E) units. The ACPS-610(E) requires the use of a minimum of 5 SLC address points, and will use up to 14 SLC address points to fulfill requirements for Canadian supervision and two stage operation.

NOTE: *PK-PPS is available for download from www.magnifire.com.*



Example of Programming for the ACPS-610 Using 6 Addresses



Example for ACPS-610 Using Canadian Reporting with Two Stage

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.
- **ULC Listed:** S635.
- **FM Approved.**
- **CSFM:** 7315-0028:0248, 7165-0028:0224, 7165-0028:0243.
- **MEA #30-08-E.**
- **FDNY:** COA #6085, #6098.

When used with the MARINE-EQ, appropriate seismic bracket, and marine approved devices, the ACPS-610(E) is approved by the following agencies:

- US Coast Guard: 161.002/50/0 (Standard 46 CFR).
- Lloyd's Register: 11/600013 (ENV 3 category).
- American Bureau of Shipping (ABS).

Product Line Information

ACPS-610: Addressable charger power supply, with selectable built-in synchronization, and four built-in control modules. Several mounting options available (see below).

ACPS-610E: Same as ACPS-610, but configured for 220/240 VAC operation.

CAB-PS1: The CAB-PS1 can house one ACPS-610(E) and two 12 AH batteries. Dimensions: 15.218" (38.654 cm) high x 14.5" (36.83 cm) wide x 3.562" (9.048 cm) deep with door.

SEISKIT-PS/2/4: Seismic kit for mounting ACPS-610 in a CAB-PS1. Includes bracket for two 12 AH batteries.

DR-PS1: When installing an ACPS-610(E) into an older version of the CAB-PS1 used for an ACPS-2406(E), the new wider door must be ordered for use with the older version cabinet.

BB-25: The BB-25 can house one ACPS-610(E) and two 12 volt, 26 AH batteries.

BB-100: The BB-100 can house one ACPS-610(E) and two 12 volt, 55 AH or 100 AH AH batteries.

BB-200: The BB-200 can house one ACPS-610(E) and four 12 volt, 100 AH batteries.

CAB-4 Series: The ACPS-610(E) can mount in any of the CAB-4 Series cabinets with CHS-PS or CHS-BH. *See DN-6857.*

EQ Cabinet Series: The ACPS-610(E) can mount in any of the EQ Cabinet Series cabinets using CHS-6. *See DN-60229.*

MARINE-EQ System: Protects equipment in shipboard and waterfront applications. For a full list of required and optional equipment, see DN-60688.

CHS-PS/CHS-6: Chassis used to mount the ACPS-610(E) in row 1, 2, or 3 of the CAB-4 or EQ series enclosure.

CHS-BH: Battery mounting chassis that holds up to two 12AH batteries on a CHS-PS.

Batteries: ACPS-610(E) battery charging circuit range is 12 - 200 AH. *See DN-6933.*

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ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

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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. 7315-0028:0248

CATEGORY: 7315 -- POWER UNITS

LISTEE: NotifierOne Fire-Lite Place, Northford, CT 06472-1653
Contact: Lisa Brant (203) 484-6105 Fax (203) 484-7309
Email: lisa.brant@honeywell.com

DESIGN: Models APS2-6R*, APS2-6RE* power supply and ACPS-610, ACPS-610E addressable charger/power supply. Models ACPS-610 and ACPS-610E can be configured to drive four notification appliance circuits or, it may be configured to provide four-wire detector power or general purpose power. Model APS2-6R* can provide two power-limited output circuits (24VDC, 3A max. each) or one non power-limited (6A max). Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING:

ACPS-610:	120 V, 50/60 Hz, 5.0 A
ACPS-610E:	240 V, 50/60 Hz, 2.5 A
*APS2-6R:	120 V, 50/60 Hz, 2.9 A
*APS2-6RE:	220-240 V, 50/60 Hz, 1.5 A

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, product designation, electrical rating and UL label.

APPROVAL: Listed as auxiliary addressable power supply and battery charger (only for ACPS-610*) for use with separately listed electrically and functionally compatible fire alarm control units.

*Rev. 07-20-09 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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

Appendix B

Fire Sprinkler Cutsheets

MATERIAL BROCHURE

FOR: GAULT E.S. 2-STORY MODULAR BUILDING

CONTRACTOR: AMERICAN MODULAR
787 Spreckels Ave
Manteca, CA.,
209-825-1921

SUBMITTED BY: D&B FIRE PROTECTION, INC.
1623 LEESON LANE
CORONA, CA. 92879
951-737-9965

DATE: NOVEMBER 2021

Schedule 10 and Schedule 40

FM Approved and UL Listed Sprinkler Pipe

(MANUFACTURER OPTIONAL)

Schedule 10 and Schedule 40 are FM Approved and UL Listed (for U.S. and Canada), even though these products do not require separate approvals and listings.

Sch. 10 and Sch. 40 have been through the same rigorous testing as other fine pipe products.

Sch. 10 and Sch. 40 pipes a made to ASTM A135 and ASTM A795. Thes products are typically supplied with protecti coating but can be supplied without the coating s they can be hot-dip galvanized to meet F requirements for use in dry systems in accordanc with the zinc coating specifications of ASTM A795 c ASTM A53.

Schedule 10 Pipe

Nominal Pipe Size (in)	O.D. (in)	I.D. (in)	Nom. Wall (in)	Weight/Ft.	Bundle Size
1	1.315	1.097	0.109	1.40 lbs/ft	91
1-1/4	1.660	1.442	0.109	1.81 lbs/ft	61
1-1/2	1.900	1.682	0.109	2.08 lbs/ft	61
2	2.375	2.157	0.109	2.64 lbs/ft	37
2-1/2	2.875	2.635	0.120	3.53 lbs/ft	30
3	3.500	3.260	0.120	4.33 lbs/ft	19
4	4.500	4.260	0.120	5.62 lbs/ft	19

Schedule 40 Pipe

Nominal Pipe Size (in)	O.D. (in)	I.D. (in)	Nom. Wall (in)	Weight/Ft.	Bundle Size
1	1.315	1.049	0.133	1.68 lbs/ft	70
1-1/4	1.660	1.380	0.140	2.27 lbs/ft	51
1-1/2	1.900	1.610	0.145	2.72 lbs/ft	44
2	2.375	2.067	0.154	3.65 lbs/ft	30

PIPE PREPARATION

For proper operation, all pipe surfaces should be cleaned prior to installation. In order to provide a leak-tight seal for the gasket, pipe surfaces should be free from indentations and projections from the end of the pipe to the groove. All loose paint, scale, dirt, chips, grease and rust must be removed prior to installation. Failure to take these important steps may result in improper coupling assembly, causing leakage. Also, check the manufacturer's instructions for the specific fitting used

LISTED

FM APPROVED

Reliable®

Model F1FR Series Quick Response Standard Spray

Bulletin 014 Rev. J

Model F1FR56 Sprinkler Types
Standard Upright
Standard Pendent
Conventional
Vertical Sidewall
Horizontal Sidewall

Model F1FR56 Recessed Sprinkler Types
Standard Pendent/F1/F2/FP
Horizontal Sidewall

Model F1FR56 Concealed Sprinkler Types
Standard Pendent

Model F1FR42, F1FRXLH & F1FR28 Sprinkler Types
Standard Upright
Standard Pendent

Model F1FR42, F1FRXLH & F1FR28 Recessed Sprinkler Types
Standard Pendent

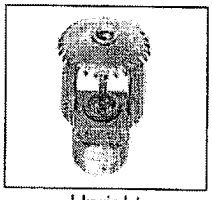
Model F1FR56LL & F1FR42LL Low Lead Sprinkler Types*
Standard Pendent
Less than 0.25% Lead Content

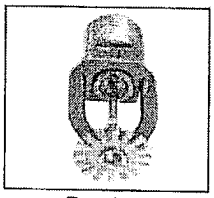
Listing & Approvals
1. Underwriters Laboratories Inc. and Certified for Canada (cULus).
2. Factory Mutual Approvals (FM)
3. Loss Prevention Council (LPCB, UK)
4. VdS Schadenverhütung GmbH
5. *NSF Certified to NSF/ANSi Standard 61 Annex G

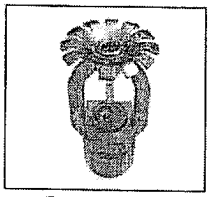
UL Listing Category
Sprinklers, Automatic & Open (VNIV)
Quick Response Sprinkler

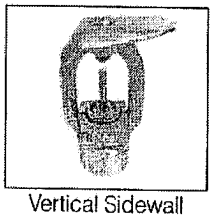
Product Description
Reliable Models F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Series Sprinklers are quick response sprinklers which combine the durability of a standard sprinkler with the attractive low profile of a decorative sprinkler.

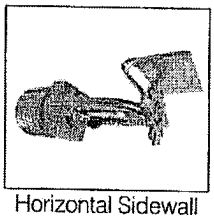
The Models F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Series Recessed automatic sprinklers utilize a 3.0 mm frangible glass bulb. These sprinklers have demonstrated response times in laboratory tests which are five to ten times faster than standard response sprinklers. This quick response enables the Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Series sprinklers to apply water to a fire much faster than standard sprinklers of the same temperature rating.

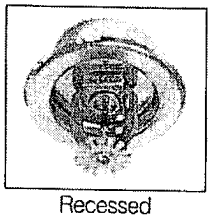

Upright

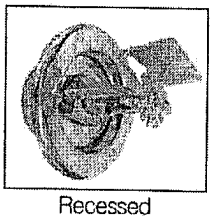

Pendent

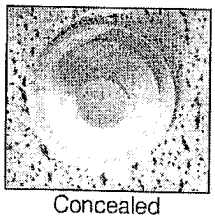

Conventional

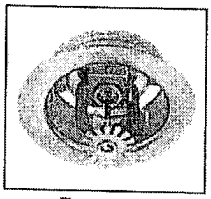

Vertical Sidewall

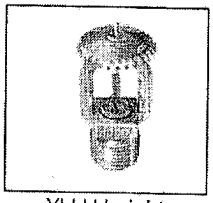

Horizontal Sidewall

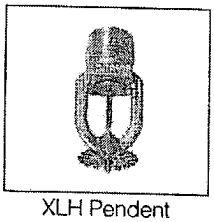

Recessed Pendent/F1/F2

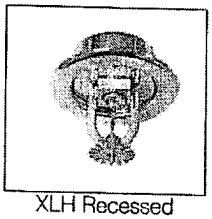

Recessed Horizontal Sidewall

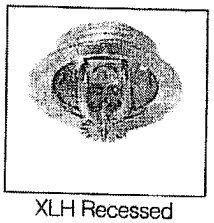

Concealed Pendent


Recessed Pendent/FP


XLH Upright


XLH Pendent


XLH Recessed Pendent F1/F2


XLH Recessed Pendent FP

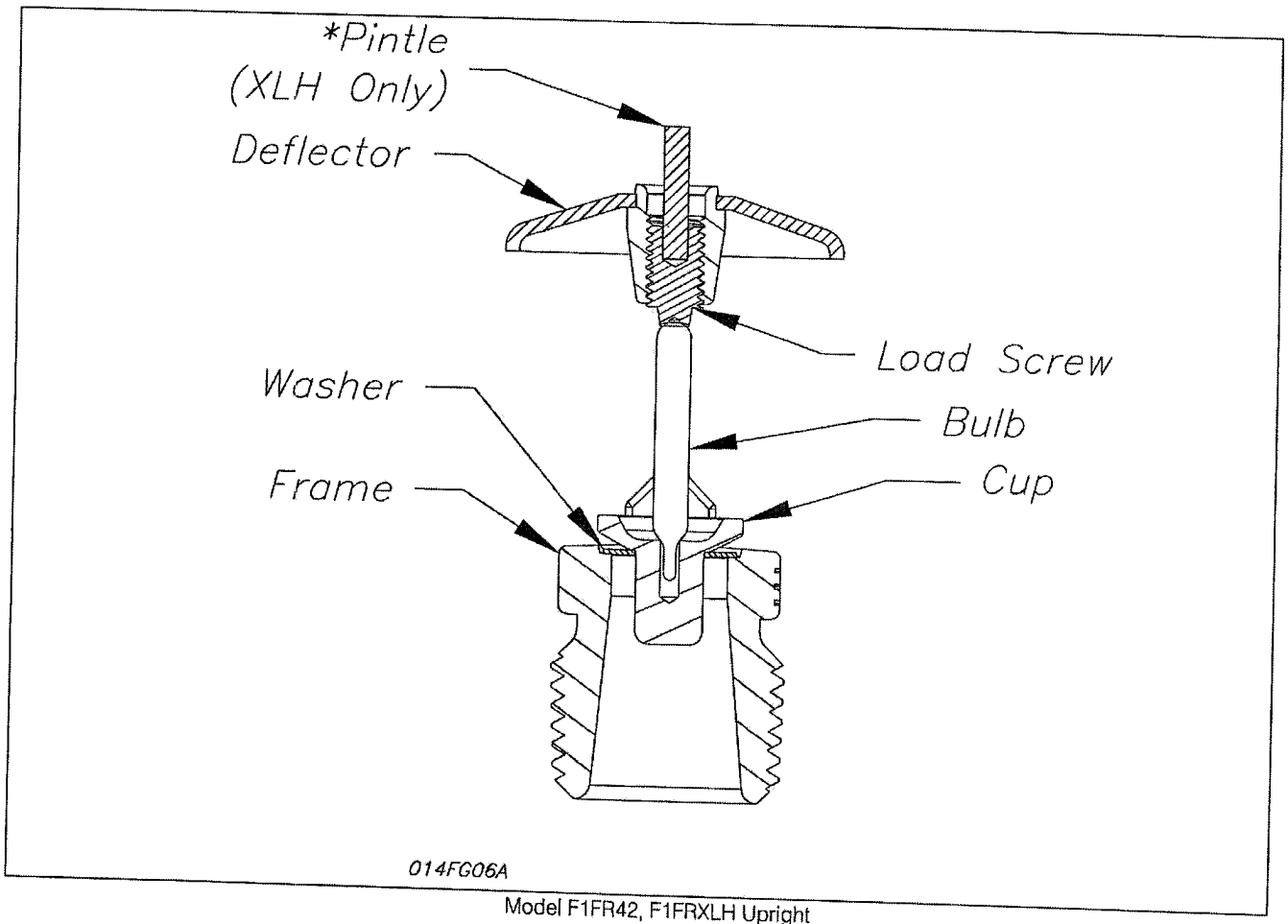
The glass bulb consists of an accurately controlled amount of special fluid hermetically sealed inside a precisely manufactured glass capsule. This glass bulb is specially constructed to provide fast thermal response.

At normal temperatures, the glass bulb contains the fluid in both the liquid and vapor phases. The vapor phase can be seen as a small bubble. As heat is applied, the liquid expands, forcing the bubble smaller and smaller as the liquid pressure increases. Continued heating forces the liquid to push out against the bulb, causing the glass to shatter, opening the waterway and allowing the deflector to distribute the discharging water.

The Reliable Automatic Sprinkler Co., Inc., 103 Fairview Park Drive, Elmsford, New York 10523

Application

Quick response sprinklers are used in fixed fire protection systems: Wet, Dry, Deluge or Preaction. Care must be exercised that the orifice size, temperature rating, deflector style and sprinkler type are in accordance with the latest published standards of the National Fire Protection Association or the approving Authority Having Jurisdiction. Quick response sprinklers are intended for installation as specified in NFPA 13. Quick response sprinklers and standard response sprinklers should not be intermixed.



Model F1FR42, F1FRXLH Upright

Technical data:

Models	Discharge Coefficient	Response	Thread Size	Max. Working Pressure	Min. Working Pressure	Temperature Rating	Finish
F1FR56 ****F1FR56LL**(1)	K 5.6	Quick Response	1/2" NPT (R1/2)	175 PSI	7 PSI	See "Temperature Ratings" Table.	See "Finish Table"
F1FR42 ****F1FR42LL**(1) **F1FRXLH**	K 4.2						
F1FR28	K 2.8						

(1) Low Lead Sprinklers available only with Temperature Rating 200°F/93°C

Material Data:

Frame	Deflector	Load Screw	*Pintle	Cup	Washer	Bulb
DZR Brass QM Brass **Low Lead Brass	CDA Alloy 260, CDA Alloy 220 or CDA Alloy510	CDA Alloy 360 or CDA Alloy 544	CDA Alloy 360 or CDA Alloy 544	CDA Alloy 651 or CDA Alloy 693	Nickel Alloy 440 or Alloy 360 coated with PTFE Adhesive Tape	Glass

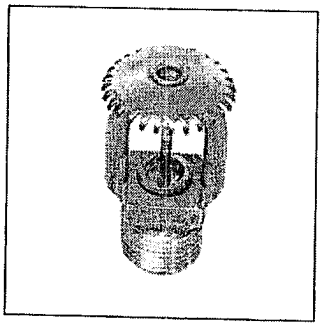
Model F1FR56, Upright, Pendent & Conventional Sprinklers
Model F1FR42, F1FRXLH & F1FR28 Upright & Pendent Sprinklers

Installation Wrench: Model D Sprinkler Wrench

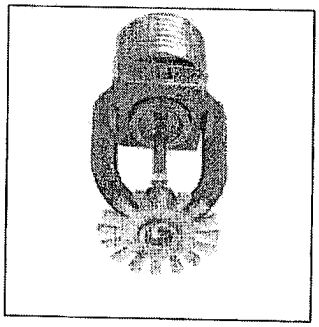
Installation Data:

Nominal Orifice	Thread Size	Nominal K Factor US	Nominal K Factor Metric	Sprinkler Height	Approval Organization	Sprinkler Identification Number (SIN) Upright	Sprinkler Identification Number (SIN) Pendent
Standard-Upright (SSU) and Pendent Deflectors Marked to Indicate Position							
1/2" (15mm) [1]	1/2" NPT (R1/2)	5.6	80	2.25" (57mm)	1,2,3,4	RA1425[1][2][3]	RA1414[1][2][3]
7/16" (10mm)	1/2" NPT (R1/2)	4.2	60	2.25" (57mm)	1	RA1423[1]	RA1413
3/8" (10mm)	1/2" NPT (R1/2)	2.8	40	2.25" (57mm)	1	RA1421[1]	RA1411
Conventional-Install in Upright or Pendent Position							
15mm [1]	1/2" NPT (R1/2)	5.6	80	57mm	3, 4	RA1475[3]	

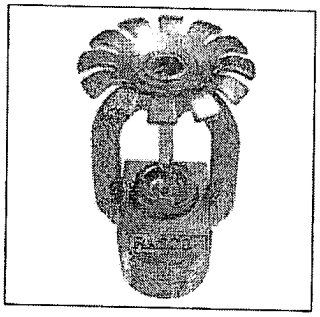
[1] cULus listed corrosion resistant (Polyester coated) sprinkler.
[2] Polyester coated FM approved sprinkler.
[3] Polyester coated LPCB & VdS approved sprinkler RA1425, RA1414 & RA1475.



Upright



Pendent



Conventional

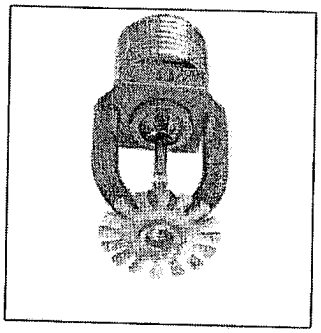
Model F1FR56LL & F1FR42LL Pendent Sprinklers

Installation Wrench: Model D Sprinkler Wrench

Installation Data:

Nominal Orifice	Thread Size	Nominal K Factor US	Nominal K Factor Metric	Sprinkler Height	Approval Organization	Sprinkler Identification Number (SIN) Pendent
Standard-Pendent Deflectors Marked to Indicate Position						
1/2" (15mm) [1]	1/2" NPT (R1/2)	5.6	80	2.25" (57mm)	1,5	RA1414
7/16" (11mm)	1/2" NPT (R1/2)	4.2	60	2.25" (57mm)	1,5	RA1413

[1] cULus listed corrosion resistant (Polyester coated) sprinkler.



Model F1FR56, F1FR42, F1FRXLH & F1FR28 Quick Response Recessed Pendent Sprinkler[1]

Installation Wrench: Model GFR2 Sprinkler Wrench

Installation Data:

Nominal Orifice	Thread Size	K Factor		Sprinkler Height	Sprinkler Identification Number (SIN)
		US	Metric		
1/2" (15mm)	1/2" NPT(R½)	5.6	80	2.25" (57mm)	RA1414
7/16" (10mm)	1/2" NPT (R1/2)	4.2	60	2.25" (57mm)	RA1413
3/8" (10mm)	1/2" NPT (R1/2)	2.8	40	2.25" (57mm)	RA1411

[1] Refer to escutcheon data table for approvals & dimensions

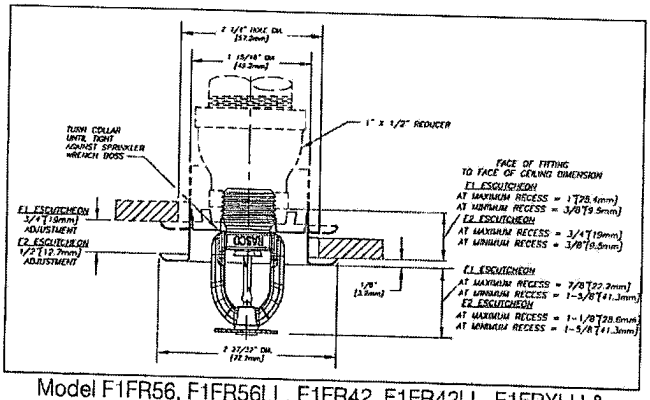
Model F1FR56LL & F1FR42LL Quick Response Recessed Pendent Sprinkler[1]

Installation Wrench: Model GFR2 Sprinkler Wrench

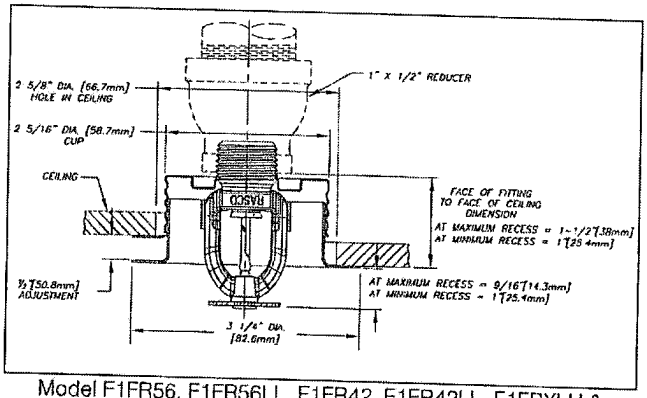
Installation Data:

Nominal Orifice	Thread Size	K Factor		Sprinkler Height	Sprinkler Identification Number (SIN)
		US	Metric		
1/2" (15mm)	1/2" NPT(R½)	5.6	80	2.25" (57mm)	RA1414
7/16" (10mm)	1/2" NPT (R1/2)	4.2	60	2.25" (57mm)	RA1413

[1] Refer to escutcheon data table for approvals & dimensions



Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 F1 or F2



Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 FP

Model F1FR56 Quick Response Vertical Sidewall Sprinkler

Installation Wrench: Model D Sprinkler Wrench

Installation Position: Upright or Pendent

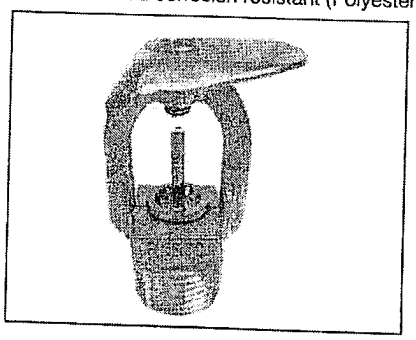
Approval Type: Light Hazard Occupancy

Installation Data:

Nominal Orifice	Thread Size	Nominal K Factor		Sprinkler Height	Approval Organizations	Sprinkler Identification Numbers (SIN)
		US	Metric			
½" (15mm)	½" NPT (R1/2)	5.6	8.0	2.25" (57mm)	1,2,3,4	RA1485[2]
15mm	½" NPT (R1/2)	5.6	8.0	2.25" (57mm)	4[1]	

[1] LPC Approval is for pendent position only.

[2] cULus Listed corrosion resistant (Polyester coated) sprinkler.



Vertical Sidewall

Sprinkler Type	Deflector to Ceiling Distance (Min. - Max.)
Upright	4" (102mm) - 12" (305mm)
Pendent	4" (102mm) - 12" (305mm)

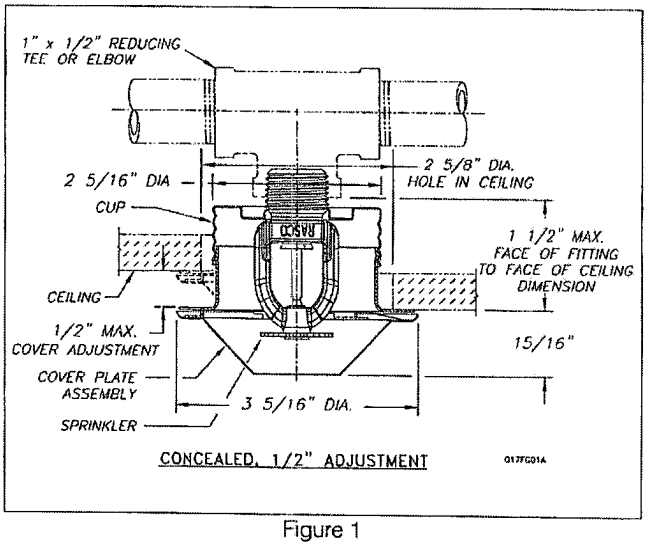


Figure 1

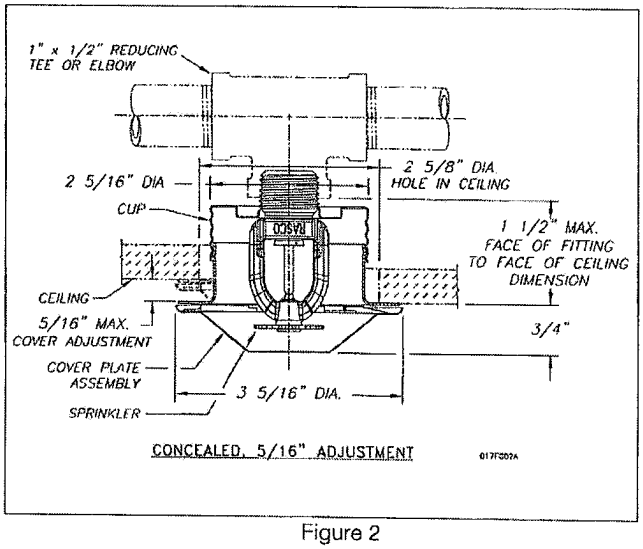


Figure 2

Installation Aid

A protective cap is included for use during installation.

Important: The F1FR56 Sprinkler with Model CCP cover plate is not an FM Approved combination.

Installation

Quick response sprinklers are intended for installation as specified in NFPA 13. Quick response sprinklers and standard response sprinklers should not be intermixed.

The Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Recessed Quick Response Sprinklers are to be installed as shown. The Model F1 or F2 Escutcheons illustrated are the only recessed escutcheons to be used with the Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Sprinklers. The use of any other recessed escutcheon will void all approvals and negate all warranties.

When installing Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Sprinklers, use the Model D Sprinkler Wrench. Use the Model GFR2 Wrench for installing F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Recessed Pendent Sprinklers. Any other type of wrench may damage these sprinklers.

NOTE: A leak tight ½" NPT (R1/2) sprinkler joint can be obtained with a torque of 8-18 ft-lbs (10,8 - 24,4 N-m). Do not tighten sprinklers over maximum recommended torque. It may cause leakage or impairment of the sprinklers.

The Models F1FR56/CCP & F1FR56LL/CCP Concealed Sprinkler use the ½" orifice, ½" NPT (R1/2), Model F1FR56 & F1FR56LL Pendent Sprinkler with a threaded Model CCP cup which is factory attached to the sprinklers. The Model F1FR56 Pndent is available in temperature rating of 135°F (57°C), 155°F (68°C), 175°F (79°C) or 200°F (93°C). The Model F1FR56LL Pendent is available only in a rating of 200°F (93°C). The concealed sprinkler assemblies are completed by the installation of the attractive low profile Model CCP push on cover plate assembly, rated 135°F (57°C) or 165°F (74°C) for the F1FR56 and 165°F (74°C) for the FIFR56 LL. The cover plate and sprinkler cup assemblies are joined using a cover plate skirt with flexible tabs for threaded engagement. A choice of two cover plate assemblies provide either 1/2" (13mm) or 5/8" (8mm) of cover adjustment,

Do not install these sprinklers in ceiling which have positive pressure in the space above.

After a $2^5/_8$" (67mm) diameter hole is cut in the ceiling, the sprinkler is easily installed with the Model RC1 Wrench. A Teflon* based thread sealant should be applied to the sprinkler threads only. The Model RC1 Wrench is then used to engage the sprinkler wrenching surfaces and to install the sprinkler in the fitting. When inserting or removing the wrench from the sprinkler/cup assembly, care should be taken to prevent damage to the sprinkler. DO NOT WRENCH ON ANY OTHER PART OF THE SPRINKLER. The cover plate is then pushed onto the cup. Final adjustment is made by hand turning the cover plate until the skirt flange makes full contact with the ceiling. Cover plate removal requires turning in the counter clockwise direction.

After installation, inspect all sprinklers to ensure that there is a gap between the cover plate and ceiling and that the four cup slots are open and free from any air flow impediment to the space above.

Concealed cover plate/cup assemblies are listed only for use with specific sprinklers. The use of any other concealed cover plate/cup assembly with the Model F1FR56 Pendent Sprinkler or the use of the Model CCP Concealed cover plate assembly on any sprinkler with which it is not specifically listed my prevent good fire protection and will void all guarantees, warranties, listings and approvals.

Glass bulb sprinklers have orange bulb protectors to minimize bulb damage during shipping, handling and installation. REMOVE THIS PROTECTION AT THE TIME THE SPRINKLER SYSTEM IS PLACED IN SERVICE FOR FIRE PROTECTION. Removal of the protectors before this time may leave the bulb vulnerable to damage. RASCO wrenches are designed to install sprinklers when covers are in place. REMOVE PROTECTORS BY UNDOING THE CLASP BY HAND. DO NOT USE TOOLS TO REMOVE THE PROTECTORS.

*DuPont Registered Trade Mark

Temperature Ratings

Classification	Sprinkler Temperature		Max. Ambient Temp.	Bulb Color
	°C	°F		
Ordinary	57	135	100°F (38°C)	Orange
Ordinary	68	155	100°F (38°C)	Red
Intermediate	79	175	150°F (66°C)	Yellow
Intermediate	93	200	150°F (66°C)	Green
High [1]	141	286	225°F (107°C)	Blue

[1] Not available for recessed sprinklers.

Escutcheon Data [1]

[1] SIN RA1435 – cULus permits use with F1, F2 or FP escutcheons for "light hazard" only, while FM limits use for same hazard with F2 escutcheon only.

Maintenance

The Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH and Model F1FR56, F1FR56LL, F1FR42, F1FR42LL, F1FRXLH & F1FR28 Recessed Sprinklers should be inspected quarterly and the sprinkler system maintained in accordance with NFPA 25. Do not clean sprinklers with soap and water, ammonia or any other cleaning fluids. Remove dust by using a soft brush or gentle vacuuming. Remove any sprinkler which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Prior to installation, sprinklers should be maintained in the original cartons and packaging to minimize the potential for damage to sprinklers that would cause improper operation or non-operation.

Sprinkler Types

Standard Upright
Standard Pendent
Conventional
Recessed Pendent
Vertical Sidewall
Horizontal Sidewall
Recessed Horizontal sidewall
Concealed pendent

Maximum Working Pressure

175 psi (12 bar)
100% Factory tested hydrostatically to 500 psi (34.5 bar)

Finishes [1]

Standard Finishes		
Sprinkler	**Escutcheon**	**Cover plate[1]**
Bronze Chrome Plated Polyester Coated [4][5][6]	Brass Chrome Plated White Painted	Chrome White
Special Application Finishes		
Sprinkler	**Escutcheon**	**Cover plate[1]**
Bright Brass [3] Black Plated Black Paint [2][6] Off White [2][6] Satin Chrome	Bright Brass Black Plated Black Paint Off White Satin Chrome	Bright Brass Satin Off White Black Paint Black Plated

[1] Other finishes and colors are available on special order. Consult the factory for details. Custom color painted sprinklers may not retain their UL Corrosion resistance listing. Coverplate custom paint is semi-gloss, unless specified otherwise.
[2] cULus Listed only.
[3] 200°F (93°C) maximum.
[4] cULus listed "corrosion resistance" applies to SIN Numbers RA1435 (HSW), RA1485(VSW), RA1425 (Upright), RA1414 (Pendent) and RA1415 (Pendent) in standard black or white. Corrosion resistance in other polyester colors is available upon request.
[5] FM Approvals finish as "Polyester coated" applies to SIN Number RA1414, RA1435 and RA1425 in standard black or white.
[6] LPCB and VdS Approved finish applies only to RA1425, RA1414 and RA1475.

Ordering Information

Specify:

1. Sprinkler Model
2. Sprinkler Type
3. Orifice Size
4. Deflector Type
5. Temperature Rating
6. Sprinkler Finish
7. Escutcheon Type
8. Escutcheon Finish (where applicable)
9. Cover plate Model
10. Cover plate Thread size
11. Cover plate Temperature
12. Cover plate Adjustment
13. Cover plate Finish

Note: When Model F1FR56 Recessed sprinklers are ordered, the sprinklers and escutcheons are packaged separately.

Anvil® Cast Iron & Malleable Iron Threaded Fittings



Manufactured in Columbia, PA USA, Anvil offers the most complete line of Cast Iron and Malleable Iron Threaded Fittings in the industry. Our versatile range of fittings is designed to provide connection options for different applications and environments.

Cast Iron (Gray Iron) Threaded Fittings are manufactured in accordance with ASME/ANSI B14.4 and are UL/ULC listed and FM approved.

Malleable Iron Fittings are manufactured in accordance with ASME/ANSI B16.3 and Unions ASME/ANSI B16.39 and are available in Class 150, Class 250, and Class 300 UL/ULC listed and FM approved. In both classes, all Elbows and Tees ⅜" and larger are 100% air tested at a minimum of 100 psi (6.9 bar).

Cast Iron Flanged Fittings are manufactured in accordance with ASME B16.1 and are available in both Class 125 and Class 250.

Anvil® Steel Pipe Nipples & Steel Pipe Couplings

Anvil offers a variety of Steel Pipe Nipples and Steel Pipe Couplings for the fire protection industry.

Anvil's Steel Pipe Nipples are manufactured in accordance with ASTM/ANSI A 733 welded and seamless carbon steel pipe nipples. Materials include black and hot-dipped galvanized finishes. Anvil manufactures a wide range of stock pipe nipples in ⅛" diameter through 8" diameter close through 72" inch length in half-inch increments. We also offer standard nipple packs ranging from one each (close to 6") and standard six packs which offer multiple counts of each. Cartons are packed with handles for easy carrying.

Steel Pipe Couplings are manufactured in accordance with ASTM specification A 865. Straight-tapped couplings range in size from ⅛" NPS through 2" NPS, while 2½" NPS and larger are taper tapped.

SPF™ Ductile Iron & Cast Iron Threaded Fittings

SPF Ductile Iron Threaded Fittings are UL/ULC Listed and FM Approved for 500 psi service. These fittings provide a dependable threaded connection and are available in a range of styles and specifications. All SPF Ductile Iron Threaded Fittings dimensions conform to ANSI B16.3 Class 150 requirements, and threads are NPT per ANSI/ASME B1.20.1.

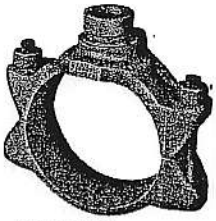
SPF Cast Iron Threaded Fittings are UL/ULC Listed and FM Approved for 300 psi service. These fittings are available in a range of styles and specifications. All SPF Cast Iron Threaded Fittings dimensions conform to ANSI B16.4 requirements, and threads are NPT per ANSI/ASME B1.20.1.



VICTAULIC® IS AN ISO 9001 CERTIFIED COMPANY

Styles 920 and 920N Mechanical-T® Bolted Branch Outlets

PRODUCT DESCRIPTION



Styles 920 and 920N



Style 920 Cross

VdS UL FM ULC

See Victaulic publication 10.01 for details.

See chart on page 4 for pressure ratings.

Victaulic Mechanical-T® Outlet provides a direct branch connection at any location a hole can be cut in pipe. The hole is cut oversize to receive a "holefinder" locating collar which secures the outlet in position permanently. A pressure responsive gasket seals on the pipe O.D.

Cross-type connections can be achieved by utilizing two upper housings of the same style and size, with the same or differing branch size connections. NOTE: Style 920 and Style 920N housings **cannot** be mated to achieve a cross connection.

Style 920 and Style 920N Mechanical-T outlets are available with grooved or female threaded outlet. Specify choice on order. Units are supplied painted with plated bolts. Galvanized housings are available, supplied with plated bolts.

All sizes of Style 920 and 920N are rated at 500 psi (3450 kPa) working pressure on Schedule 10 and 40 carbon steel pipe. They may also be used on high density polyethylene or polybutylene (HDPE) pipe. Pressure ratings on HDPE are dependent on the pipe rating. Contact Victaulic for ratings on other pipe. **Style 920 and 920N are not recommended for use on PVC plastic pipe.**

Standard piping practices dictate that the Mechanical-T Styles 920 and 920N must be installed so that the main and branch connections are a true 90° angle when permanently attached to the pipeline surface.

MATERIAL SPECIFICATIONS

Housing/Coating: Ductile iron conforming to ASTM A-395, grade 65-45-15, and ASTM A-536, grade 65-45-12, with orange enamel coating.

- **Optional:** Hot dipped galvanized

Gasket: (Specify choice*)

- **Grade "E" EPDM**
  EPDM (Green color code). Temperature range –30°F to +230°F (–34°C to +110°C). Recommended for cold and hot water service within the specified temperature range plus a variety of dilute acids, oil-free air and many chemical services. UL Classified in accordance with ANSI/NSF 61 for cold +86°F (+30°C) and hot +180°F (+82°C) NOT RECOMMENDED FOR PETROLEUM SERVICES.
- **Grade "T" nitrile**
  Nitrile (Orange color code). Temperature range –20°F to +180°F (–29°C to +82°C). Recommended for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range. Not recommended for hot water services over +150°F (+66°C) or for hot dry air over +140°F (+60°C).

*Services listed are General Service Recommendations only. It should be noted that there are services for which these gaskets are not recommended. Reference should always be made to the latest Victaulic Gasket Selection Guide for specific gasket service recommendations and for a listing of services which are not recommended.

Bolts/Nuts: (Styles 920 and 920N) Heat treated carbon steel zinc plated to ASTM B-633, track-head conforming to physical properties of ASTM A-183 minimum tensile 110,000 psi (758340 kPa).

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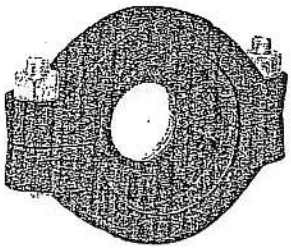
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Victaulic®

Vic-Plus™ Gasket System PATENT PENDING

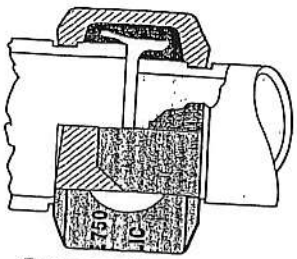
Style 750 Reducing Coupling

PRODUCT DESCRIPTION



The Style 750 Reducing Coupling permits direct reduction on the piping run. Designed to replace two couplings and a reducing fitting, the Style 750 features a special reducing gasket for pressure responsive sealing. A steel washer which prevents telescoping of the smaller pipe inside the larger pipe during vertical systems assembly is available upon request

Vic-Plus Gasket System: Victaulic® now offers a gasket system which requires no field lubrication. The Vic-Plus™ System (patent pending) is dry, clean, and non-toxic. It reduces assembly time substantially and eliminates the mess and chance of over-lubrication.

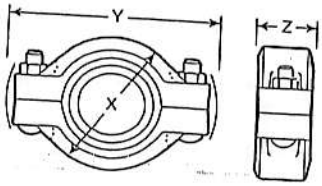


Exaggerated for Clarity

UL UL FM

See Victaulic publication 10.01 for details.

DIMENSIONS



SIZE Nominal Inches Actual mm	Max. Work Pres. PSI* kPa	Max. End Load Lbs.** N	Allow. Pipe End † Sep. In. mm	Deflect. Fr. C_L † Per Cplg. Deg.	Deflect. Fr. C_L † Pipe In./Ft. mm/m	@ Bolt/Nut No. - Size Inches	Dimensions Inches/millimeters X	Y	Z	Aprx. Wgt. Each Lbs. kg
2 × 1 60,3 × 33,7	350 2410	1000 4450	0 – 0.07 0 – 1,8	0°- 57′	0.20 17	2 - ⅜ × 2	3.38 85	5.25 133	1.88 48	2.0 0,9
× 1½ × 48,3	350 2410	1000 4450	0 – 0.07 0 – 1,8	0°- 57′	0.20 17	2 - ⅜ × 2	3.38 85	5.25 133	1.88 48	2.0 1,0
2½ × 2 73,0 × 60,3	350 2410	1550 6900	0 – 0.07 0 – 1,8	0°- 47′	0.16 14	2 - ⅜ × 2	4.13 105	6.00 152	1.88 48	2.9 1,4
76,1 mm × 2 × 60,3	350 2410	1550 6900	0 – 0.07 0 – 1,8	0°- 47′	0.16 14	2 - ⅜ × 2	4.13 105	6.00 152	1.88 48	4.6 2,1
3 × 2 88,9 × 60,3	350 2410	1550 6900	0 – 0.07 0 – 1,8	0°- 39′	0.13 11	2 - ½ × 2¾	4.75 121	7.13 181	1.88 48	4.6 2,1
× 2½ × 73,0	350 2410	2275 10125	0 – 0.07 0 – 1,8	0°- 39′	0.13 11	2 - ½ × 2¾	4.75 121	7.13 181	1.88 48	4.1 1,9
× 76,1 mm	350 2410	2275 10125	0 – 0.07 0 – 1,8	0°- 39′	0.13 11	2 - ½ × 2¾	4.75 121	7.13 181	1.88 48	4.8 2,2
4 × 2 114,3 × 60,3	350 2410	1550 6900	0 – 0.13 0 – 3,2	1°- 19′	0.28 25	2 - ⅝ × 3¼	6.25 159	8.88 225	2.25 57	8.8 4,0
× 2½ × 73,0	350 2410	2275 10125	0 – 0.13 0 – 3,2	1°- 19′	0.28 25	2 - ⅝ × 3¼	6.25 159	8.88 225	2.25 57	8.3 3,8
× 3 × 88,9	350 2410	3365 14975	0 – 0.13 0 – 3,2	1°- 19′	0.28 25	2 - ⅝ × 3¼	6.25 159	8.88 225	2.25 57	6.6 3,0
4½ × 127,0 × 76,1 mm	350 2410	2275 10125	0 – 0.13 0 – 3,2	1°- 19′	0.28 25	2 - ⅝ × 3¼	6.25 159	8.88 225	2.25 57	6.4 3,8
5 × 4 141,3 × 114,3	350 2410	5565 24765	0 – 0.13 0 – 3,2	1°- 3′	0.22 19	2 - ¾ × 4¼	7.13 181	10.63 270	2.13 54	10.8 4,9
6 × 4 168,3 × 114,3	350 2410	5565 24765	0 – 0.13 0 – 3,2	0°- 52′	0.18 15	2 -¾ × 4¼	8.63 181	11.88 302	2.25 57	16.1 7,3
× 5 × 141,3	350 2410	8500 37825	0 – 0.13 0 – 3,2	0°- 52′	0.18 15	2 -¾ × 4¼	8.50 216	11.88 302	2.25 57	12.6 5,7
165,1 mm × 4 × 114,3	350 2410	5565 24765	0 – 0.13 0 – 3,2	0°- 55′	0.19 16	2 - ¾ × 4¼	8.50 216	11.38 289	2.25 57	15.2 6,9
8 × 6 219,1 × 168,3	350 2410	12000 53400	0 – 0.13 0 – 3,2	0°- 38′	0.13 11	2 - ⅞ × 5	10.75 273	14.75 375	2.50 64	22.3 10,1

Refer to notes on page 2.

Style 750 Reducing couplings should not be used with end caps (#60) in systems where a vacuum may be developed. Contact Victaulic for details.

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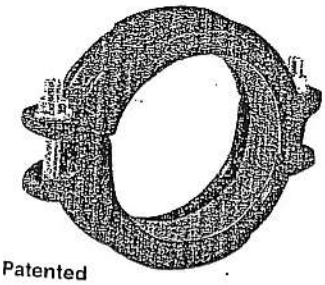
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VicPlus™ Gasket System PATENT PENDING

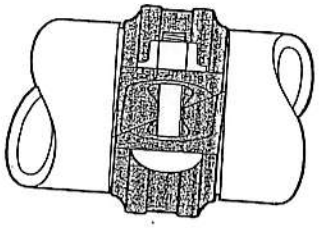
Style 005 FireLock™ Rigid Coupling

with Vic-Plus™ Gasket System

PRODUCT DESCRIPTION



Patented



FireLock™ Style 005 rigid coupling has a unique, patented angle-pad design which allows the housings to offset while clamping the grooves. By permitting the housings to slide on the angled bolt pads, rigidity is obtained.

The FireLock couplings provide rigidity for valve connections, fire mains and long straight runs. Support and hanging requirements correspond to NFPA 13 Sprinkler Systems. Angle-pad design permits assembly by removing one nut/bolt and swinging the housing over the gasket. This reduces components to handle during assembly; speeds and eases installation on pipe grooved to Victaulic specifications.

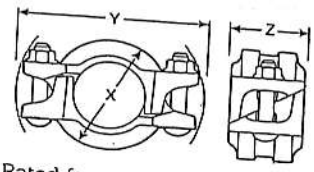
Style 005 FireLock couplings with the Vic-Plus™ Gasket System are designed and recommended for use ONLY on fire protection systems.

Vic-Plus Gasket System: Victaulic® now offers a gasket system which requires no field lubrication. The Vic-Plus™ System (patent pending) is dry, clean, and non-toxic. It reduces assembly time substantially and eliminates the mess and chance of over-lubrication.

UL FM ULC LPC VdS

§ LPC and VdS Approved, see notes on page 2.

DIMENSIONS



Rated for wet and dry sprinkler systems at 350 PSI (2413 kPa) for 1¼ - 4" (42,4 - 114,3 mm) sizes and 300 PSI (2068 kPa) for 4¼ - 8" (108,0 - 219,1 mm) sizes; Schedule 10 roll grooved or Schedule 40 cut or roll grooved steel pipe. Style 005 is rigid and does not accommodate expansion, contraction or angular deflection.

10.02-1D

SIZE Nominal Inches Actual mm	Max. Work. Press. § PSI*/kPa	Max. End Load Lbs.*/N	Allow. Pipe End Sep. † In./mm	@ Bolt/Nut No. - Size Inches/mm	Dimensions Inches/mm X	Y	Z	Aprx. Wgt. Ea. Lbs./kg
1¼ 42,4	350 2413	755 3370	0.05 1,2	2 - ⅜ × 2	2.75 70	4.50 114	1.88 148	1.2 0,5
1½ 48,3	350 2413	990 4415	0.05 1,2	2 - ⅜ × 2	3.00 76	4.75 121	1.88 148	1.2 0,5
2 60,3	350 2413	1550 6900	0.07 1,7	2 - ⅜ × 2½	3.50 89	5.25 133	1.88 148	1.6 0,7
2½ 73,0	350 2413	2270 10110	0.07 1,7	2 - ⅜ × 2½	4.00 102	5.75 146	1.88 148	1.9 0,9
76,1 mm	350 2413	2475 11010	0.07 1,7	2 - ⅜ × 2½	4.13 105	5.75 146	1.88 148	1.9 0,9
3 88,9	350 2413	3365 14985	0.07 1,7	2 - ⅜ × 2½	4.63 118	6.13 156	1.88 148	2.1 1,0
4 114,3	350 2413	5565 24770	0.16 4,1	2 - ⅜ × 2½	5.75 146	7.25 184	2.13 54	3.1 1,4
108,0 mm	300 2068	4255 18940	0.16 4,1	2 - ⅜ × 2½	5.63 143	7.25 184	2.13 54	3.1 1,4
5 141,3	300 2068	7290 32445	0.16 4,1	2 - ½ × 2¾	6.88 175	9.00 229	2.13 54	4.5 2,0
133,0 mm	300 2068	6495 28900	0.16 4,1	2 - ½ × 2¾	6.63 168	9.00 229	2.13 54	4.5 2,0
139,7 mm	300 2068	7125 31715	0.16 4,1	2 - ½ × 2¾	6.88 175	9.00 229	2.13 54	4.8 2,2
6 168,3	300 2068	10340 46020	0.16 4,1	2 - ½ × 2¾	8.00 203	10.00 254	2.13 54	5.0 2,3
159,0 mm	300 2068	9200 40955	0.16 4,1	2 - ⅝ × 4¼	7.63 194	10.00 254	2.13 54	5.5 2,5
165,1 mm	300 2068	9955 44295	0.16 4,1	2 - ½ × 2¾	8.15 207	10.00 254	2.13 54	5.5 2,5
8 219,1	300 2068	17525 78000	0.19 4,8	2 - ⅝ × 4¼	10.50 267	13.13 334	2.63 67	11.3 5,1

* @ § † Refer to notes on page 2.

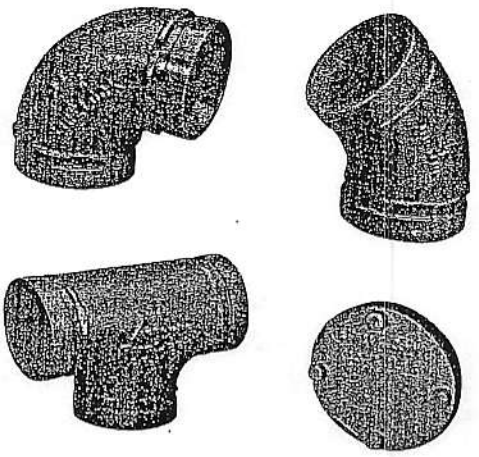
1538 Rev.E 10/00

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FireLock™ Fittings

PRODUCT DESCRIPTION



Patented

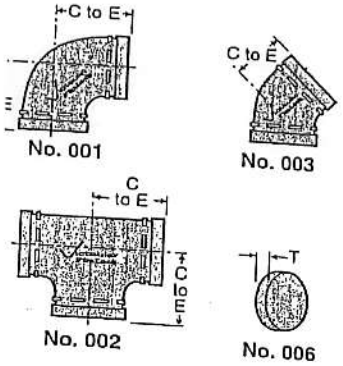
See Victaulic publication 10.01 for details.

FireLock™ products comprise a unique system specifically designed for fire protection services. FireLock full-flow elbows and tees are a CAD-developed, hydrodynamic design that has a shorter center-to-end dimension than standard fittings. A noticeable bulge allows the water to make a smoother turn to maintain similar flow characteristics as standard full flow fittings.

FireLock fittings are designed for use exclusively with Style 005 FireLock couplings. Use of other couplings or flange adapters may result in bolt pad interference.

Victaulic FireLock fittings pressure ratings conform to the ratings of Victaulic FireLock Style 005 couplings.

DIMENSIONS



SIZE Nominal Inches Actual mm	No. 001 90° Elbow C to E Inches mm	No. 001 90° Elbow Aprx. Weight Each Lbs./kg	No. 003 45° Elbow C to E Inches mm	No. 003 45° Elbow Aprx. Weight Each Lbs./kg	No. 002 Straight Tee C to E Inches mm	No. 002 Straight Tee Aprx. Weight Each Lbs./kg	No. 006 Cap Thickness "T" Inches mm	No. 006 Cap Aprx. Weight Each Lbs./kg
1¼ 42,2	– –	– –	– –	– –	– –	– –		
1½ 48,3	– –	– –	– –	– –	– –	– –	0.82 21	0.3 0,1
2 60,3	2.75 70	1.7 0,8	2.00 51	1.8 0,8	2.75 70	2.4 1,1	0.82 21	0.4 0,2
2½ 73,0	3.00 76	3.1 1,4	2.25 57	2.2 1,0	3.00 76	3.6 1,6	0.88 22	0.6 0,3
76,1 mm	3.00 76	3.30 1,5	2.25 57	2.4 1,1	– –	– –	0.88 22	1.0 0,5
3 88,9	3.38 86	4.0 1,8	2.50 64	3.1 1,4	3.38 86	5.3 2,4	– –	– –
4 114,3	4.00 102	6.7 3,0	3.00 76	5.6 2,5	4.00 102	8.7 3,9	0.88 22	1.2 0,5
5 141,3	4.88 124	12.6 5,7	3.25 83	8.3 3,8	4.88 124	15.7 7,1	1.00 25	2.4 1,1
6 168,3	5.50 140	18.3 8,3	3.50 89	11.7 5,3	5.50 140	22.7 10,3	1.00 25	4.1 1,9
8 219,1	6.81 173	25.5 11,6	4.25 108	20.4 9,3	6.94 176	38.7 17,6	1.00 25	5.9 2,7
							1.13 29	12.7 5,8

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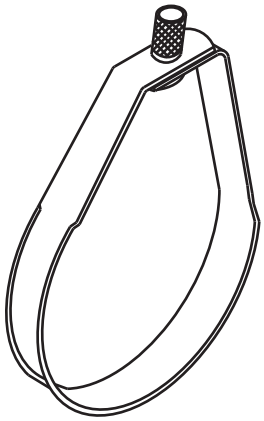
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300

RING HANGER



1 thru 4 inch pipe
LISTED FOR STEEL/CPVC



1/2 & 3/4 inch pipe
5 thru 8 inch pipe

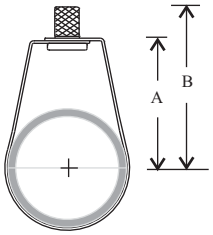
NFPA 13				
PIPE	ROD	1 WT.	5 WT.+250	UL TEST LOAD
1	3/8	30.75	403.75	750
1 1/4	3/8	43.95	469.75	750
1 1/2	3/8	54.15	520.75	750
2	3/8	76.95	634.75	750
2 1/2	3/8	118.35	841.75	850
3	3/8	162.30	1061.50	1050
4	3/8	246.00	1480.00	1500
5	1/2	349.45	1996.75	2000
6	1/2	476.35	2631.75	2650
8	1/2	711.00	3805.00	4050

SIZE - ROD- 3/8" or 1/2"
SIZE - SYSTEM PIPE - 1/2" thru 8"
MATERIAL - Carbon Steel, Mil. Galvanized to G-90 spec.
LISTING/APPROVAL -

c UL us LISTED **203-EX 2551 1"- 8"**
FM **Approval guide - 1"- 8"**
OSHPD OPA-0601 See Website.

CONFORMS WITH: Federal Specification WW-H-171E, Type 10. Manufacturers Standardization Society ANSI/MSS-SP-58 Type 10.
MAXIMUM TEMPERATURE - 650°F.
FUNCTION - Pipe hanger component of an ***AFCON*** hanger. To support steel, CPVC or copper pipe.
INSTALLATION - Per NFPA 13, 13R, 13D, these instructions and the CPVC or copper pipe manufacturers instructions.
FEATURES -
* **Sized and listed exclusively for use with #310 Surge Restrainer.**
* Band edge is offset for EASY pipe insertion.
* Custom fit swivel nut for better retention in ring.

ORDERING - Part #, pipe size.



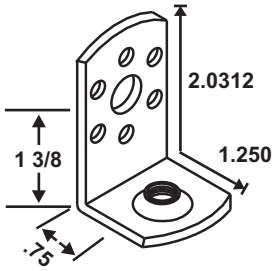
PIPE	A	B
1	1.8793	2.5259
1 1/4	2.1382	2.7850
1 1/2	2.2673	2.9140
2	2.6048	3.2516
2 1/2	3.4920	4.1150
3	3.7845	4.4311
4	4.3582	4.9992
6	6.0668	6.8180
8	7.5768	8.3290

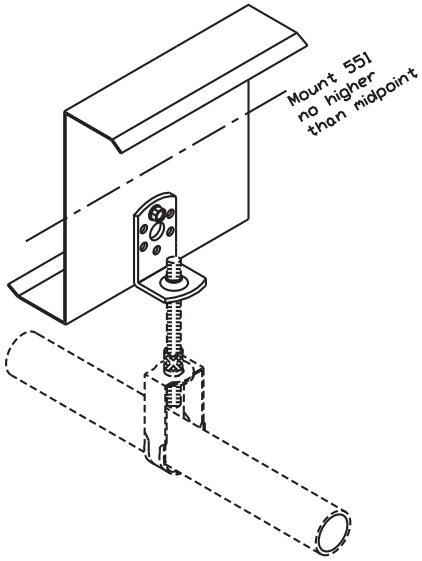
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551

REVOLVER™
TAPPED BRACKET





SIZE - ROD: 3/8"
SIZE - SYSTEM PIPE: 4" max.
MATERIAL - Carbon Steel.
FINISH - Plain, E.G. and S.S.
LISTING/APPROVAL -

c UL us LISTED **203 - EX 2551**

PATENT - No. 6,568,642
FUNCTION - Attachment component of an ***AFCON*** hanger.
To support horizontal piping.
INSTALLATION - Per NFPA 13 and these instructions.
Install on vertical mounting surface.
ASSEMBLY/ATTACHMENT - See drawing.
Center mounting hole accepts 3/8" and 1/2" fasteners.

***FASTENER LOCATION OPTIONS - See chart.**
Vertical - Hangs plumb from first fastener.
Stops wood splitting along the grain.
Horizontal - When vertical space is limited.

c UL us LISTED **FASTENERS PER NFPA 13 FOR STEEL PIPE - SEE TABLE.**

Special Note:
The purlin lip is not capable of supporting **NFPA 13** fire sprinkler pipe at **1(wt.) +250 lbs min.** When purlin manufacturers **specify 200 lbs. max.**



***Fastener Locations**

1 @ B or E	3 @ A - C - E
2 @ B - E	3 @ B - D - F
2 @ A - C	4 @ A - C - D - F

FEATURES
* **Universal fastener array for enhanced mounting.**
* **Radius -Tapped orifice:** Aligns rod for easy thread engagement and eliminates structural deficiencies associated with rod inserts.
* **No speed/pal nuts** required.
ORDERING - Part # and finish.

c UL us LISTED **MOUNTING FASTENERS**

Wood Fastener No Pre-Drill	Qty.	Steel Pipe
1/4 x 1 ½ LB	1	2
	2	4
#14 x 1 ½ SMS	1	2
	2	4
#16 x 2 DS	2	2
	3	4
Wood - Thru 5/8" Gyp.		
1/4 x 2 LB	1	2
	2	4
#14 x 2 SMS	1	2
	2	4

Steel - 1/4 or #14 Tek Min. Thickness	Qty.	Steel Pipe
14 GA.	1	3
	2	4
16 GA.	1	2 ½
	2	4
18 GA.	1	2 ½
	2	3
	3	4
20 GA.	* 1	2
* @ B ONLY	2	3
	3	4
22 GA.	3	2 ½

Steel - #10 SMS or #905 Min. Thickness	Qty.	Steel Pipe
18 GA.	1	2 ½
	2	3
	3	4
20 GA.	2	3
	4	4
22 GA.	3	3

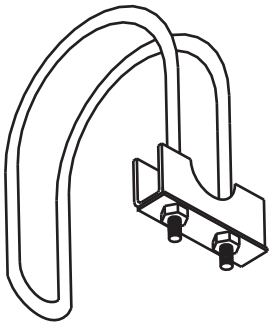
SMS = Sheet Metal Screw
DS= Drive Screw
LB = Lag Bolt
Gyp= Gypsum Board

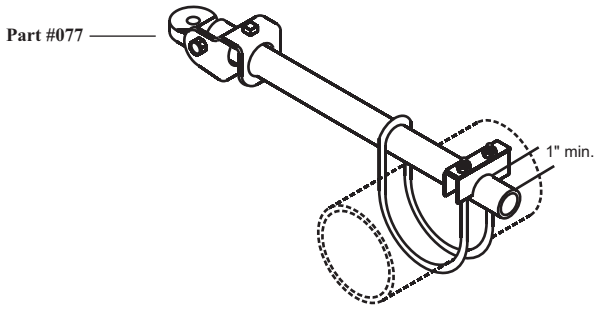
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001/020

SWAY BRACE FITTING
MODEL E





Load Ratings		
Size	FM Sch. 10	FM Sch. 40
1	250	1000
1 1/4	250	1000
1 1/2	250	1000
2	1000	1300
2 1/2	800	1300
3	800	1300
4	800	1500

SIZE - SYSTEM PIPE: Nominal
Steel 1" thru 4" Sch. 10 and Sch. 40
SIZE - BRACE PIPE: 1" or 1 1/4" Sch. 40
MATERIAL - Carbon Steel or **S.S. (Type 304).**
FINISH - Plain or E.G.
LISTING/APPROVAL -

FM **FM Approved - 1950**
OSHPD See Website.

FUNCTION - Lateral fitting of an ***AFCON*** sway brace assembly.
Sway brace assemblies are intended to be installed in accordance with NFPA 13 and the manufacturer's installation instructions.
INSTALLATION - Per these instructions including NFPA 13 and 13R.
Load rating - see chart.
Align brace pipe perpendicular to system pipe.
ASSEMBLY - See drawing.
Combine with proper ***AFCON*** components- **see disclaimer below**.
Insert brace pipe through rod bend and under channel bracket to achieve minimum 1" extension.
Tighten hex nuts until gage spring lays flat or torque to 165 in.-lbs.
FEATURES
* Visual inspection, verifies proper installation.
ORDERING - Part #, size - system pipe, size - brace pipe and finish.

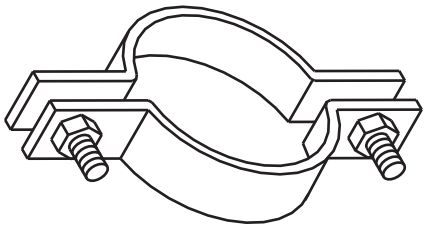
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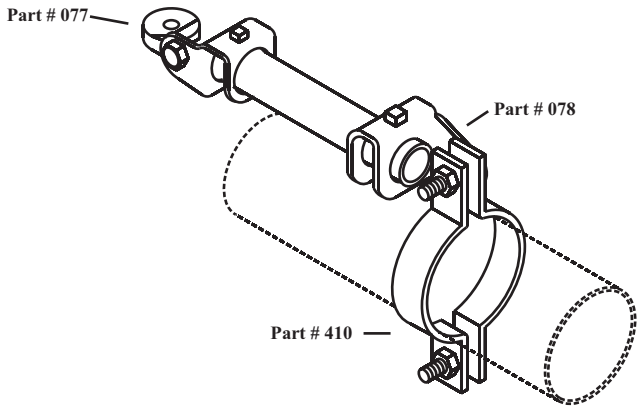
Specific ***AFCON*** products are exclusively designed to be compatible **ONLY** with other ***AFCON*** products including parts and fasteners, resulting in a listed sway brace, restrainer or hanger assembly. **Be advised** the following warranty restriction will apply. **DISCLAIMER** - ***AFCON*** will **NOT** warrant against the failure of its products when used in combination with other products, parts or systems not manufactured or sold by ***AFCON***. ***AFCON*** shall **NOT** be liable under any circumstances whatsoever for any direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business or profit, when non-***AFCON*** products have been, or are used.

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410

SWAY BRACE FITTING





SIZE - SYSTEM PIPE: Nominal Pipe Size
Sch. 40 Steel 1" thru 8"
Sch. 10 Steel 1 1/4" thru 8"
MATERIAL - Carbon Steel
FINISH - Plain or E.G.
LISTING/APPROVAL -

c UL us LISTED **203A-EX 2625**
203-EX 2551 (4"-8" Only)
OSHPD OPA-0601 See Website.

Horizontal Load Ratings	
Size	**UL**
1" - 4"	1000
6" - 8"	2015

FUNCTION - Longitudinal fitting of an ***AFCON*** sway brace assembly. Sway brace assemblies are intended to be installed in accordance with NFPA 13 and the manufacturer's installation instructions.
INSTALLATION - Per NFPA 13 and these instructions.
Load rating - see chart.
Align brace pipe parallel to system pipe.
ASSEMBLY - See drawing.
Combine with proper ***AFCON*** components- **see disclaimer below**.
Align brace member parallel through 410 bolt flanges.
Tighten bolts to 40 ft. lbs.
ORDERING - Part #, size - system pipe and finish.

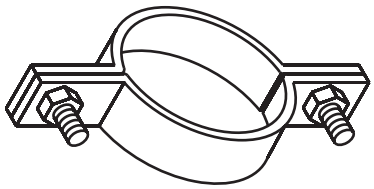
CAD

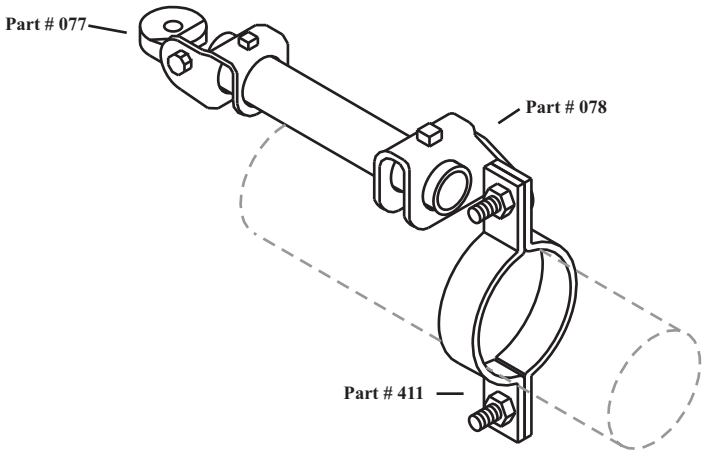
Specific ***AFCON*** products are exclusively designed to be compatible **ONLY** with other ***AFCON*** products including parts and fasteners, resulting in a listed sway brace, restrainer or hanger assembly. **Be advised** the following warranty restriction will apply. **DISCLAIMER** - ***AFCON*** will **NOT** warrant against the failure of its products when used in combination with other products, parts or systems not manufactured or sold by ***AFCON***. ***AFCON*** shall **NOT** be liable under any circumstances whatsoever for any direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business or profit, when non-***AFCON*** products have been, or are used.

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411

SWAY BRACE FITTING





SIZE - SYSTEM PIPE: Nominal Pipe Size
1" - 12" Steel - Sch. 40
1 1/4" - 12" Steel - Sch. 10
MATERIAL - Carbon Steel
FINISH - Plain or E.G.
PATENT - No. 7,140,579
LISTING/APPROVAL

c UL us LISTED **203A-EX 2625**

FM APPROVED **FM Approved - 1950**
OSHPD See Website.

Listed Max. Horizontal Load					
System NPS	Sch.	30°-44°	45°-59°	60°-89°	90°
1" - 1 1/2"	10-40	1383	1956	2394	2765
2" - 4"	7-40	1383	1956	2394	2765
5" - 6"	7-40	1383	1956	2394	2765
8"	10-40	1383	1956	2394	2765
10"	10-40	1383	1956	2394	2765
12"	10-40	1870	2645	3238	3740

Certified Max. ASD Horizontal Load					
System NPS	Sch.	30°-44°	45°-59°	60°-74°	75°-90°
1" - 1 1/2"	10 - 40		420	510	570
2" - 3"	7 - 40		860	1030	1150
4"	7 - 40		860	1030	1150
5"	7 - 40		950	1150	1280
6"	7 - 40		2220	2220	3040
8"	10 - 40		1340	1620	1810

FUNCTION - Longitudinal fitting of an AFCON sway brace assembly. Sway brace assemblies are intended to be installed in accordance with NFPA 13 and the manufacturer's installation instructions.
INSTALLATION - Per these instructions including NFPA 13 or FM 2-8
Load rating - see chart.
ASSEMBLY - See drawing.
Combine with proper ***AFCON*** components- **see disclaimer below**.
Align brace member parallel to face of 411 bolt flanges.
Tighten 411 bolts until flanges are flat to flat.
FEATURES
* **Patented** - design eliminates bending of ears during installation.
* **Patented** - design prevents over tightening on system pipe.
* **Improved assembly** - ears connected for superior strength.
* Visual inspection - proper installation when 411 bolt flanges are together.

ORDERING - Part #, size - system pipe and finish.

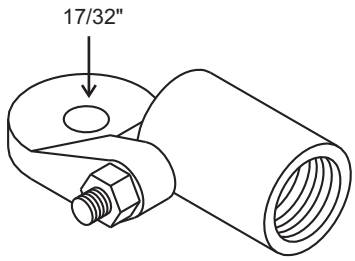
CAD

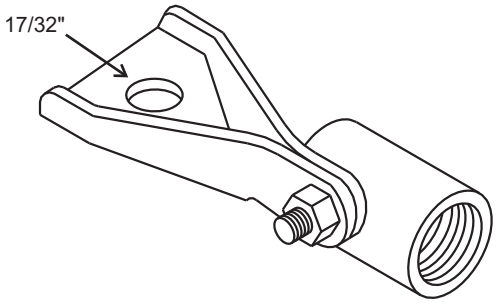
Specific ***AFCON*** products are exclusively designed to be compatible **ONLY** with other ***AFCON*** products including parts and fasteners, resulting in a listed sway brace, restrainer or hanger assembly. **Be advised** the following warranty restriction will apply. **DISCLAIMER** - ***AFCON*** will **NOT** warrant against the failure of its products when used in combination with other products, parts or systems not manufactured or sold by ***AFCON***. ***AFCON*** shall **NOT** be liable under any circumstances whatsoever for any direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business or profit, when non-***AFCON*** products have been, or are used.

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070

ATTACHMENT FITTING
THREADED





SIZE - BRACE PIPE: 1" thru 2" Sch. 40.
MATERIAL - Carbon steel and ductile iron
FINISH - Plain or E.G.
LISTING/APPROVAL -

c UL us LISTED **203A-EX 2625**
OSHPD See Website.

FUNCTION - Structural attachment fitting of an ***AFCON*** sway brace assembly. Sway brace assemblies are intended to be installed in accordance with NFPA 13 and the manufacturer's installation instructions.
INSTALLATION - Per these instructions including NFPA 13.
Load rating - see chart.
ASSEMBLY
Combine with proper ***AFCON*** components- **see disclaimer below**.
FEATURES
* Swivel allows attachment at any angle.
* Larger fastener hole available.- Consult factory.
ORDERING - Part #, size-brace pipe and finish.

Max. Horizontal Load		
Size 1-2	UL	
Ductile Base	2765	
Steel Base	2015	

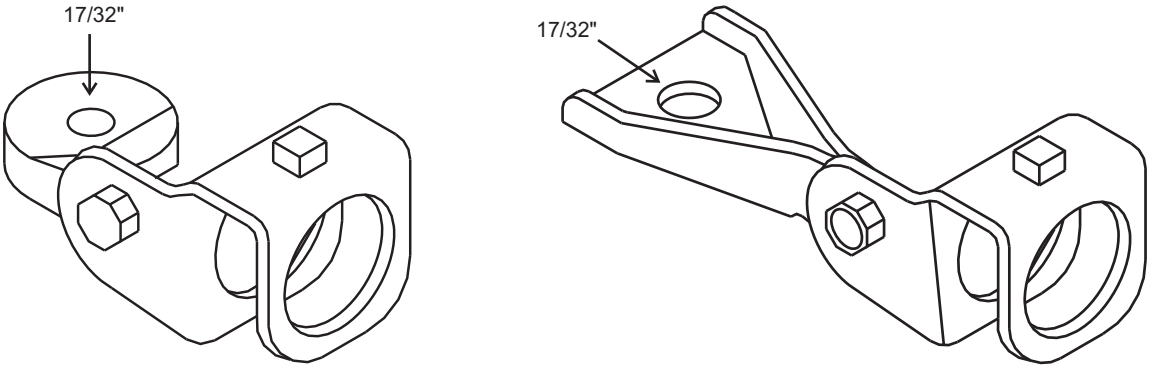
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CAD

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077

ATTACHMENT FITTING
LOCKING



SIZE - BRACE PIPE: 1" and 1 1/4" Sch. 40
MATERIAL - Carbon Steel, Ductile Iron or **S.S. (Type 304).**
FINISH - Plain or E.G.
LISTING/APPROVAL -

c UL us LISTED **203A-EX2625**
FM **FM Approved - 1950**
OSHPD See Website.

FUNCTION - Structure attachment fitting of an ***AFCON*** sway brace assembly. Sway brace assemblies are intended to be installed in accordance with NFPA 13 and the manufacturer's installation instructions.

INSTALLATION - Per these instructions
including NFPA 13 FM 2-8.
Load rating - see chart.

ASSEMBLY
Combine with proper ***AFCON*** components- **see disclaimer below**.
Insert brace pipe thru fitting near pivot bolt.
Tighten set bolt until head contacts bracket.

FEATURES
* Swivel allows attachment at any angle.
* Visual inspection, verifies proper installation.
* Larger fastener hole available.- Consult factory.

ORDERING - Part #, size - brace pipe and finish.

Max. Horizontal Load		
Size 1-2	UL	FM
Ductile Base	2015	1500
Steel Base	2015	---

Specific ***AFCON*** products are exclusively designed to be compatible **ONLY** with other ***AFCON*** products including parts and fasteners, resulting in a listed sway brace, restrainer or hanger assembly. **Be advised** the following warranty restriction will apply. **DISCLAIMER** - ***AFCON*** will **NOT** warrant against the failure of its products when used in combination with other products, parts or systems not manufactured or sold by ***AFCON***. ***AFCON*** shall **NOT** be liable under any circumstances whatsoever for any direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business or profit, when non-***AFCON*** products have been, or are used.

CAD

Fireriser® Butterfly Valve

Grooved Butterfly Valves, UL、ULC Listed/FM Approved

Fig.No.:HPG

Specifications

Working Pressure: 300 PSI (21Bars)
Max.Test Pressure: 600 PSI (42.8 Bars)
Max.Working Temp: 250°F (120°C)
Factory installed UL, listed double Tamper Switches
Valve Approved For Indoor and Outdoor Use



Primary Materials:

Component	Material
Body	ASTM A-536 Nylon-11 Coated
Disc	ASTM B-536 EPDM Encapsulated
Upper&Lower Stems	AISI 420-SS
Worn Gear Shaft	AISI 410-SS
Housing	ASTM A-536
Hand Wheel	ASTM A-536
Flag indicator	ASTM A-536
Shear Pin	ASTM A-510
Segment Gear	EPDM Grade"E" ASTM B-148 or B-584
Housing Gasket	EPDM Grade"E"
O-Rings (All)	EPDM Grade" E"

Dimensions(mm/inch):

Size	A	B	C	D	E	F	G	H
2-1/2"	4.1(106)	3.3(85)	3.80(96.4)	2.8(73.0)	5.31(136)	5.04(128)	5.04(128)	
3"	4.4(112)	3.6(92)	3.80(96.4)	3.50(83.9)	5.99 (142)	5.04(128)	5.04(128)	
4"	5.7(145)	4.34(108)	4.54(115.4)	4. 50(114.3)	6.89(173)	5.04(128)	5.04(128)	
6"	7.1(180)	5.7(146)	5.21(132.4)	6.6(168.3)	8.23(209)	8.66(220)	8.66(220).	0.28(7.10)
8"	8.0(204)	6.7(170)	5.80(147.4)	8.63(219.1)	9.21 (234)	8.66(220)	8.66(220).	0.9(24.0)
10"	8.98(224)	7.88(200)	6.26(199)	10.75(273)	10.16(256)	9.65(245)	11.23(289)	
12"	10.52(267)	9.14(232)	6.50(65.1)	11.10(297)	9.65(245)	9.65(245)	11.23(289)	

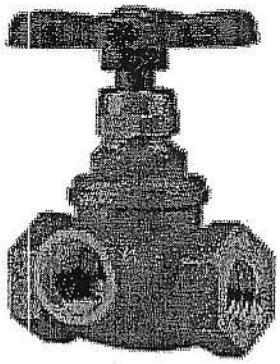
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400 lb. WWP Bronze Side Outlet Globe Valves

Dezincification Resistant

Fire Protection Valve • 3-Way Valve • Screw-in Bonnet • Integral Seat • Renewable Disc

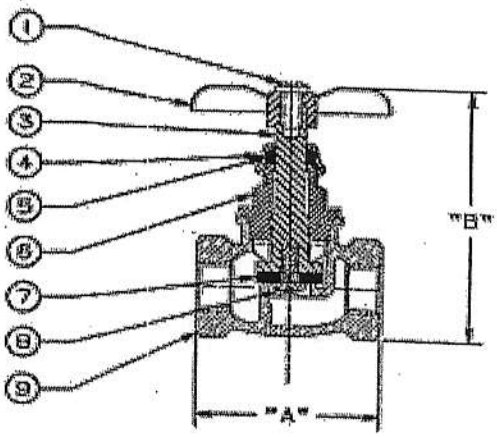
400 PSI/27.6 Bar Non-Shock Cold Water



KT-291-W3
Threaded

MATERIAL LIST

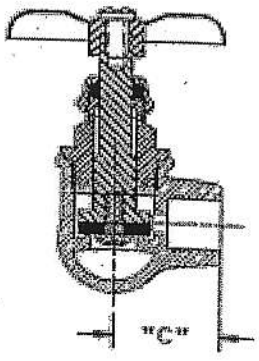
	PART	SPECIFICATION
1.	Handwheel Screw	Zinc Plated Steel
2.	Handwheel	Aluminum ASTM B 85 Alloy C38000
3.	Stem	ASTM B 133 Alloy C10200
4.	Packing Nut	ASTM B 16 Alloy C36000
5.	Packing	Non Asbestos Aramid Fibers w/Graphite
6.	Bonnet	Bronze ASTM B 584 Alloy C84400
7.	Disc	Buna-N
8.	Disc Screw	Stainless Steel ASTM A 276 Alloy S43000
9.	Body	Bronze ASTM B 584 Alloy C84400



KT-291-W3
NPT x NPT x NPT

DIMENSIONS—WEIGHTS—QUANTITIES

Size		Dimensions A		B		C		Weight		Box	Master
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	Qty.	Ctn. Qty.
¼	8	1.75	44	2.25	57	.94	24	.41	.19	10	100

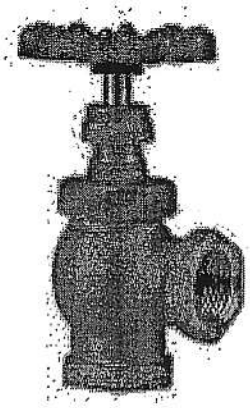


175 lb. WWP Bronze Angle Valves

Fire Protection Valve • Threaded Ends • Rubber Disc • Screw Over Bonnet

Dezincification Resistant

175 PSI/12.1 Bar Non-Shock Cold Water

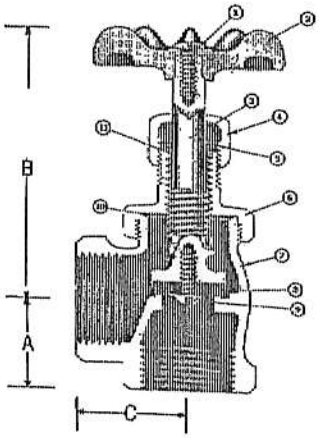


KT-67-UL
Threaded

UL LISTED*

MATERIAL LIST

	PART	SPECIFICATION
1.	Handwheel	Aluminum
2.	Handwheel Screw	Carbon Steel (½" & ¾") Stainless Steel (1")
3.	Stem	Bronze ASTM B 584 Alloy C84400
4.	Packing Nut	Bronze ASTM B 584 Alloy C83600 or ASTM B 16
5.	Packing	Graphite Impregnated (Non Asbestos)
6.	Bonnet	Bronze ASTM B 584 Alloy C84400
7.	Body	Bronze ASTM B 584 Alloy C84400
8.	Seat Disc	EPDM Rubber
9.	Seat Screw	Stainless Steel
10.	Pack Washer	Sheet Brass



KT-67-UL
NPT x NPT

DIMENSIONS—WEIGHTS—QUANTITIES

Size		Dimensions A		B		C		Weight		Box	Master
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	Qty.	Ctn. Qty.
½	15	.94	24	3.25	83	1.06	27	.62	.28	10	60
¾	20	1.02	26	3.12	79	1.20	30	.70	.32	10	60
1	25	1.80	46	4.50	114	1.62	41	1.57	.71	5	25

*UL Listed for Trim and Drain Use.

300 lb. WWP Bronze Ball Valves

Fire Protection Valve • Two-Piece Body • Chrome Plated Ball • Blowout-Proof Stem • Reinforced TFE Seats

300 PSI/20.7 Bar Non-Shock Cold Water

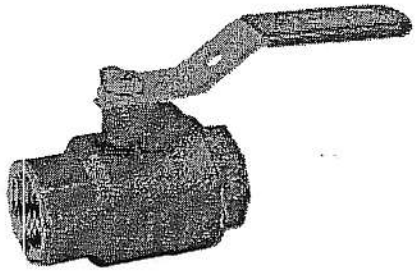
Dezincification Resistant

CONFORMS TO MSS SP-110 • UL LISTED† • FMRC APPROVED†

MATERIAL LIST

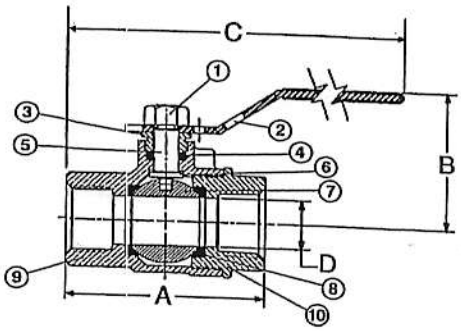
	PART	SPECIFICATION
1.	Handle Nut	Zinc Plated Steel
2.	Handle	Zinc Plated Steel Clear Chromate with Plastisol Grip
3.	Threaded Pack Gland	Brass ASTM B 16
4.	Packing	TFE
5.	Stem	Silicon Bronze ASTM B 371 Alloy C69430 or ASTM B 99 Alloy C65100
6.	Thrust Washer	Reinforced TFE
7.	Ball	Brass ASTM B 124 Alloy C37700 or ASTM B 16 Alloy C36000 with Hard Chrome Plate
8.	Seat Ring (2)	Reinforced TFE
9.	Body	Cast Red Bronze ASTM B 584 Alloy C84400
10.	Body End Piece	Cast Red Bronze ASTM B 584 Alloy C84400

¼" and ⅜" size only has a 304 stainless steel grounding washer.



KT-585-70-UL
¼" - 1" Full Port
Threaded

KT-580-70-UL
1¼" - 3" Standard Port
Threaded



KT-585-70-UL
Full Port
NPT x NPT

KT-580-70-UL
Standard Port
NPT x NPT

DIMENSIONS—WEIGHTS—QUANTITIES

KT-585-70-UL Dimensions

Size		A		B		C		D Port		Weight		Box	Master
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	Qty.	Ctn. Qty.
¼	8	2.00	51	1.75	44	5.00	127	.38	10	.45	.20	10	100
⅜	10	2.00	51	1.75	44	5.00	127	.38	10	.45	.20	10	100
½	15	2.44	62	1.88	48	5.19	132	.50	13	.64	.29	10	100
¾	20	2.94	75	2.25	57	6.25	159	.75	19	1.33	.60	5	50
1	25	3.34	85	2.38	59	6.44	164	1.00	25	1.79	.81	5	20

KT-580-70-UL Dimensions

Size		A		B		C		D Port		Weight		Box	Master
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	Qty.	Ctn. Qty.
1¼	32	3.94	100	2.63	67	6.75	171	1.00	25	2.17	.99	5	20
1½	40	4.31	110	3.00	76	8.91	228	1.25	32	3.27	1.49	5	20
2	50	4.63	117	3.25	83	9.06	230	1.50	38	5.09	2.31	5	10
2½	65	5.84	148	3.53	90	9.66	245	2.00	51	8.25	3.79	2	6
3	80	7.09	202	4.41	112	11.53	293	2.50	64	15.65	7.11	1	4

† UL Listed, FMRC Approved for trim and drain use – sizes ¼" thru 2".

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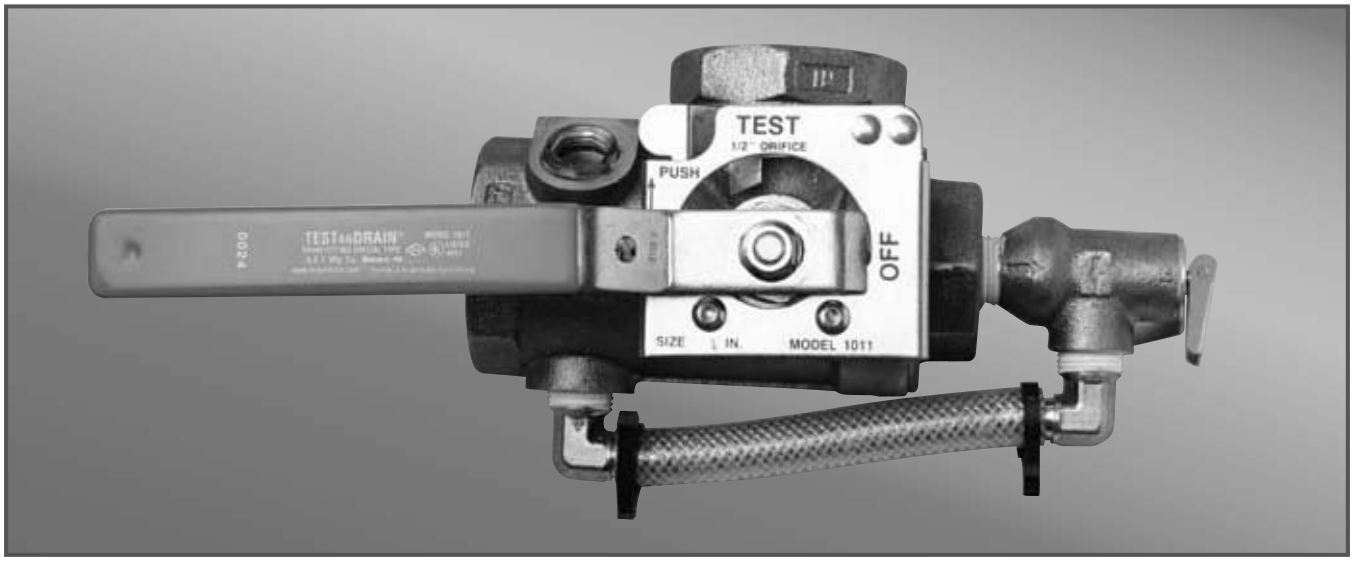
Model 1011A

TESTANDRAIN®

Sectional Floor Control Test and Drain Valve for Systems Requiring Pressure Relief Valve

c UL us FM APPROVED

¾" 1" 1¼" 1½" 2"



- The AGF Manufacturing Inc. **Model 1011A TESTANDRAIN®** matches all the features and benefits of our **Model 1000** by providing both the test function and the express drain function in a multistory installation for a wet fire sprinkler system, with the added feature of an integral **Model 7000 Pressure Relief Valve** with drainage piping.
- The **Model 1011A** complies with the requirements of NFPA-13 that stipulate a pressure relief valve be installed on all gridded systems and downstream of all pressure reducing valves (see reverse).
- The **Model 1011A TESTANDRAIN®** is a compact single handle ball valve which includes a tamper resistant test orifice and integral tamper resistant sight glasses, and is 300 PSI rated.
- Available in a full range of sizes from ¾" to 2" NPT and BSPT, with all specifiable orifice sizes ⅜" (2.8K), 7/16" (4.2K), ½" (5.6K), 17/32" (8.0K), ⅝" (11.2K, ELO), ¾" (14.0K, ESFR), and K25 as required by NFPA 13, 2007 Edition (see reverse).
- The included UL/FM **Model 7000 Pressure Relief Valve** features a flushing handle and is factory rated for 175 PSI. Other pressure settings are available and may be substituted.
- Designed to relieve excess system pressure caused by surges or temperature changes as well as solve the difficult problem of providing the relief valve with a convenient drainage-piping outlet.
- Shipped with relief valve and bypass drain ports plugged to expedite pressure testing the system.
- A locking kit is available and can be ordered with the valve to provide vandal resistance or prevent unintentional alarm activation.
- Repair kits including (1) adapter gasket, (1) ball, (2) valve seats, (1) stem packing, and (1) stem washer are available for all **TESTANDRAIN®** valves. Valve and orifice size must be specified when ordering.

NOTE: It is important to note that the pressure rating of the relief valve indicates an operating range of pressure for both opening and closing of the valve. Standard relief valves are required to OPEN in a range of pressure between 90% and 105% of their rating. The valves are required to CLOSE at a pressure above 80% of that rating. The relief valve should be installed where it is easily accessible for maintenance. Care should be taken that the relief valve CANNOT be isolated from the system when the system is operational. A relief valve should NEVER have a shutoff valve or a plug downstream of its outlet.

Reliability, Versatility, Code Compatibility

TESTANDRAIN is a registered trademark of AGF Manufacturing Inc.

Model 1011A

TEST AN DRAIN®

Model 1011A 300 PSI Bronze Ball Valve, Model 7000 Pressure Relief Valve
Factory Rated at 175 PSI with other settings available

Dimensions

Orifice Size Available: ⅜", 7⁄16", ½", 17⁄32", ELO (⅝")*, ESFR (¾")*, & K25**

SIZE	A	B	C	D	E	F	G	H
¾"	7 9⁄16" (191 mm)	1½" (37.5 mm)	2 3⁄16" (57 mm)	3 5⁄8" (93 mm)	3 3⁄8" (86 mm)	1 13⁄16" (46 mm)	4 9⁄16" (117 mm)	6 3⁄8" (162.5 mm)
1"	7 9⁄16" (191 mm)	1½" (37.5 mm)	2 3⁄16" (57 mm)	3 5⁄8" (93 mm)	3 3⁄8" (86 mm)	1 13⁄16" (46 mm)	4 9⁄16" (117 mm)	6 3⁄8" (162.5 mm)
1¼"	7 15⁄16" (201 mm)	1 11⁄16" (43 mm)	2 9⁄16" (65 mm)	4¼" (108 mm)	3 5⁄8" (91 mm)	1 15⁄16" (51 mm)	5 9⁄16" (141 mm)	5½" (192 mm)
1½"	8 15⁄16" (227 mm)	1 13⁄16" (45 mm)	3¼" (81.5 mm)	5 1⁄16" (127 mm)	3 7⁄8" (99 mm)	2 5⁄8" (67 mm)	8¼" (207 mm)	10 7⁄8" (274 mm)
2"	8 15⁄16" (227 mm)	1 13⁄16" (45 mm)	3¼" (81.5 mm)	5 1⁄16" (127 mm)	3 7⁄8" (99 mm)	2 5⁄8" (67 mm)	8¼" (207 mm)	10 7⁄8" (274 mm)

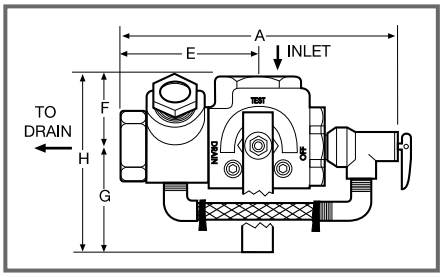
* Available on 1¼" to 2" size units only ** Available on 1½" and 2" size units only

The Model 1011A provides all of the following...

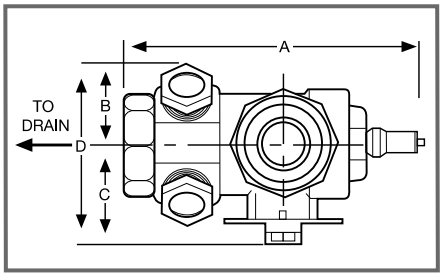
From the 2007 Edition of NFPA 13

Chapter 8.16.2.4.1*	Provisions shall be made to properly drain all parts of the system.
Chapter 8.16.2.4.2 & 8.16.2.4.3	Drain connections, interior sectional or floor control valve(s) – shall be provided with a drain connection having a minimum size as shown in Table 8.16.2.4.2.
Chapter 8.16.2.4.4	Drains shall discharge outside or to a drain capable of handling the flow of the drain.
Chapter A.8.17.4.2	(Wet Pipe System) test connection is permitted to terminate into a drain capable of accepting full flow… using an approved sight test connection containing a smooth bore corrosion-resistant orifice giving a flow equivalent to one sprinkler…
Chapter 8.17.4.2.2	The test connection valve shall be readily accessible.
Chapter 8.17.4.2.4	shall be permitted to be installed in any location… downstream of the waterflow alarm.
Chapter 8.17.4.3.1	(Dry Pipe System) a trip test connection not less than 1" in diameter, terminating in a smooth bore corrosion-resistant orifice, to provide a flow equivalent to one sprinkler…
Chapter 8.17.4.3.2	The trip test connection… with a shutoff valve and plug not less than 1", at least one of which shall be brass.
Chapter 7.1.2	- a gridded wet pipe system shall be provided with a relief valve set to operate at 175 PSI or 10 PSI in excess of the maximum system pressure, whichever is greater.
Chapter 8.16.1.2.3*	A relief valve of not less than ½" in size shall be provided on the discharge side of the pressure-reducing valve set to operate at a pressure not exceeding 175 PSI.
Chapter A.8.16.1.2.3	- consideration should be given to piping the discharge from the (pressure relief) valve

Model 1011A - Front View



Model 1011A - Plan View



Materials

Handle: Steel
Stem: Rod Brass
Ball: C.P. Brass
Body: Bronze
Valve Seat: Impregnated Teflon®
Indicator Plate: Steel
Relief Valve: Bronze
Bypass Fittings: Brass
Bypass Tubing: Nylobraid

Approvals

UL and ULC Listed: (EX4019 & EX4533)
FM Approved
NYC-BSA No. 720-87-SM

MADE IN U.S.A.

USA Patent # 4741361 and Other Patents Pending

AGF Manufacturing Inc.
100 Quaker Lane, Malvern, PA 19355
Phone: 610-240-4900
Fax: 610-240-4906
www.testandrain.com

Job Name:_____

Architect:_____

Engineer:_____

Contractor:_____

FlexHead commercial fire sprinkler connections



FLEXHEAD®
INDUSTRIES

The best idea in sprinkler systems since water

Your connection to higher productivity. And lower costs.



FM APPROVED · c UL us LISTED · LPCB

N.Y.C. MEA #261-99-E
CA: OPA-0672

Friction Loss Data and Specifications

FRICTION LOSS

FlexHead Model #	Outlet Size in(cm)	Hose Assembly Length ft(m)	Maximum Number of 90-Degree Bends (3 in. Bending Radius)	FM/UL Maximum Equivalent Length Length of Schedule 40, Nominal 1 in. Diameter Pipe, ft FM/UL	Maximum Ambient Temperature Rating F(C)	Maximum Rated Pressure H-Series psi (kPa)/psi (kPa)
2024, 2024H	1/2(1.27)	2(0.6)	3	3.5/11	300°(148°)	175(1205)/300(2068)
2036, 2036H	1/2(1.27)	3(0.9)	3	4.8/16	300°(148°)	175(1205)/300(2068)
2048, 2048H	1/2(1.27)	4(1.2)	4	6.8/24	300°(148°)	175(1205)/300(2068)
2060, 2060H	1/2(1.27)	5(1.5)	4	8.5/29	300°(148°)	175(1205)/300(2068)
2072, 2072H	1/2(1.27)	6(1.8)	4	8.9/35	300°(148°)	175(1205)/300(2068)
2024, 2024H	3/4(1.90)	2(0.6)	3	7.8/12	300°(148°)	175(1205)/300(2068)
2036, 2036H	3/4(1.90)	3(0.9)	3	8.1/18	300°(148°)	175(1205)/300(2068)
2048, 2048H	3/4(1.90)	4(1.2)	4	17.9/23	300°(148°)	175(1205)/300(2068)
2060, 2060H	3/4(1.90)	5(1.5)	4	19.9/29	300°(148°)	175(1205)/300(2068)
2072, 2072H	3/4(1.90)	6(1.8)	4	24.3/32	300°(148°)	175(1205)/300(2068)
2024E, 2024HE	1/2(1.27)	2(0.6)	3	5.5/19	300°(148°)	175(1205)/300(2068)
2036E, 2036HE	1/2(1.27)	3(0.9)	3	6.8/23	300°(148°)	175(1205)/300(2068)
2048E, 2048HE	1/2(1.27)	4(1.2)	4	8.8/27	300°(148°)	175(1205)/300(2068)
2060E, 2060HE	1/2(1.27)	5(1.5)	4	10.5/32	300°(148°)	175(1205)/300(2068)
2072E, 2072HE	1/2(1.27)	6(1.8)	4	10.9/35	300°(148°)	175(1205)/300(2068)
2024E, 2024HE	3/4(1.90)	2(0.6)	3	9.8/18	300°(148°)	175(1205)/300(2068)
2036E, 2036HE	3/4(1.90)	3(0.9)	3	10.1/23	300°(148°)	175(1205)/300(2068)
2048E, 2048HE	3/4(1.90)	4(1.2)	4	19.9/23	300°(148°)	175(1205)/300(2068)
2060E, 2060HE	3/4(1.90)	5(1.5)	4	21.9/29	300°(148°)	175(1205)/300(2068)
2072E, 2072HE	3/4(1.90)	6(1.8)	4	26.3/32	300°(148°)	175(1205)/300(2068)

Model Numbers: The "H" designates high pressure unit rated to 300 psig and the "E" designates elbow style unit.

FlexHead products are intended for use in hydraulically designed wet, pre-action, deluge or dry pipe sprinkler connections per NFPA 13, 13R, and 13D guidelines. The hydraulic loss of the FlexHead connector needs to be included in the hydraulic design calculations the same as a valve or fitting. *Each FlexHead sprinkler drop has a 3" minimum bend radius per UL guidelines, and a 7" minimum bend radius per FM guidelines.*

* **Equivalent lengths are shown with maximum number of 90 degree bends at the minimum bend-radius. Different values were obtained by FM and UL due to the differences in minimum bend radius, testing protocol and calculation methods. Please see individual testing standards for more information relative to friction loss (Equivalent Length of Pipe).**

Pressure surges aren't a risk for FlexHead connection systems. Our fully braided stainless steel hose is rated to 300 psi.

Let FlexHead make your connection today.

Engineers

Stainless steel quality at black iron costs

Fast-track construction

Simplified project management

Cost-effective code compliance

Seismically qualified

Contractors

Lower installation costs

More productive installers

No punch list items

Highest quality available

More flexible scheduling

Competitive advantage for your company

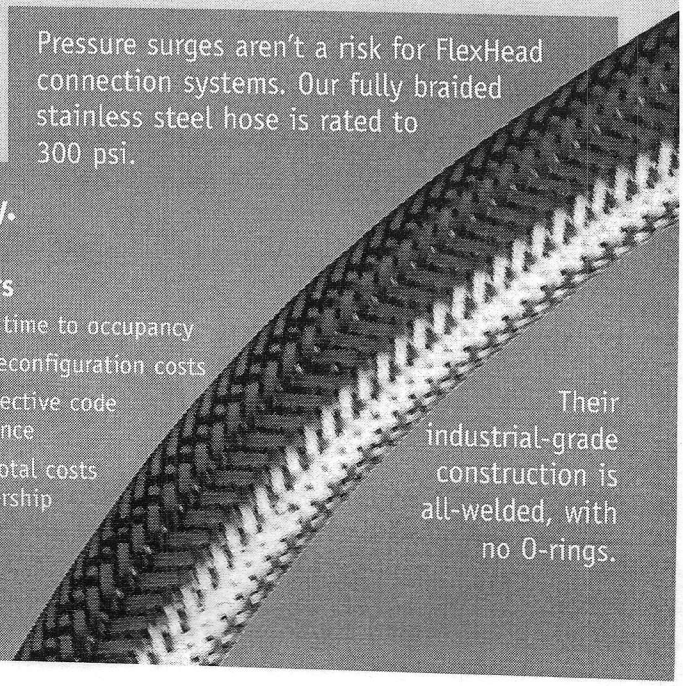
Owners

Shorter time to occupancy

Lower reconfiguration costs

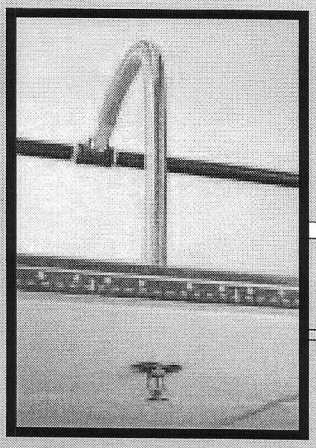
Cost effective code compliance

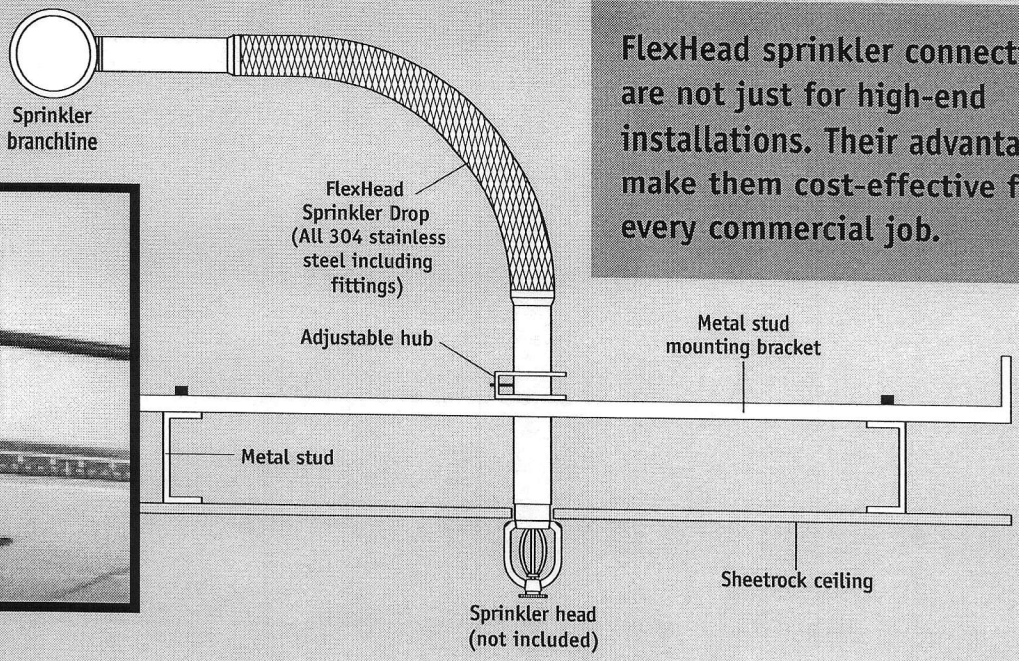
Lower total costs of ownership



Their industrial-grade construction is all-welded, with no O-rings.

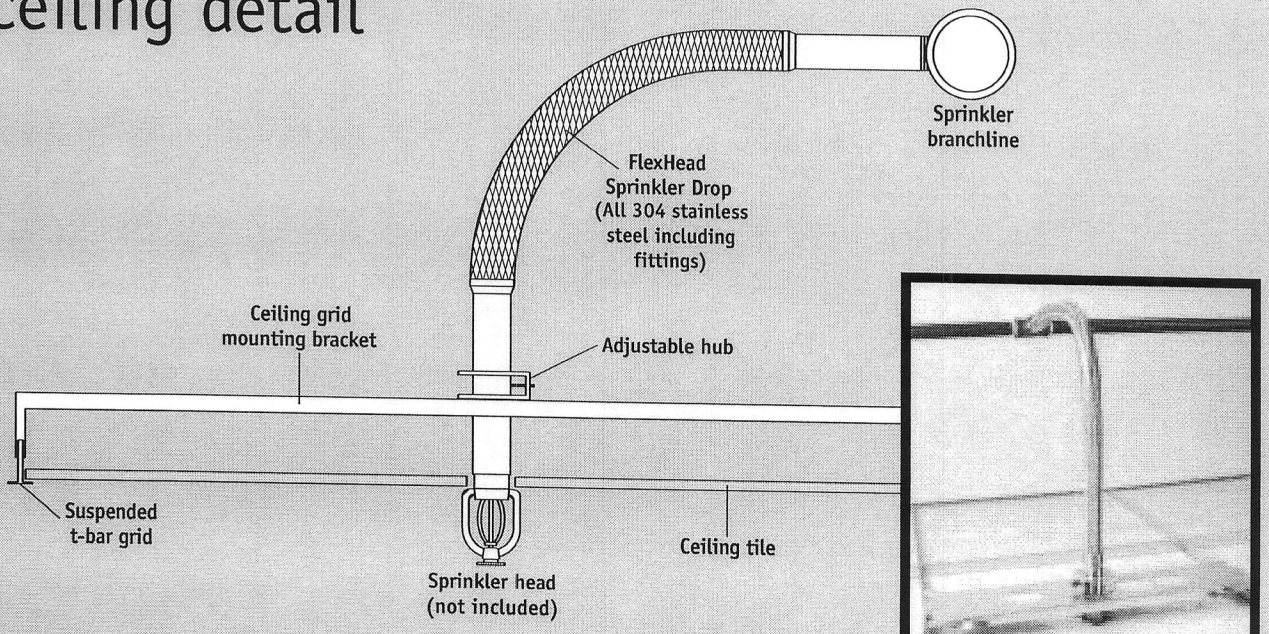
FlexHead metal stud detail

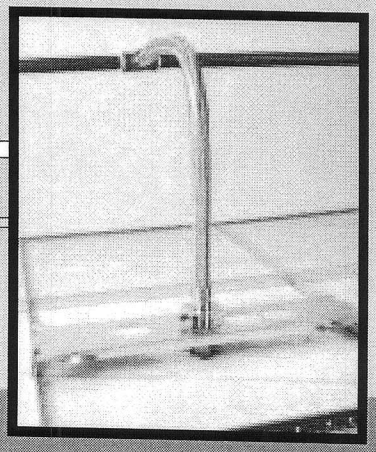




FlexHead sprinkler connections are not just for high-end installations. Their advantages make them cost-effective for every commercial job.

FlexHead suspended ceiling detail



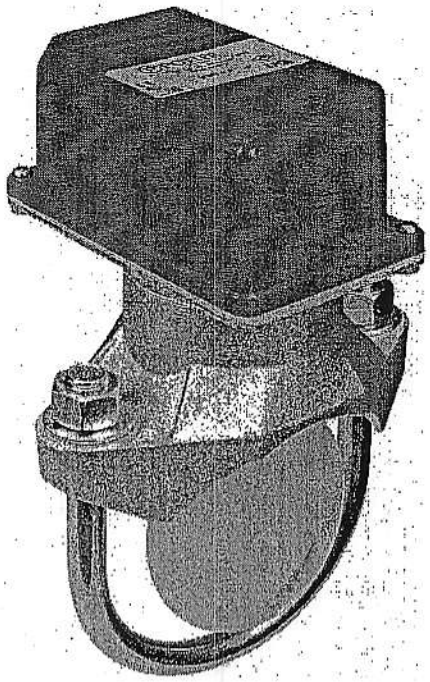


Each FM approved, UL listed, LPCB certified unit is ready-to-install, pressure- and leak-tested, and comes complete with a flexible stainless steel hose and mounting bracket with adjustable hub.

NOTE: OR EQUAL BY SYSTEM SENSOR

POTTER
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VSR-F
VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD



U.S. Pat. No. 3921989
Canadian Pat. No. 1009680
Other Patents Pending
Potter Electric, Rd., 1990

UL, ULC and CSFM Listed, FM and LPCB Approved, NYMEA Accepted, CE Marked

Service Pressure: Up to 450 PSI (31 BAR)

Minimum Flow Rate for Alarm: 10 GPM (38 LPM)

Maximum Surge: 18 FPS (5,5 m/s)

Contact Ratings: Two sets of SPDT (Form C)
15.0 Amps at 125/250VAC
2.0 Amps at 30VDC Resistive

Conduit Entrances: Two knockouts provided for 1/2" conduit

Environmental Specifications:

- Suitable for indoor or outdoor use with factory installed gasket and die-cast housing.
- NEMA 4/IP54 Rated Enclosure - use with appropriate conduit fitting.
- Temperature Range: 40°F/120°F, 4,5°C/49°C
- Non-corrosive sleeve factory installed in saddle.

Caution: This device is not intended for applications in explosive environments.

Sizes Available: Steel Pipe schedules 10 thru 40, sizes 2" thru 8"
BS 1387 pipe 50mm thru 200mm
Note: For copper or plastic pipe use Model VSR-CF.

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

Optional: Cover Tamper Switch Kit, Stock No. 0090018

GENERAL INFORMATION

The Model VSR-F is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50mm thru 200mm).

LPC approved sizes are 2" thru 8" (50mm thru 200mm).

The unit may also be used as a sectional waterflow detector on large systems.

The unit contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 gallons per minute (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

ENCLOSURE: The unit is enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin no. 5400775 for installation instructions of this switch.

INSTALLATION: See Fig.2

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

Drain the system and drill a hole in the pipe using a circular saw in a slow speed drill. The 2" (50mm) and 2 1/2" (65mm) devices require a hole with a diameter of 1 1/4" + 1/8" - 1/16" (33mm ±2mm). All other sizes require a hole with a diameter of 2" ±1/8" (50mm ±2mm).

Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole.

Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Install the saddle strap and tighten nuts alternately to an eventual 50 ft-lbs. (68 n-m) of torque (see Fig. 2). The vane must not rub the inside of the pipe or bind in any way.

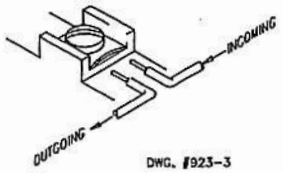
Specifications subject to change without notice.

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VSR-F
VANE TYPE WATERFLOW ALARM SWITCH WITH RETARD

FIG. 1

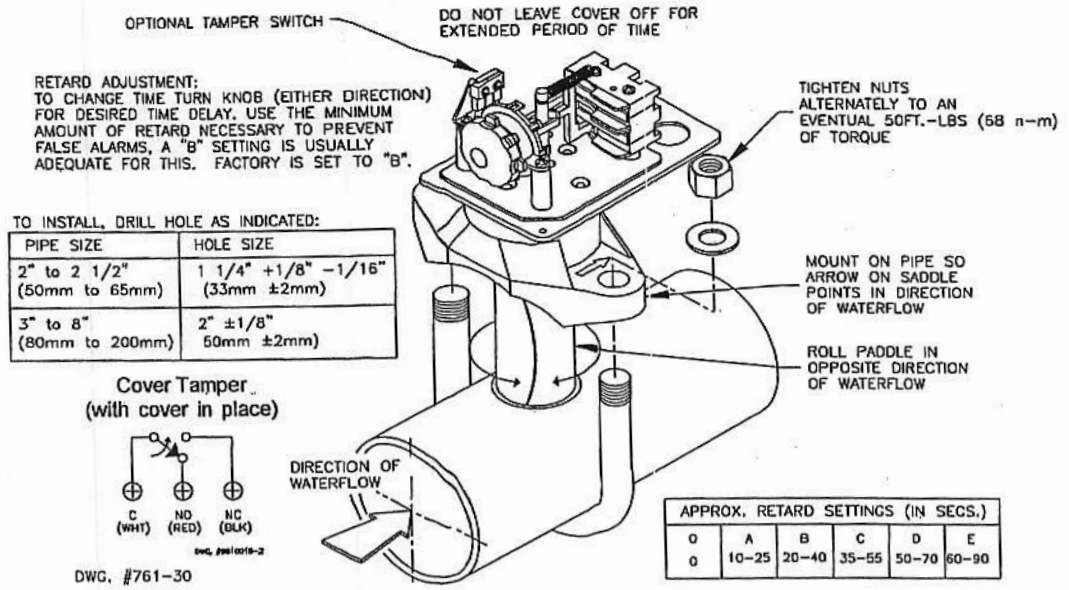
SWITCH TERMINAL CONNECTIONS CLAMPING PLATE TERMINAL



DWG. #923-3

CAUTION:
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

FIG. 2



TO INSTALL, DRILL HOLE AS INDICATED:

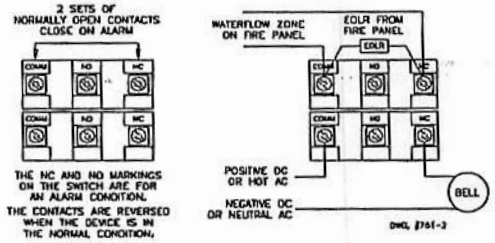
PIPE SIZE	HOLE SIZE
2" to 2 1/2" (50mm to 65mm)	1 1/4" +1/8" -1/16" (33mm ±2mm)
3" to 8" (80mm to 200mm)	2" ±1/8" 50mm ±2mm)

Cover Tamper (with cover in place)

DWG. #761-30

APPROX. RETARD SETTINGS (IN SECS.)					
0	A	B	C	D	E
0	10-25	20-40	35-55	50-70	60-90

FIG. 3 TYPICAL ELECTRICAL CONNECTIONS

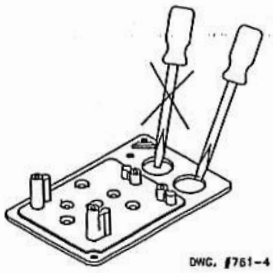


NOTES:

1. The Model VSR-F has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. A condition of LPC Approval of this product is that the electrical entry must be sealed to exclude moisture.
3. For supervised circuits see "Switch Terminal Connections" drawing and caution note (Fig. 1).

FIG. 4

To remove knockouts: Place screwdriver at edge of knockouts, not in the center.



DWG. #761-4

APPLICATION WARNING!

Due to the possibility of unintended discharges caused by pressure surges, trapped air, or short retard times, waterflow switches that are monitoring wet pipe sprinkler systems should not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems.

TESTING

The frequency of inspection and testing for the model VSR-F and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

If provided, the inspector's test valve, that is usually located at the end of the most remote branch line, should always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-F is not recommended or advisable.

A minimum flow of 10 gpm (38 Lpm) is required to activate this device.

IMPORTANT NOTICE: Please advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7770-0328:0001

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: Potter Electric Signal Co1609 Park 370 Place, Hazelwood, MO 63042 United States
Contact: Brad Serangeli (314) 595-6900 Fax (314) 595-6999
Email: brads@pottersignal.com

DESIGN: Vane and pressure type water flow alarm switches listed below. Refer to listee's data sheet for detailed product description and operational considerations.

Vane Types:

VSR-CF	VSR-D	VSR-F	VSR-SF
VSR-FE-2	VS-SP	VS-F	VSR-SFG
VSR-SFT	VSG	VSR	VSR-S
VSR-C	VSR-ST	VSR-SG	

Pressure Type:

WFS-B	WFSR-C	WFSPD-B	PS10
PS-10A	PS-100A	WFSR-F	PS100

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 and UL or FM label.

APPROVAL: Listed as waterflow alarm switches for use with fire sprinkler systems. Vane models may be used in wet pipe systems; pressure models may be used in wet or dry systems. Model VSR-CF is for use on K, L or M copper pipe (2", 2-1/2", 3", 4") and listed CPVC pipe (2", 2-1/2", 3"). Model VSR-SF for use on 1", 1-1/4", 1-1/2" and *2" steel, copper or listed plastic pipe. Model VSG is for low flow rate. Model VSR-SFG and VSR-SFT are for use on 1", 1-1/4", 1-1/2" and *2" plastic pipe. Models VS-F, VSR-F, VSR-FE and VSR-FE-2 is for use on 2", 2-1/2", 3", 3-1/2", 4", 5", 6", 8" and 10" pipe. *Model VSR is for use on steel pipe sizes from 2" through 8". Vane type switches may be used outdoors when the outdoor temperature never falls below 40oF.

Rev*5-17-2007 jw

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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

NOTE: OR EQUAL BY SYSTEM SENSOR

POTTER
The Symbol of Protection

BELLS
PBA-AC & PBD-DC



6" BELL SHOWN

UL Listed, FM Approved

Sizes Available: 6" (150mm), 8" (200mm) and 10" (250mm)

Voltages Available: 24VAC
120VAC
12VDC (10.2 to 15.6) Polarized
24VDC (20.4 to 31.2) Polarized

Service Use: Fire Alarm
General Signaling
Burglar Alarm

Environment: Indoor or outdoor use (See Note 1)
-40° to 150°F (-40° to 66°C)
(Outdoor use requires weatherproof backbox.)

Termination: 4 No. 18 AWG stranded wires

Finish: Red powder coating

Optional: Model BBK-1 weatherproof backbox

These vibrating type bells are designed for use as fire, burglar or general signaling devices. They have low power consumption and high decibel ratings. The unit mounts on a standard 4" (101mm) square electrical box for indoor use or on a model BBK-1 weatherproof backbox for outdoor applications. Weatherproof backbox model BBK-1, Stock No. 1500001.

ALL DC BELLS ARE POLARIZED AND HAVE BUILT-IN TRANSIENT PROTECTION:

SIZE INCHES (mm)	VOLTAGE	MODEL NO.	STOCK NO.	CURRENT (MAX.)	TYPICAL dB AT 10 FT. (3m) (2)	MINIMUM dB AT 10 FT. (3m) (1)
6 (150)	12VDC	PBD126	1706012	.12A	85	76
8 (200)	12VDC	PBD128	1708012	.12A	90	76
10 (250)	12VDC	PBD1210	1710012	.12A	92	76
6 (150)	24VDC	PBD246	1706024	.06A	87	76
8 (200)	24VDC	PBD248	1708024	.06A	91	79
10 (250)	24VDC	PBD2410	1710024	.06A	94	79
6 (150)	24VAC	PBA246	1806024	.17A	91	76
8 (200)	24VAC	PBA248	1808024	.17A	94	76
10 (250)	24VAC	PBA2410	1810024	.17A	94	76
6 (150)	120VAC	PBA1206	1806120	.05A	92	82
8 (200)	120VAC	PBA1208	1808120	.05A	99	82
10 (250)	120VAC	PBA12010	1810120	.05A	99	85

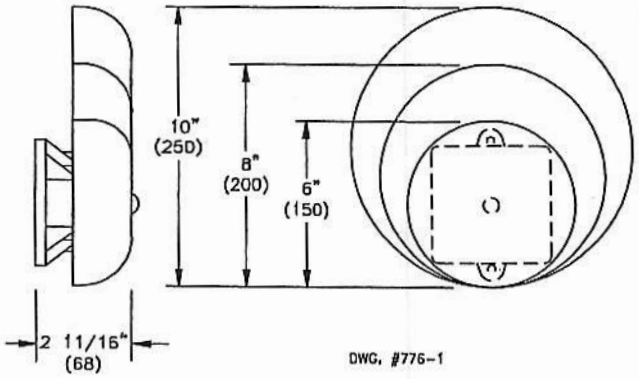
Notes:
1. Minimum dB ratings are calculated from integrated sound pressure measurements made at Underwriters Laboratories as specified in UL Standard 464. UL temperature range is -30° to 150°F (-34° to 66°C).
2. Typical dB ratings are calculated from measurements made with a conventional sound level meter and are indicative of output levels in an actual installation.

POTTER
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BELLS
PBA-AC & PBD-DC

DIMENSIONS
INCHES (mm)

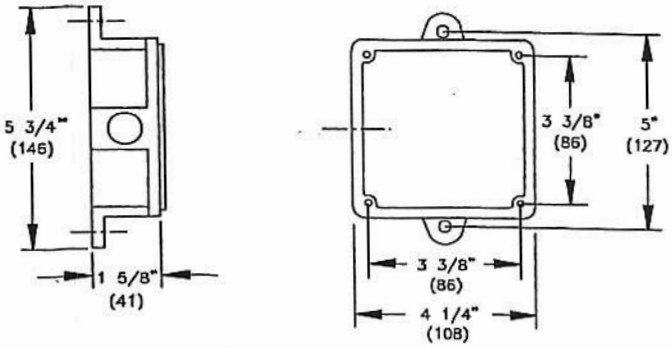
FIG. 1 **BELLS**



DWG. #776-1

FIG. 2 **WEATHERPROOF BACKBOX**

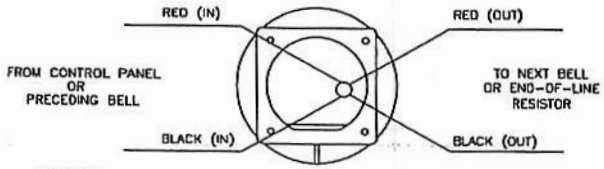
BOX HAS ONE THREADED 1/2" CONDUIT ENTRANCE



DWG. #776-2

FIG. 3 **WIRING (REAR VIEW)**

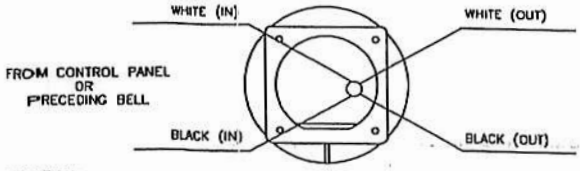
D.C. BELLS (OBSERVE POLARITY)



CAUTION:
WHEN ELECTRICAL SUPERVISION IS REQUIRED USE IN AND OUT LEADS AS SHOWN.

NOTES:
1. OBSERVE POLARITY TO RING D.C. BELLS.
2. RED WIRES POSITIVE (+)
3. BLACK WIRES NEGATIVE (-)

A.C. BELLS



CAUTION:
WHEN ELECTRICAL SUPERVISION IS REQUIRED USE IN AND OUT LEADS AS SHOWN.

NOTES:
1. WHEN USING A.C. BELLS, TERMINATE EACH EXTRA WIRE SEPARATELY AFTER LAST BELL.
2. END-OF-LINE RESISTOR IS NOT REQUIRED ON A.C. BELLS.

DWG. #776-3

INSTALLATION

1. The bell should be mounted a minimum of 8 ft. (2,4m) from the floor or as close to the ceiling as possible.
2. Remove the gong.
3. Connect wiring (see Fig. 3).
4. Mount bell mechanism to backbox (bell mechanism must be mounted with the striker pointing down).
5. Reinstall the gong (be sure that the gong positioning pin, in the mechanism housing, is in the hole in the gong).
6. Test all bells for proper operation and observe that they can be heard where required (bells must be heard in all areas as designated by the authority having jurisdiction).

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7135-0328:0119

CATEGORY: 7135 -- AUDIBLE DEVICES

LISTEE: Potter Electric Signal Co1609 Park 370 Place, Hazelwood, MO 63042 United States
Contact: Brad Serangeli (314) 595-6900 Fax (314) 595-6999
Email: brads@pottersignal.com

DESIGN: Models SB624-153075, SB624-75110, PBA246, PBA248, PBA2410, PBA1206, PBA1208, PBA12010, *PBD-126, *PBD-128, *PBD-1210, *PBD-246, *PBD-248, * PBD-2410 vibrating bells. Suitable for outdoor use when used with Model BBK-1 backbox. Models are AC or DC powered and available in 6", 8" and 10". Models MBA-6, -8 and -10 bells, suitable for outdoor use when used with Model BBX-1 backbox. Refer to listee's data sheet for detailed product description and operational considerations.

RATING:
PBA-246, -248, -2410: 24 VAC
PBA-1206, -1208, -12010: 120 VAC
MBA-6, -8, -10: 12 or 24 VDC
*PBD-126, -128, -1210: 12VDC, .12A
*PBD-246, -248, -2410: 24VDC, .06A

INSTALLATION: In accordance with listee's printed installation instruction, applicable codes & ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number and UL label.

APPROVAL: Listed as audible devices for use with separately listed compatible fire alarm control units. If this appliance is required to produce a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2002 Edition, the appliance must be used with a fire alarm control unit that can generate the temporal pattern signal. Refer to manufacturer’s Installation Manual for details.

*Revision 01-31-2017 dcc

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, 2021** *Listing Expires* **June 30, 2022**

Authorized By: ***DAVID CASTILLO,**, M.E., F.P.E.*

Fire Engineering Division

Signs

For sprinkler systems & devices



Identification Signs

Manufactured by: Central Sprinkler Company
451 North Cannon Avenue, Lansdale, Pennsylvania 19446

Product Description

Central's Identification Signs are designed to provide information to the end user about the sprinkler system and it's components. They are available with a variety of wording combinations to meet the signing requirements of NFPA 13.

The five basic types of signs are as follows:

Type A - Control Valve Sign
Type B - Multi-purpose Text Signs
Type C - Cold Weather Sign
Type D - Fire Alarm Sign
Type E - Hydraulic Calculation Sign

The Signs are constructed of 18 gauge steel or aluminum with a porcelain enamel or printed mylar facing respectively. The signs have corner holes or slots for easy attachment in the field.

Sign Type B is available with the following text options:

Air control
Air control valve
Air line
Alarm test
Alarm line
Antifreeze system
Auxiliary drain
Control
Control valve
Drain
Drain valve
Entire system
From city main
In this building
In this section
Inspectors test
Main control
Main drain
Open sprinkler control
Open sprinkler drain
Test valve
Triangular main drain
Water motor
Water motor line

Technical Data

Model: Sign
Style: Flat, rectangular
Standard Finish: porcelain or mylar
Size: Type A - 9" × 7"
Type B - 6" × 2"
Type C - 7¾" x 1¼"
Type D - 9" × 7"
Type E - 5" × 7"
Weight: Type A - 4.5 oz.
Type B - 0.5 oz.
Type C - 2.0 oz.
Type D - 4.0 oz.
Type E - 1.5 oz.

Installation

The Identification Signs are provided with ⅛" diameter or larger holes (or slots) in the corners for easy attachment using standard hardware chain, wire, plastic lock ties, or light gauge metal strap (not included).

Installation

Central's Sprinkler Head Cabinet is designed with two 3/16" diameter holes for wall mounting or direct attachment to the system riser with a strap-type hanger. The Cabinet should be installed at or near the system control valve and must be stocked with an adequate supply of spare sprinklers and a sprinkler wrench.

The stock of spare sprinklers should include sprinklers of each type and temperature rating as are installed in the sprinkler system, in the following quantities:

Sprinklers In System	Spare Sprinklers Required
under 300	6
300-1000	12
over 1000	24

The Cabinets are designed to accept both ½" and ¾" N.P.T. threaded sprinklers. For ½" N.P.T. sprinklers, leave the removable knockout in the hole. For ¾" N.P.T. sprinklers, insert a screwdriver blade from the front top of the shelf and under the near bottom part of the knockout annular ring. Press the screwdriver handle down to remove the knockout ring. The hole, with the knockout ring removed, will accept a ¾" N.P.T. sprinkler.

Care & Maintenance

The Cabinet, wrench, and stock of spare sprinklers should be inspected at least quarterly. The following items should be checked:

1. The Cabinet should be readily accessible, and not exposed to a corrosive atmosphere or temperatures in excess of 100°F/38°C.
2. The stock of spare sprinklers should include an adequate number of each type and temperature rating.
3. The stock of sprinklers must be in good condition.
4. A sprinkler wrench of the appropriate type must be included in the Cabinet.

Ordering Information

When placing an order, indicate the full product name. Please specify the quantity, model, style, capacity, and size.

Sprinklers, wrenches, and hardware for hanging are not supplied with the Cabinet. They must be ordered separately.

Availability and Service: Central sprinklers, accessories, and other products are available throughout the U.S. and Canada, and internationally through a network of Central Sprinkler distribution centers. You may write directly to Central Sprinkler Company, or call (215) 362-0700 for the distributor nearest you.

Guarantee: Central Sprinkler Company will repair and/or replace any products found to be defective in material or workmanship within a period of one year from date of shipment. Please refer to the current Price List for further details of the warranty.

Conversion Table:
1 inch = 25.400 mm
1 foot = 0.3048 M
1 pound = 0.4536 kg

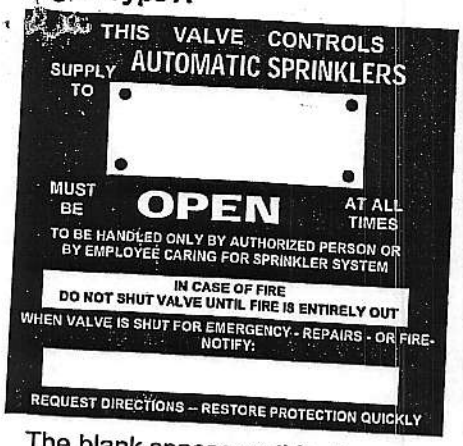
Conversions are approximate.

CENTRAL

Central Sprinkler Company
451 North Cannon Avenue, Lansdale, PA 19446
Phone (215) 362-0700
FAX (215) 362-5385

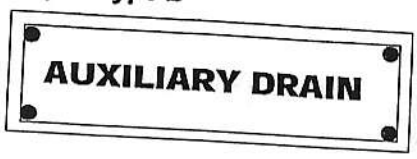
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Sign - Type A



The blank spaces on this sign may be utilized to provide message flexibility. Simply add combinations of sign Type B and Type C as desired.

Sign - Type B



Sign - Type C

FRONT



BACK



Sign - Type D



Sign - Type E



Ordering Information

When placing an order, indicate the full product name. Please specify the quantity and type.

Hardware for hanging is not supplied with the Sign. It must be ordered separately.

Availability and Service: Central sprinklers, accessories, and other products are available throughout the U.S. and Canada, and internationally through a network of Central Sprinkler distribution centers. You may write directly to Central Sprinkler Company, or call (215) 362-0700 for the distributor nearest you.

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FAX (215) 362-5385

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Appendix C

Door Hardware Cutsheets

BB1279

Five Knuckle - Ball Bearing - Standard Weight



Description:

- ANSI A8112
- Two ball bearings
- Non-rising removable pin with button tip and plug
- 3-1/2" x 3-1/2" (89 mm x 89mm) available with reversible hole pattern
- For use on medium weight doors or doors requiring medium frequency service

Note:

- Complies with NFPA80 requirements for use on fire rated door assemblies

Electric Modifications:

- EMN (Electric Monitor Only)
- ETW (Electric Through-Wire Only)
- ETM (Electric Through-Wire with Monitoring)
- Quick Connect



PRODUCT SPECIFICATIONS

MATERIAL:
- Steel with Steel pin

FINISHES:
- LS, H2H, USP, US3, US4, US10, US10A, US10B, US15, US26, US26D

OPTIONS:
- NRP - Non-removable pin

PRODUCT SIZE OPTIONS

HINGE SIZE (INCHES)	HINGE SIZE (MM)	GAUGE OF METAL	HOLE COUNT	SCREW SIZE (MACHINE)	SCREW SIZE (WOOD)
3 1/2 x 3 1/2	89 x 89	0.119	6	1/2 x 10-24	1 x 9
4 x 4	102 x 102	0.129	8	1/2 x 12-24	1 1/4 x 12
4 1/2 x 4	114 x 102	0.134	8	1/2 x 12-24	1 1/4 x 12
4 1/2 x 4 1/2	114 x 114	0.134	8	1/2 x 12-24	1 1/4 x 12
5 x 4	127 x 102	0.145	8	1/2 x 12-24	1 1/4 x 12
5 x 4 1/2	127 x 114	0.145	8	1/2 x 12-24	1 1/4 x 12
5 x 5	127 x 127	0.145	8	1/2 x 12-24	1 1/4 x 12
6 x 4-1/2	152 x 114	0.160	10	1/2 x 1/4-20	1 1/2 x 14
6 x 5	152 x 127	0.160	10	1/2 x 1/4-20	1 1/2 x 14
6 x 6	152 x 152	0.160	10	1/2 x 1/4-20	1 1/2 x 14

PEMKO

ASSA ABLOY

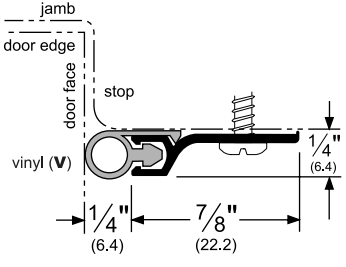
PERIMETER GASKETING:
STANDARD PERIMETER GASKETING

303DV

AVAILABLE FINISHES: **A, BDG, D, G, PW, SN**

WIDTH: **1/4" (6.4 mm)**

PROFILE HEIGHT: **7/8" (22.2 mm)**
TOTAL HEIGHT WITH INSERT: **1-1/8" (28.6 mm)**



A (Mill Finish Aluminum)
BDG (Bright Dip Gold Anodized Aluminum)
D (Dark Bronze Anodized Aluminum)
G (Gold Anodized Aluminum)
PW (Painted White Aluminum)
SN (Satin Nickel Anodized Aluminum)

TITLE:
PREPARED FOR:
PREPARED BY:
DATE:
COMMENTS:

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8000 SERIES
Architectural Door Closer



Norton®
ASSA ABLOY

ASSA ABLOY, the global leader
in door opening solutions

OVERVIEW

The 8000 Series Door Closers offer the ideal combination of appearance, reliability and durability in today's market. With features such as staked valves, precise valve adjustment and a complete range of arm and cover options, this closer can meet virtually any application challenge.

Features

- Exceeds 15 million cycles (witnessed and verified by UL)
- Adjustable spring sizes 1 through 6
- Tri-Style® packaging standard (regular arm, top jamb and parallel arm mounting)
- Non-handed
- Staked valves
- Cast aluminum body
- Rack and pinion design
- 1-1/4" (32mm) diameter piston
- 5/8" (16mm) diameter pinion journals
- 2-1/8" (54mm) projection (standard covers)
- All standard arm applications (with slim, full or metal covers) allow doors to swing 180 degrees, conditions permitting
- Full size template
- Metal, architectural plastic or architectural metal covers (8501 only)
- Lead lined metal cover - suffix MLL
- Application specific arms: Regular (S), Top Jamb (JS) and Parallel (P)
- Heavy-duty arms; Regular Rigid, Parallel Rigid, CloserPlus®, CloserPlus Spring™, Unitrol®
- Slide Tracks: push or pull side mounting
- 25-year limited warranty

Functions

- Standard, separate and independent, latch, sweep and backcheck intensity valves
- Delayed action

Features	8301	8501
Adjustable spring sizes 1 through 6	X	X
Tri-Style® packaging standard (regular arm, top jamb and parallel arm mounting)	X	X
Slim Line Cover	X	
Full cover		X

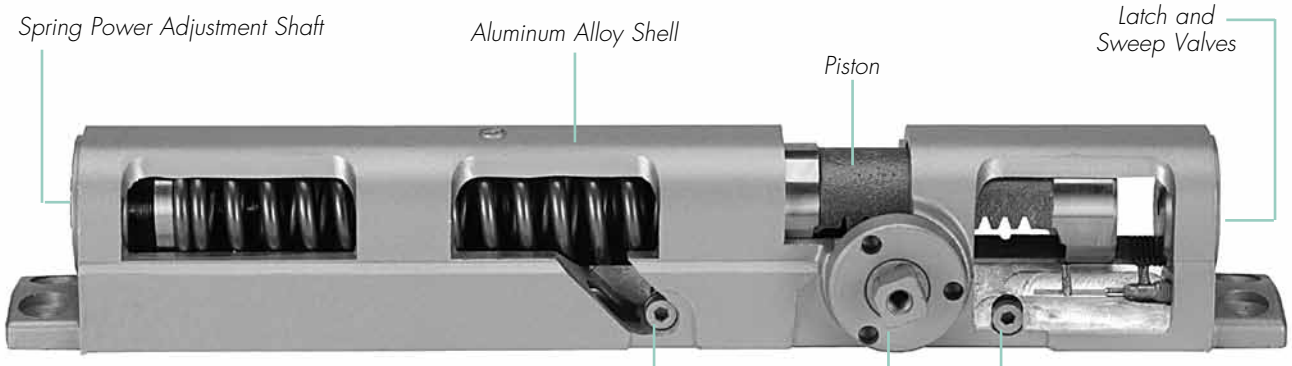
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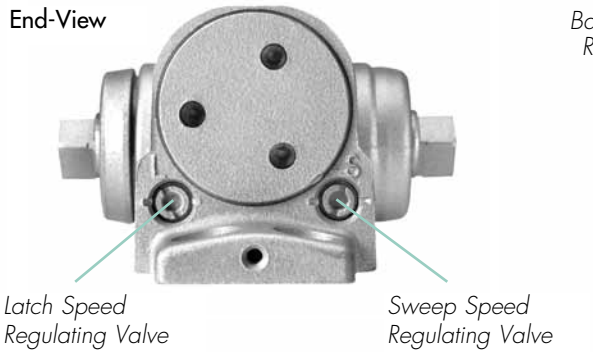
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OVERVIEW

Cutaway View



End-View



COMPLIANCE STANDARDS

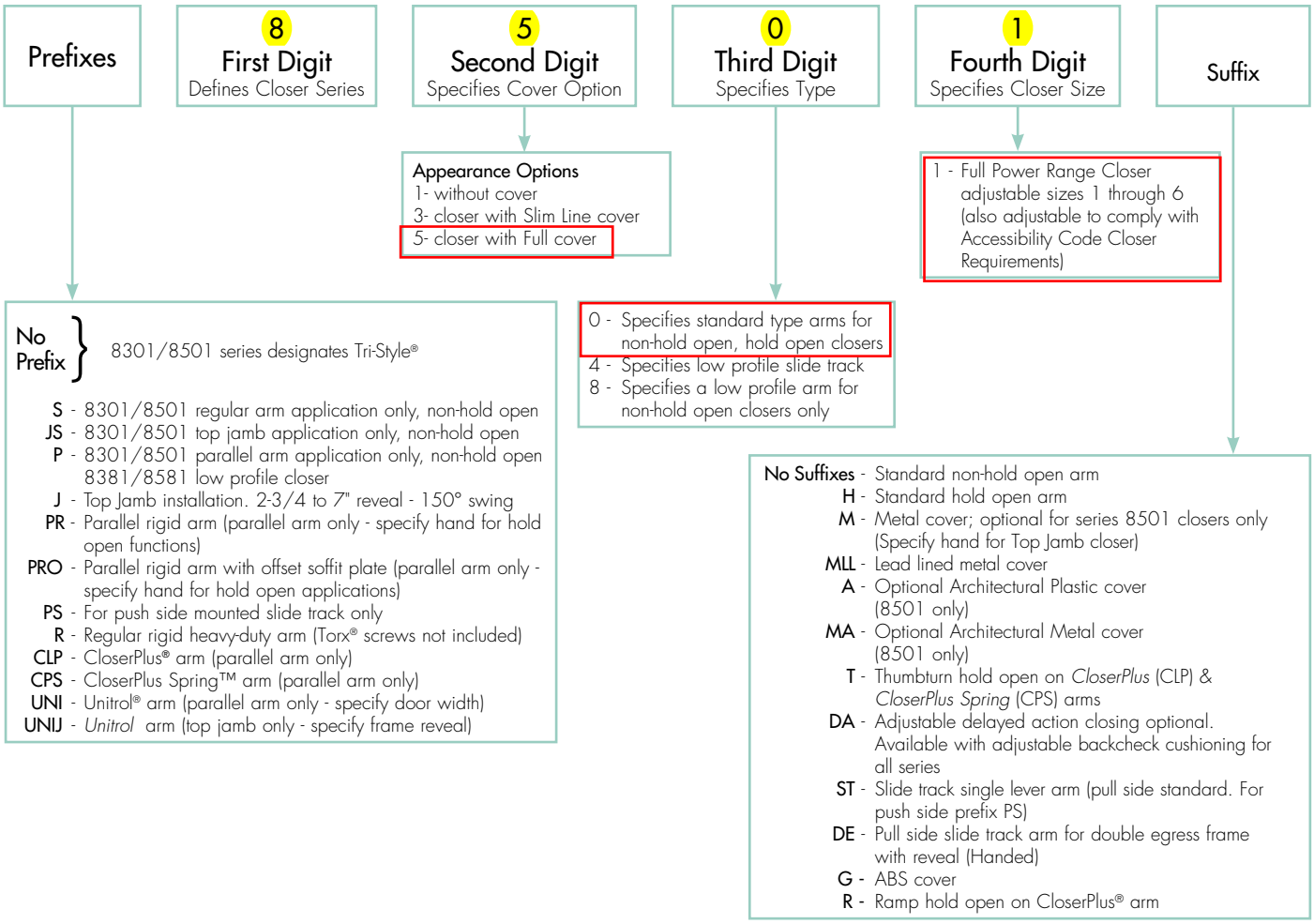
- ANSI/BHMA A156.4, Grade 1 certified
- UL / cUL listed for use on fire rated doors
- UL10C listed for positive pressure fire test
- 8301 and 8501 door closers are designed to comply with requirements for the Americans with Disabilities Act (A.D.A) and ANSI standard A117.1
- This product is manufactured in an ISO 9001 facility

CAUTION: Door Closers for Low Opening Force Applications:
Door closers installed in openings required to meet the requirements of The Americans with Disabilities Act or ANSI/BHMA Standard A117.1, when adjusted to meet those requirements, may not provide adequate closing power to dependably close and latch the door.

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HOW TO ORDER

For optimum protection of door and frame assemblies, always use auxiliary wall, floor, or overhead door stop.



Notes:
- Warranty becomes void if door closer is installed on the exterior side of a door in the exterior wall of a building.
- It is strongly recommended, and required on fire door assemblies, that doors having a door closer be hung on ball bearing or anti-friction hinges or pivots; unless an alternate method is identified in the door manufacturer's listing.
- Failure to use the correct type and size fasteners may void factory warranty.
- Fasteners for fire/smoke door assemblies must conform to NFPA 80. In some applications additional fasteners may be mandated by NFPA 80 that are not shipped with standard *Norton* product, such as sleeve-nuts/sex nuts or through-bolts and grommet nuts.
- Sizing charts provided on pages 13-25 are based on 1-3/4" (44mm) x 7' (2.13m) standard weight doors swinging to 110°. Other conditions (such as door height or weight; or wind/draft conditions) may require a larger size closer.

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FASTENERS

Type	Description	Arm								
		RA	PA	TJ	Low Profile	PR	CLP / CPS	UNI	UNI-J	Slide Track
DOOR										
SDST	Self Drilling Self Tapping	S	S	S	S	S	S	S	O	O
MS	Machine Screw	S	S	S	S	S	S	S	S	S
SN	Sleeve Nut/Sex Nut	O	O	O	O	S	S	S	S	S
TBGN	Through-Bolts & Grommet Nuts	O	O	O	O	O	O	O	O	O
SMS	Sheet Metal Screws	O	O	O	O	O	O	O	O	O
Torx®	*Torx* Drive Security Screw	O	O	O	O	O	O	O	O	O
FRAME										
SDST	Self Drilling Self Tapping	S	S	S	S	S	S	S	S	S
MS	Machine Screw	S	S	S	S	S	S	S	S	S
SMS	Sheet Metal Screws	O	O	O	O	O	O	O	O	O
Torx	*Torx* Drive Security Screw	O	O	O	O	O	O	O	O	O

S = standard; O = optional

SN are for use on unreinforced hollow metal doors or to prevent any hollow metal door from collapse/dimpling. They can also be used for thru bolting on wood doors. SN are supplied for 1-3/4" (44mm) thick doors unless specified for 2-1/4" (57mm) thick doors.
TBGN are an alternative to SN for wood doors. TBGN are supplied standard for 1-3/4" (44mm) thick doors. They can be specified for 1-3/8" (35mm) thick doors.
SMS - when specified, closer will be packed with sheet metal screws for the door AND sheet metal screws plus machine screws for the frame.
TORX screws with security pin are standard with Security Door Closers. *Torx* may be specified for all other series applications. *Torx* are only available with machine screw threads. Sheet metal screw threads or wood screw threads are not available.
Note: To order special fasteners with closers, specify model number x fastener (Ex: 8501 x 689 x TBGN)

FINISHES

Norton offers waterborne acrylic, polyster powder coat and plated finishes. Custom finishes are available on special order. A sample and approval is required.

Waterborne acrylic and polyester powder coat will withstand 100 hours of salt spray (ANSI requires 25 hours).

ANSI/BHMA	Description
600*	Prime Coat
605	Bright Brass
606	Satin Brass
611	Bright Bronze
612	Satin Bronze
613E	Dark Oxidized Satin Bronze - Equivalent
619	Satin Nickel
625	Bright Chrome
626	Satin Chrome

ANSI/BHMA	Description
689	Aluminum
690	Statuary Bronze
691	Dull Bronze
693	Black
694	Medium Amber
696	Gold
N/A	556 White

* 600 is a special rust-inhibiting prime coat. Closers can be ordered prime coat only (specify closer x 600). An additional charge applies if finish coat is required over prime coat.
- Norton closer bodies and plastic covers are available in waterborne acrylic finishes. Arms and metal covers are available in powder coat or plated finishes.
- When a plated finish is ordered, arm and cover will be plated unless "cover only" is specified.

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FEATURES

Aluminum Alloy Housing
Closer bodies are constructed of a special aluminum alloy, carefully selected to accommodate interactive steel components and operating conditions.

Rack & Pinion Operation
Provides a smooth constant control of the door through its full opening and closing cycle. 180° door swing can be achieved when door, frame, hardware and arm function do not interfere.

Non-handed
With few exceptions all series 8301/8501 door closers are non-handed and can be installed on either right- or left-hand swing doors. Pinion shaft extends vertically through the closer body in both directions. Some options, as noted on pages 6-7, will require that the hand of the closer be specified.

Sweep Speed Control Valve
Allows adjustment of door speed from the door's full open position down to approximately 10° from the closed position.

Latch Speed Control Valve
Allows adjustment of door speed from approximately 10° down to the door's fully closed position.

Tri-Style®
8301/8501 comes with screws, brackets and soffit plates to allow for regular, top jamb, and parallel arm installations.

Adjustable Backcheck Valve
Provides control of the door in the opening cycle, beginning at approximately 75° of door opening. It cushions the door opening when the door is forcibly opened beyond its pre-adjusted limits.

Standard Molded Covers
Molded of high-impact U.L. listed material. These covers are non-handed for all applications.

Warranty
Limited 25-year warranty for defects and life of the building on the aluminum housing.

Closer Fluid
NorGlide® closer fluid is a specially formulated multi-viscosity hydraulic fluid that contains lubricity and anti-oxidation agents that provide optimum performance and efficiency. This fluid complements the interaction of the door closer's aluminum housing with its steel and brass components, while maintaining stable viscosity to allow the door closer to perform in temperatures ranging from extremely high to as low as -40° F.

Door Closer Power Options

Series 8301/8501 Multi-Sized Door Closer
Adjustable through the power range of sizes 1 through 6; as outlined in ANSI/BHMA specification A156.4 option PT 4H.

Closers will also comply with the opening force requirements as outlined in the Americans with Disabilities Act (ADA) and ANSI/BHMA standard A117.1 for interior doors.

OPTIONAL FEATURES COVERS

Optional Metal Cover
This steel cover is non-handed for regular and parallel arm applications, but is handed for top jamb applications. Cover is available in sprayed or plated finishes.



Optional Architectural Covers *

Plastic Architectural plastic covers are molded of high-impact U.L. listed material. They are non-handed and available in sprayed finishes.

Metal The architectural metal covers are steel and non-handed for all applications. These covers are available in sprayed or plated finishes.



Optional ABS Cover
Consult factory for details

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OPTIONAL FEATURES

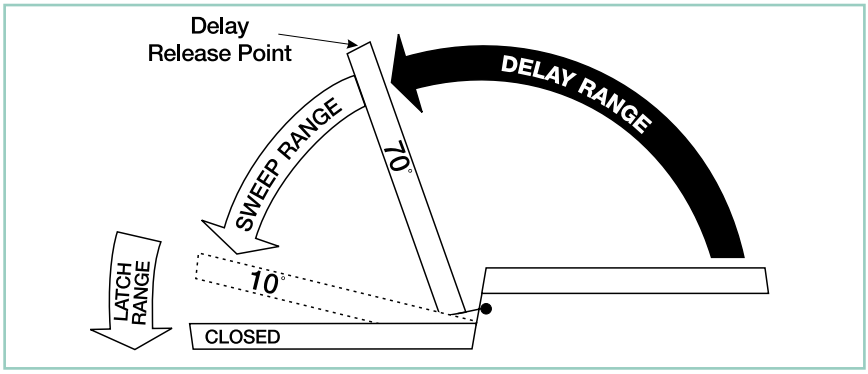
Adjustable Delayed Action Closing

An optional hydraulic feature that adds a third speed range to the closing cycle. This feature becomes effective when the door is opened and released at any point beyond 70°. The amount of time delay depends upon the combination of the angle of door release and valve adjustment. The valve can be adjusted with a 1/8" (3mm) hex key from no delay time up to maximum delay times of:

Door Opened	Approximate Time of Delay Cycle
180°	4-5 minutes
120°	2-3 minutes
90°	25-30 seconds

Pressure Relief Safety Valve

The delayed action hydraulic system contains a pressure relief valve. Any time the door is forced toward the closed direction while it is in the closing cycle, the valve will open and permit the door to close. This prevents damage to door, frame and closer.



Suggested Applications

Delayed Action closing allows slow-moving traffic to clear the opening before the door closer's normal closing cycle begins. This feature can be helpful in health care facilities such as hospitals and nursing homes. It provides sufficient time for persons on crutches or in wheelchairs to pass through a door without concern of it closing. At the same time, it can accommodate the facility's staff with movement of food service carts, beds, and other wheeled traffic.

Use of delayed action closers on many doors throughout industrial and commercial buildings can also assist the flow of traffic. Locations where additional time to clear the opening is advantageous are doors between office and factory/warehouse facilities, doors to workshops or laboratories, to kitchen and food processing areas, etc.

OPTIONAL FEATURES ARMS

Non-Hold Open

Self-closes door every time door is opened. Auxiliary stop (by others) required except when using the CloserPlus®, CloserPlus Spring™ or Unitrol® arms.

Hold Open

Achieved by means of friction or ball and detent/ roller. Friction hold open has a range of 90° to 180° using template location and mechanical adjustment.

Ball and detent or roller hold open is effective in a range of 85° to 110°.

Hold open arm door closers are not permitted to be used on fire door assemblies.

Door Opening Degrees

Arm Function	Regular Arm, Top Jamb Parallel Arm	Parallel Rigid Arm	CloserPlus® Parallel Arm	CloserPlus Spring™ Parallel Arm	Unitrol® Parallel Arm	*Unitrol* Top Jamb	Low Profile Regular, Parallel	Slide Track
Non-Hold Open	✓	✓	85° to 110°	85° to 110°	85° to 110°	85° to 110°	✓	85° to 110°/180°
Hold Open	90° to 180°	85° to 180°	85° to 110°	85° to 110°	85° to 110°	85° to 110°	N/A	85° to 110°

✓=180° trim and template permitting

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SUGGESTED SPECIFICATIONS

8301/8501 Series

Closers for interior and exterior doors shall be full rack-and-pinion type with cast aluminum alloy shell. Closers shall be surface mounted and shall project no more than 2-1/8" from the surface of the door with standard cover. Closers shall be non-handed to permit installation on doors of either hand. Closer fluid shall contain lubricity and anti-oxidation agents. Closer fluid shall maintain stable viscosity to allow door closer to perform in temperatures ranging from extremely high to as low as -40°F. Closers shall have multi-size spring power adjustment to permit setting of spring from size 1 through size 6. Closers shall have two non-critical valves, hex key adjusted, to independently regulate sweep speed and latch speed. Closers shall have adjustable backcheck intensity controlled by a hex key adjusted valve.

[Closers shall have adjustable delayed action closing controlled by a hex key adjustable valve.]

Regular arm and top jamb closers shall have a non-hold open shoe permitting 15% (+ or – 7-1/2%) power adjustment. **Closers shall be enclosed in a [molded resin cover] [plated or sprayed metal cover], Closers to be Norton® [8301/8501] [8501M] [8501MA] [8501A].

**For special arms insert that specification here (see column three on this page).

**Unitrol® Arm

Door closers shall have a fixed door stop feature effective at one point selected at installation, from 85° - 110° in five-degree increments. Door stop shall be cushioned by a shock-absorbing heavy-duty spring action effective at the [soffit plate] [arm shoe] pivot. [Closers shall be provided for parallel arm installation using a rigid steel main arm and secondary arm lengths proportional to the door width.] [Closers shall be provided for top jamb installation using a forged steel, rigid main arm and telescoping secondary arm adequate for the frame reveal of the openings.]

**CloserPlus® Arm

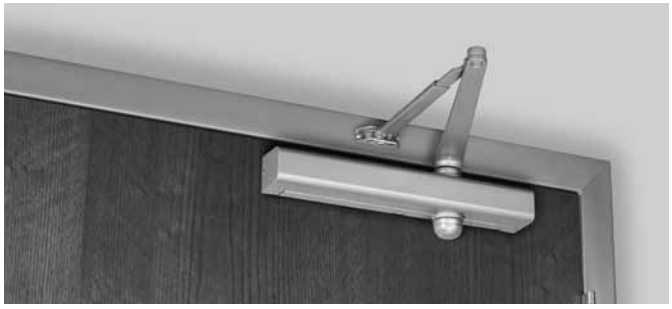
Door closers shall have a field reversible door stop. Door closer shall have a feature with selectable on and off ball and detent hold open. Hold open tension shall be adjustable effective at one point selected at installation, from 85° - 110° in five degree increments. [Hold open mechanism shall have engage/disengage selection actuated by thumbturn]. Closers shall be provided for parallel arm installation using a forged rigid steel main arm and secondary arm.

**CloserPlus Spring™ Arm

Door closers shall have built-in door stop [and holder] effective at one point selected at installation, from 85° - 110° in five-degree increments. Door stop mechanism shall be reversible and have a buffer spring that engages prior to the dead stop feature, reducing shock loads to the door and frame assembly. Door stop mechanism shall be non-handed and attached to soffit plate. [Hold open mechanism shall have engage/disengage selection actuated by thumbturn]. Closers shall be provided for parallel installation using a forged rigid steel main arm and secondary arm.

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APPLICATIONS



8301 - slim cover

Regular Arm

This is the only pull-side application where a double lever arm is used. It is the most power-efficient application for a door closer. Sufficient frame, door and/or ceiling clearance must be considered.



8501 - full cover

Since the arm assembly projects directly out from the frame, this application may present an aesthetics issue or be prone to vandalism.



Top Jamb

For efficiency reasons this application provides the best alternative to the regular arm application. There must be sufficient frame face and/or ceiling clearance for this application. It requires a top rail on the door of just 2-1/4" (57mm). This application provides the best door control for doors in exterior walls that swing out of a building.



The entire door closer and arm assembly project from the frame, similar to the regular arm application, where matters of appearance and malicious abuse can be of concern. Consideration must be given to depth of frame reveal.



Parallel Arm

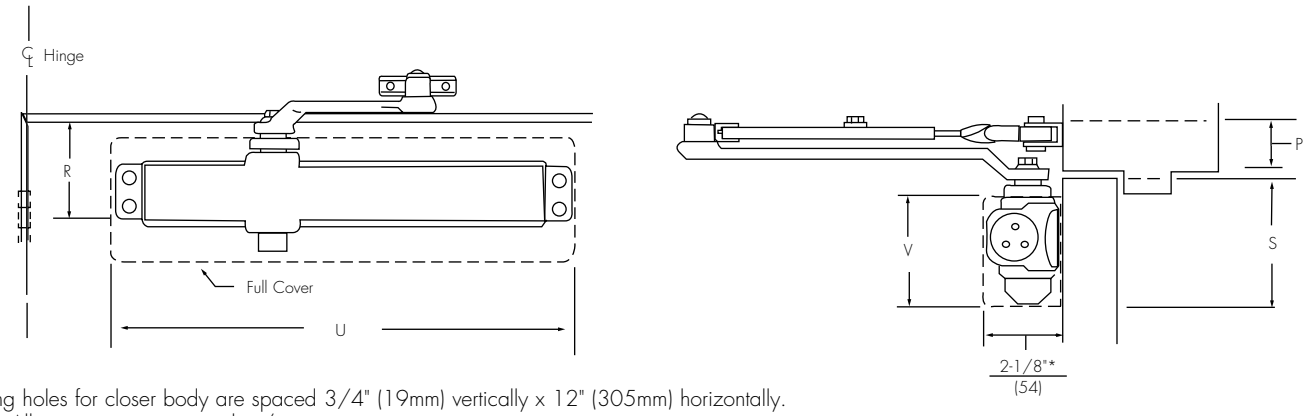
This application provides the most appealing design appearance for a surface-mounted door closer having a double lever arm. This also makes it beneficial in vandalism-prone areas. It is on the push side of the door and the arm assembly extends almost parallel to the door. In the closed position, there is very little or no hardware projecting beyond the frame face in most situations.



Due to the geometry of the arm it is approximately 25% less power efficient than a regular arm application. The entire closer and arm assembly are mounted below the frame stop. Top rail clearance dimensions will vary based on the type of cover used. (See pg.15)

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REGULAR ARM



Mounting holes for closer body are spaced 3/4" (19mm) vertically x 12" (305mm) horizontally.
Note: All measurements are inches/mm.
Maximum 180° door swing, conditions permitting.

Closer Series	Covers	P Minimum Ceiling Clearance			R Minimum Top Rail				S Minimum Top Rail Clearance		U Closer Length	V Closer Height
					W/O Drop Plate		W/8146 Drop Plate					
		NHO	Low Profile	HO	NHO	Low Profile	NHO	Low Profile	NHO	Low Profile		
8101	No Cover	1-1/2" (38)	1" (25)	1-5/8" (41)	2-1/2" (64)	2-3/8" (60)	1-5/8" (41)	1-1/2" (38)	3-1/2" (89)	3-3/8" (86)	12-3/4" (324)	2-7/8" (73)
8301	Slim Line Plastic										13" (330)	
8501	Full Plastic											
8501M	Metal								4-1/4" (108)	4-1/8" (105)	13-5/8" (346)	3-3/4" (95)
8501A	Arch. Plastic								3-5/8" (92)	3-1/2" (89)	14" (356)	3-1/8" (79)
8501MA	Arch. Metal								3-1/2" (89)	3-3/8" (86)		3" (76)

Door Width Inches (cm)		Model Number	
Interior	Exterior	Non-Hold Open	Hold Open
30" (76)	—	8301 8501	8301H 8501H
36" (91)	30" (76)		
48" (122)	36" (91)		
—	48" (122)		
Unusual			

Note: 8301/8501 door closers are set at midpower range from the factory and can be adjusted for door sizes noted above.

* Projection is for Slim Line or Full Covers. Projection for Metal Covers = 2-3/16" (56mm). Projection for Architectural Plastic & Architectural Metal Covers = 2-1/4" (57mm).

Note: Please contact factory if door weight exceeds 250 lbs.

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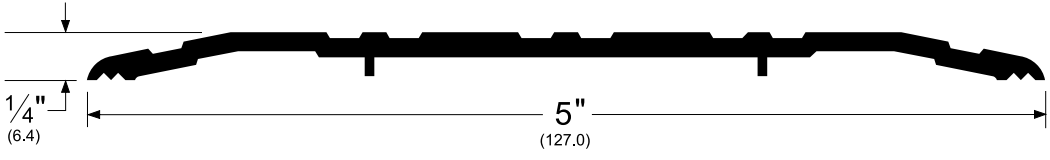
ASSA ABLOY

COMMERCIAL THRESHOLDS:
SADDLE THRESHOLDS

271AV

AVAILABLE FINISHES: **A, B, D, G, SN**
WIDTH: **5" (127.0 mm)**
HEIGHT: **1/4" (6.4 mm)**

TITLE:
PREPARED FOR:
PREPARED BY:
DATE:
COMMENTS:



A (Mill Finish Aluminum)
B (Mill Finish Extruded Bronze [Brass])
D (Dark Bronze Anodized)
G (Gold Anodized)
SN (Satin Nickel Anodized)

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ASSA ABLOY

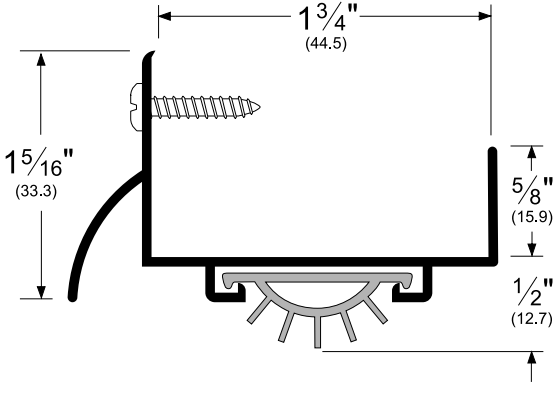
DOOR BOTTOMS: DOOR SHOES

216AV

AVAILABLE FINISHES: **A, B, BDG, D, G, PW, SN**

WIDTH: **1-3/4" (44.5 mm)**

PROFILE HEIGHT 1: **1-5/16" (33.3 mm)** PROFILE HEIGHT 2: **5/8" (15.9 mm)**
TOTAL HEIGHT WITH INSERT: Approx. **1-9/16" (39.7 mm)**



TITLE:
PREPARED FOR:
PREPARED BY:
DATE:
COMMENTS:

A (Mill Finish Aluminum)
B (Mill Finish Extruded Bronze [Brass])
BDG (Bright Dip Gold Anodized Aluminum)
D (Dark Bronze Anodized Aluminum)
G (Gold Anodized Aluminum)
PW (Painted White Aluminum)
SN (Satin Nickel Anodized Aluminum)

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TRIMCO | **1233 626**

Floor Stop
Height 2-7/8"
Cast Brass/Bronze,
Satin Chrome Plated

MFR PART # 1233 626
PART # CS113199

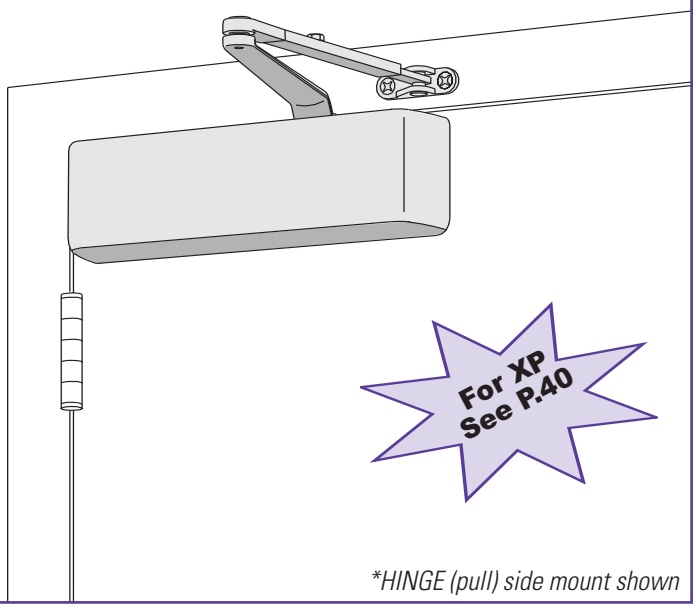
Specifications:

Bass Material	BRASS
Finish	US26D SATIN CHROME
Product Type	STOP
Mounting	FLOOR MOUNT
Sales Category	STOP
UNSPSC Code	46171500

LCN 4040 SERIES

FEATURES

CLOSER MOUNTS
***HINGE (PULL) SIDE**
TOP JAMB (PUSH SIDE)
PARALLEL ARM (PUSH SIDE)

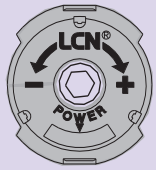


**HINGE (pull) side mount shown*

The 4040 SUPER SMOOTHEE® is LCN's most flexible heavy duty closer designed for institutional and other rugged high traffic applications.

- **Ten Million Cycles**
- **Cast Iron**
- **Forged Steel Arm**
- **Double Heat Treated Steel Pinion**
- **All Weather Fluid**
- **Non-Handed**
- **LCN® Fast™ Power Adjust**
- **Fast & Accurate Installation**
- **UL & cUL Listed**

- Standard 4040 series closer shipped with regular arm, standard plastic cover, and self reaming and tapping screws. See 4040 Series pages 45-47 for options.
- Non-sized cylinder is adjustable for interior doors to 5'0" and exterior doors to 4'0".
- Closer mounts hinge side, top jamb, and parallel arm w/PA Shoe on either right or left swinging doors.
- Closers to meet ADA requirements. See 4040 Series page 48.
- Standard or optional custom powder coat finish.
- Optional plated finish on cover, arm, and fasteners.
- Optional SRI primer for installations in corrosive conditions.
- Optional designer series metal cover
- UL and cUL listed for self-closing doors without hold-open.
- Tested and certified under ANSI Standard A156.4, grade one.



The 4040 Series includes the **LCN® FAST™ Power Adjust,** *a revolutionary visual indicator for Spring Power Adjustment.*

MOUNTING					FINISH		COVER		CYLINDER						**ARM FUNCTION						
HINGE (PULL) SIDE	TOP JAMB (PULL)	TOP JAMB (PUSH)	PARALLEL ARM	STOP FACE	POWDER COAT	PLATED	PLASTIC	METAL	DESIGNER METAL	NON-HANDED	NON-SIZED	ACCESSIBILITY	DELAYED ACTION	AVB***	XP	REGULAR (DOUBLE)	STANDARD (SINGLE)	HOLD-OPEN	FUSIBLE LINK	EDA/HEDA	CUSH/HCUSH	SCUSH/SHCUSH
●	○	●	●	○	●	●	●	●	●	●	●	♿	●	○	○	120°	○	120°	○	180°	110°	110°

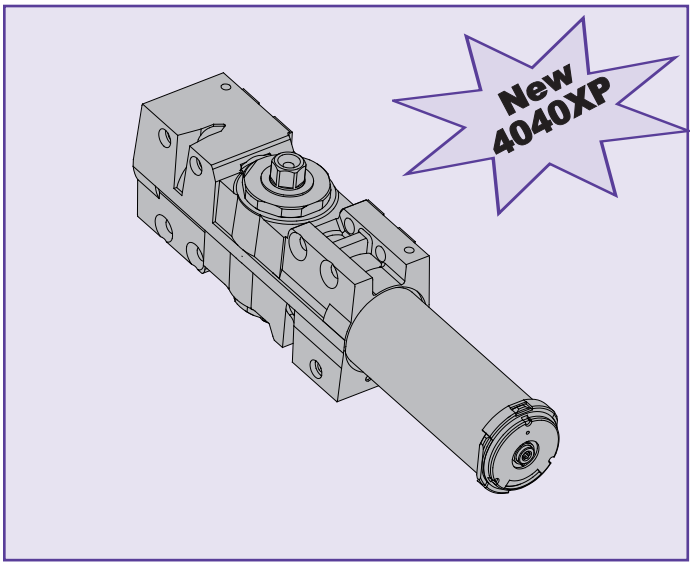
● *Available*
○ *Not available*

♿ *Closer available with less than 5.0 lbs. opening force on 36" door.*
***Maximum opening/hold-open point with standard template.*
**** Advanced Variable Backcheck*

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FEATURES

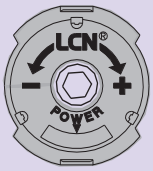


New 4040XP

The new 4040XP is LCN's most durable heavy duty closer designed for the most demanding, high use and abuse applications.

- 44% increased bearing load capacity
- Strongest pinion ever- at 3/4" journal diameter
- Widest bearing ever- at 5/8"
- Stronger pinion teeth
- New V-shield™ seal with 20% longer life
- XP = eXtra Protection in real world applications
- Cast Iron
- Forged Steel Arm
- Double Heat Treated Steel Pinion
- All Weather Fluid
- Non-Handed
- LCN® Fast™ Power Adjust
- Fast & Accurate Installation
- UL & cUL Listed
- Tested and certified under ANSI Standard A156.4, grade one

- **NEW 4040XP** closer shipped with **EDA arm**, standard plastic cover, and self reaming and tapping screws.
- Non-sized cylinder is adjustable for interior doors to 5'0" and exterior doors to 4'0".
- Closer mounts parallel arm (EDA arm) on either right or left swinging doors.
- Optional hinge side and top jamb mount with optional regular arm.
- Closers to meet ADA requirements. See 4040XP Series page 49.
- Standard or optional custom powder coat finish.
- Optional plated finish on metal cover, arm and fasteners.
- Optional SRI primer for installations in corrosive conditions is available with powder coat only.
- Optional designer series metal cover
- UL and cUL listed for self-closing doors without hold-open.
- 4040XP can be used with all 4041 accessories. See pages 45-47 for options.



The 4040 Series includes the **LCN® FAST™ Power Adjust,** *a revolutionary visual indicator for Spring Power Adjustment.*

MOUNTING					FINISH		COVER			CYLINDER						**ARM FUNCTION							
HINGE(PULL)SIDE	TOP JAMB (PULL)	TOP JAMB (PUSH)	PARALLEL ARM	STOP FACE	POWDER COAT	PLATED	PLASTIC	METAL	DESIGNER METAL	NON-HANDED	NON-SIZED	ACCESSIBILITY	DELAYED ACTION	AVB***	XP	REGULAR(DOUBLE)	STANDARD(SINGLE)	HOLD-OPEN	FUSIBLE LINK	EDA/HEDA	CUSH/HCUSH	SCUSH/SHCUSH
●	○	●	●	○	●	●	●	●	●	●	●	♿	○	○	●	120°	○	120°	○	180°	110°	110°

● *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*

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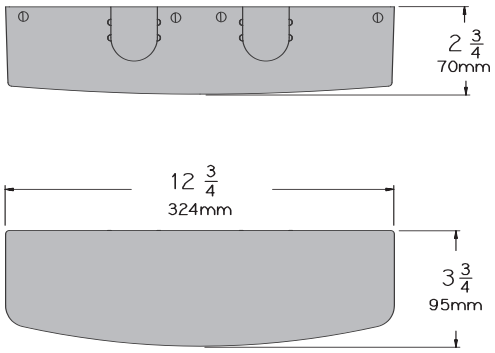
HINGE (PULL) SIDE MOUNTING

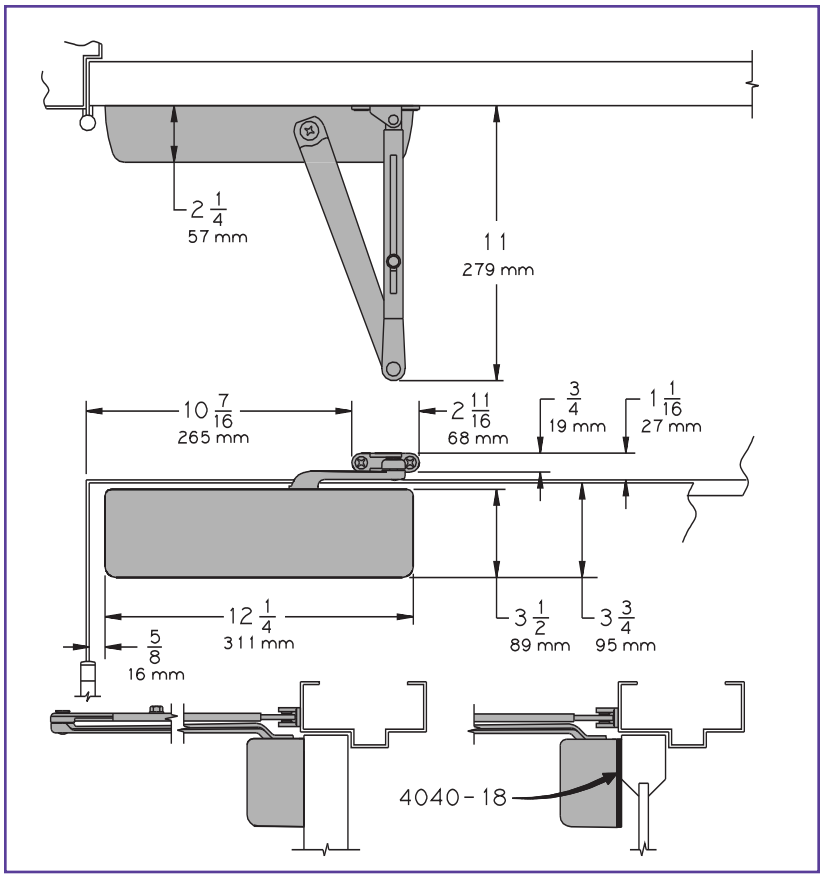
MAXIMUM OPENING

Templating allows up to 120°.

Hold-open points 90° up to 120° with hold-open arm.

Optional, Non-handed Designer Series Metal Cover





- **Butt Hinges** should not exceed 5" (127 mm) in width.
- **Auxiliary Stop** is recommended at hold-open point or where a door cannot swing beyond 120°.
- **Reveal** should not exceed 3/4" (19 mm) for regular arm or hold-open arm.
- **Top Rail** less than 3 3/4" (95 mm) requires PLATE, 4040-18. Plate requires 2" (51 mm) minimum. With Designer Series metal cover, use PLATE, 4040-18DS1
- **Clearance** of 2 3/8" (60 mm) behind door required for 90° installation. 2 7/8" (73 mm) for Designer Series metal covers
- **Delayed Action** (not available on 4040XP) Add suffix "DEL" to selected cylinder (eg. 4041 DEL). Delays closing from 120° to 70°. Delay time adjustable up to approximately 1 minute.
- **Bull Nose Trim** requires SOFFIT SHOE, 4040-65.
- **Corner Bracket** available for doors where top jamb or parallel arm mounting can not be used.
  4040-16 allows 110° opening. Projects 5" (127 mm) from stop, 12 13/16" (325 mm) from frame.
  4040-17 allows 100° opening with certain auxiliary door holders (consult factory). Projects 6 3/8" (162 mm) from stop, 13 11/16" (348 mm) from frame.

Options

- 4040XP cylinder
- 4041 Delayed action cylinder.
- Hold-open arm.
- Metal or lead lined cover.
- Corner bracket.
- Designer Series metal cover.

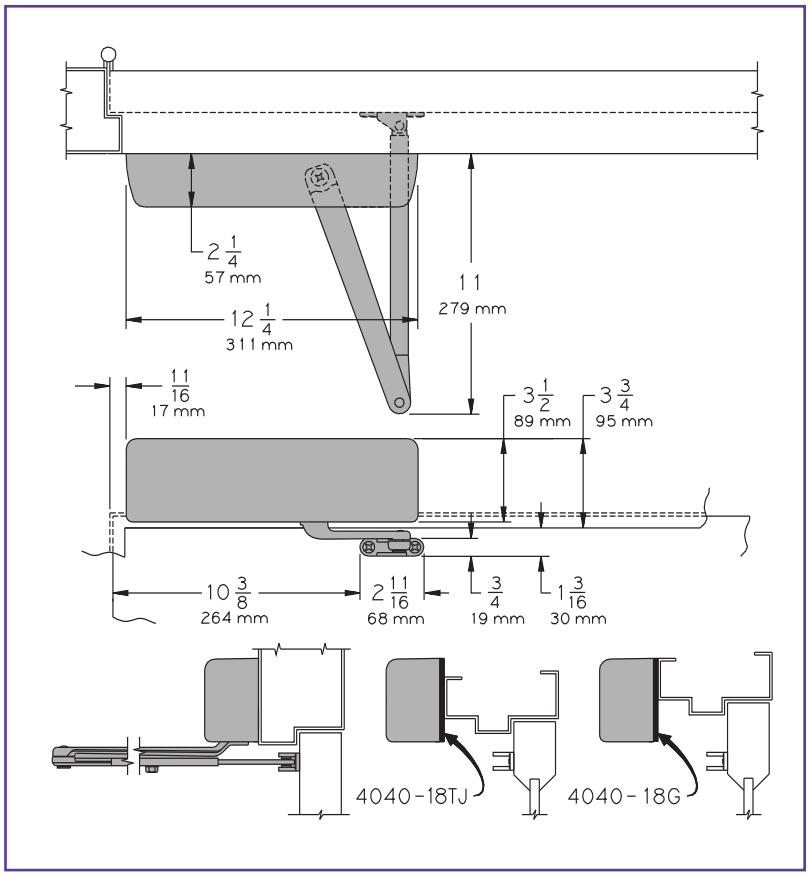
Special Templates

Customized installation templates or products may be available to solve unusual applications. Contact LCN for assistance.

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MOUNTING DETAILS



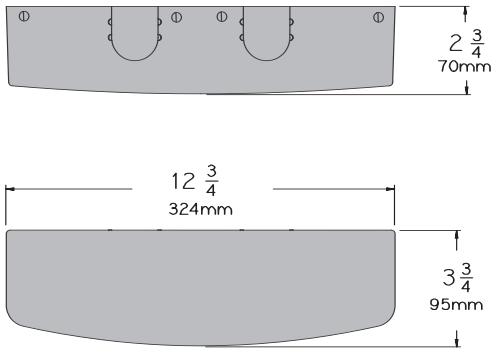
TOP JAMB (PUSH SIDE) MOUNTING

MAXIMUM OPENING

Templating allows up to 120°.

Hold-open points 85° up to 120° with hold-open arm.

Optional, Non-handed Designer Series Metal Cover



- **Butt Hinges** should not exceed 5" (127 mm) in width.
- **Auxiliary Stop** is recommended at hold-open point or where the door cannot swing 120°.
- **Reveal** of 2 9/16" (65 mm) allows 120° opening for REGULAR ARM or standard HOLD-OPEN ARM. 4 13/16" (122 mm) allows up to 120° opening with LONG ARM where standard rod and shoe is replaced with optional LONG ROD AND SHOE 4040-79LR. Use H-LONG ARM with LONG HEAD AND TUBE, 4040-78HL for hold-open. 8" (203 mm) allows up to 120° opening with EXTRA LONG ARM where standard rod and shoe is replaced with optional EXTRA LONG ROD AND SHOE, 4040-79ELR.
- **Top Rail** requires 1 1/4" (32 mm) minimum.
  2 1/4" (57 mm) minimum with closer on PLATE, 4040-18TJ.
  3" (76 mm) minimum with closer on PLATE, 4040-18G. With Designer Series metal cover, use PLATE, 4040-18TJDS1
- **Head Frame** less than 3 1/2" (89 mm) requires PLATE, 4040-18TJ.
  With flush ceiling, use PLATE, 4040-18G.
  Either plate requires 1 3/4" (44 mm) minimum.
- **Delayed Action** (not available on 4040XP) Add suffix "DEL" to selected cylinder (eg. 4041 DEL). Delays closing from 120° to 80°. Delay time adjustable up to approximately 1 minute.

Options

- 4040XP cylinder
- 4041Delayed action cylinder.
- Long arm, extra long arm, hold-open arm, long hold-open arm.
- Metal or lead lined cover.
- Designer Series metal cover.

Special Templates

Customized installation templates or products may be available to solve unusual applications. Contact LCN for assistance.

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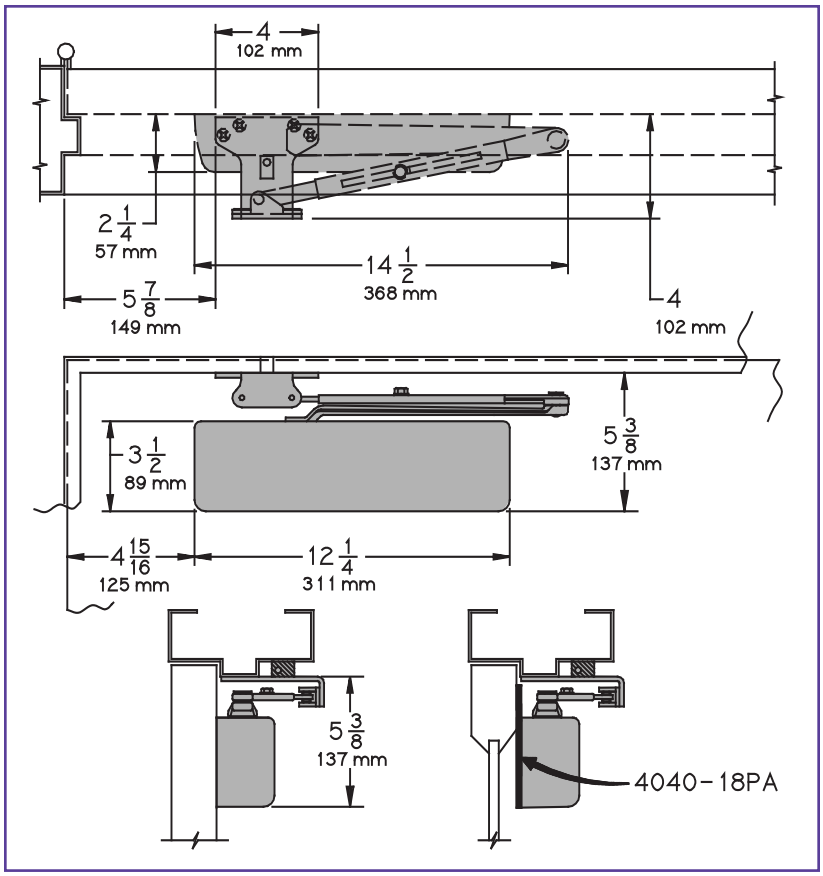
PARALLEL ARM (PUSH SIDE) MOUNTING

Optional mounting requires PA SHOE, 4040-62PA for REGULAR or HOLD-OPEN arms. Add prefix "P" to closer description (eg. P4041). P4041 closer includes 4040-201 FIFTH HOLE SPACER to support PA SHOE.

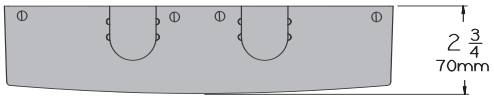
MAXIMUM OPENING

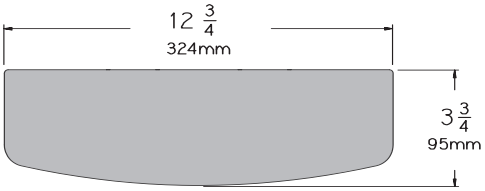
180° opening/hold-open points with all except CUSH arms.

110° opening/hold-open with CUSH arms.



Optional, Non-handed Designer Series Metal Cover





Options

- 4040XP cylinder
- 4041Delayed action cylinder.
- Hold-open, EDA, HEDA, CUSH, HCUSH, SPRING CUSH, or SPRING HCUSH arm.
- Metal or lead lined cover.
- Designer Series metal cover.

Special Templates

Customized installation templates or products may be available to solve unusual applications. Contact LCN for assistance.

- **Butt Hinges** should not exceed 5" (127 mm) in width.
- **Auxiliary Stop** is recommended at hold-open point, where the door cannot swing 180°, or where CUSH-N-STOP arm is not used.
- **Clearance** for 4040-62PA shoe is 4" (102 mm) from door face.
  EDA shoe projects 5 1/2" (140 mm) from door face.
  CUSH shoe projects 6" (152 mm) from door face.
- **Top Rail** less than 5 3/8" (137 mm) measured from the stop requires PLATE, 4040-18PA. Plate requires 2" (51 mm) minimum from the stop. With Designer Series metal cover, use PLATE, 4040-18PADS1
- **Head Frame** flush or rabetted requires PA SHOE ADAPTER, 4040-418.
- **Stop Width** minimum 1" (25 mm). CUSH arm requires minimum 1 1/2" (38 mm).
- **Blade Stop** clearance requires 1/2" (13mm) BLADE STOP SPACER, 4040-61.
- **Delayed Action** (not available on 4040XP) Add suffix "DEL" to selected cylinder (eg. P4041 DEL). Delays time adjustable up to approximately 1 minute.

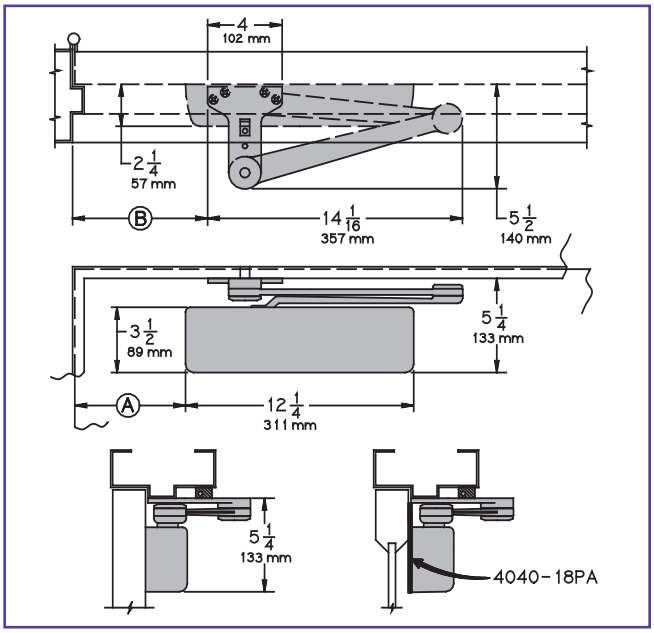
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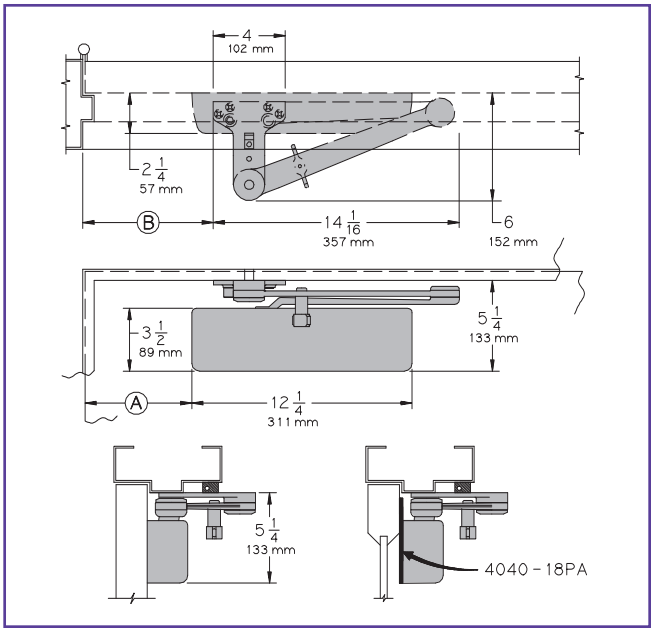
LCN 4040 SERIES

Mounting details are the same as 4040 Series REGULAR or HOLD-OPEN except as listed below. 4040 Series closers ordered with EDA or CUSH arms include 4040-201 FIFTH HOLE SPACER to support the shoe.

4040 SERIES EDA MOUNT



4040 SERIES CUSH MOUNT



- **Clearance** for 4040-62EDA is 5 1/2" (140 mm) from door face. 6" (152 mm) for CUSH.
- **Head Frame** flush or rabetted requires CUSH FLUSH PANEL ADAPTER, 4040-419.
- **CUSH ARM** requires SHOE SUPPORT, 4040-30 for fifth screw anchorage for narrow frames.
- **Delayed Action** (not available on 4040XP) Add suffix "DEL" to selected cylinder (eg. 4041 DEL). 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.

MAXIMUM OPENING

EDA arm can be templated for points at: 110°,
Ⓐ = 6 3/8" (162 mm)
Ⓑ = 7 3/4" (197 mm)
or 180°.
Ⓐ = 2 7/8" (73 mm)
Ⓑ = 4 1/4" (108 mm)
Hold-open points up to maximum opening with HEDA arm.

CUSH arms can be templated for opening/hold-open point at:
85°,
Ⓐ = 7 15/16" (202 mm)
Ⓑ = 9 1/8" (232 mm)
90°,
Ⓐ = 7 3/16" (183 mm)
Ⓑ = 8 1/2" (216 mm)
100°,
Ⓐ = 6 1/16" (154 mm)
Ⓑ = 7 1/4" (184 mm)
or 110°.
Ⓐ = 5 1/16" (129 mm)
Ⓑ = 6 3/8" (162 mm)

Spring Cush dead stop points are approximately 5˚ more than templated stop point. Hold open at templated stop points.

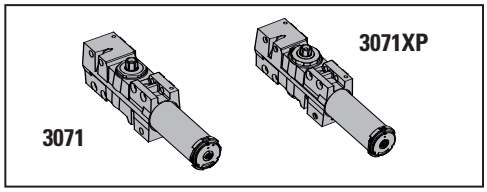
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LCN 4040 SERIES

CYLINDERS

CYLINDER, 4041-3071
Standard, non-handed cast iron cylinder assembly.

CYLINDER, 4040XP-3071
Heavy duty, non-handed cast iron cylinder assembly.



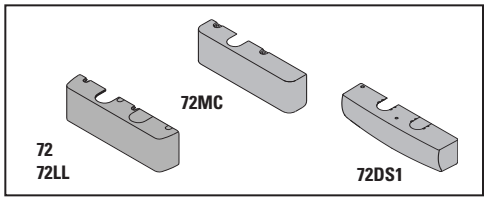
COVERS

COVER, 4040-72
Standard, non-handed plastic cover.

METAL COVER, 4040-72MC
Optional, handed cover. Required for plated finishes and custom powder coat finishes.

LEAD LINED COVER, 4040-72LL
Optional non-handed plastic cover.

DESIGNER SERIES METAL COVER, 4040-72DS1
Optional, non-handed designer series metal cover.



ARMS

REGULAR ARM, 4040-3077
Non-handed arm mounts pull side or top jamb with shallow reveal. P4041 closer includes PA SHOE, 4040-62PA required for parallel arm mounting.

PA SHOE, 4040-62PA
Required for parallel arm mounting.

LONG ARM, 4040-3077L
Optional non-handed arm includes LONG ROD AND SHOE, 4040-79LR for top jamb mount.

EXTRA LONG ARM, 4040-3077ELR
Optional non-handed arm includes EXTRA LONG ROD AND SHOE, 4040-79ELR for top jamb mount with deep reveal.

HOLD-OPEN ARM, 4040-3049
Optional, non-handed arm mounts pull side or top jamb with shallow reveal, hold-open adjustable shoe. P4041 closer includes 4040-62PA shoe required for parallel arm mounting.

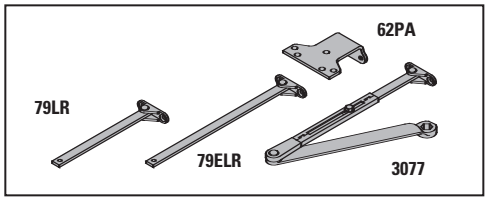
LONG HOLD-OPEN ARM, 4040-3049L
Optional non-handed arm includes LONG HEAD AND TUBE, 4040-3048L for top jamb mount.

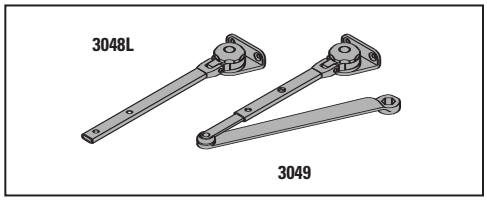
EXTRA DUTY ARM, 4040-3077EDA
Non-handed parallel arm features forged, solid steel main and forearm for potentially abusive installations.

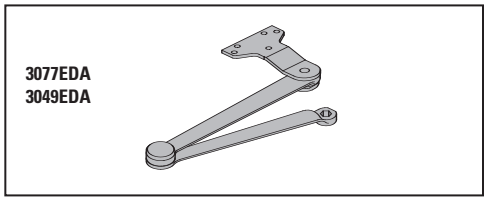
HOLD-OPEN EXTRA DUTY ARM, 4040-3049EDA
Optional handed arm provides hold-open function, adjustable at the shoe.

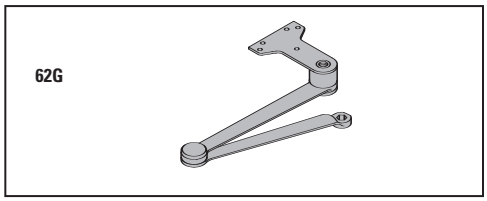
THICK HUB SHOE, 4040-62G
Optional for blade stop clearance, requires special templating.

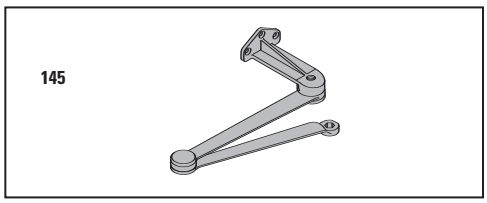
FLUSH TRANSOM SHOE, 4040-145
Optional for single rabetted installations, requires special templating.









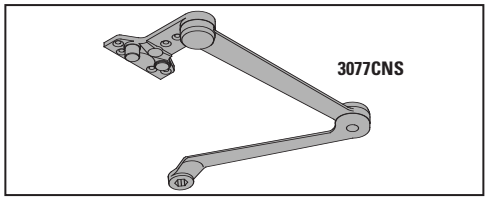


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ARMS cont.

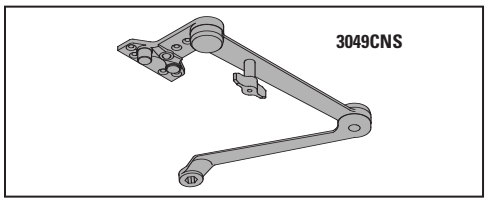
CUSH-N-STOP® ARM, 4040-3077CNS

Optional, non-handed parallel arm features solid forged steel main arm and forearm with stop in soffit shoe.



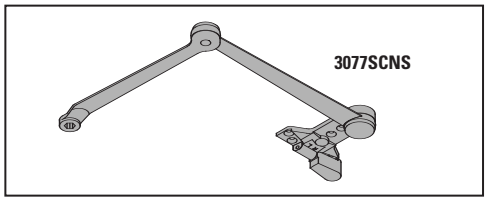
HCUSH ARM, 4040-3049CNS

Provides hold-open function with templated stop/hold-open points. Handle controls hold-open function.



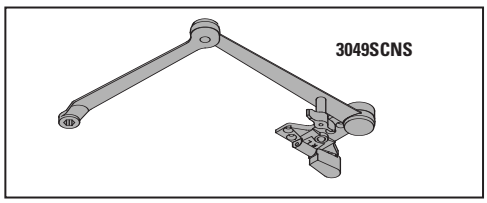
SPRING CUSH ARM, 4040-3077SCNS

Optional, non-handed parallel arm for abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe.



SPRING HCUSH ARM, 4040-3049SCNS

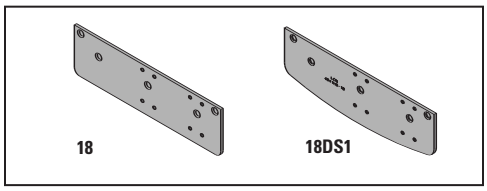
Optional, non-handed parallel arm for abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe. Handle controls hold-open function.



INSTALLATION ACCESSORIES

PLATE, 4040-18/4040-18DS1

Required for hinge side mount where top rail is less than 3 3/4" (95 mm). Plate requires minimum 2" (51 mm) minimum top rail. With Designer Series metal cover, use PLATE, 4040-18DS1

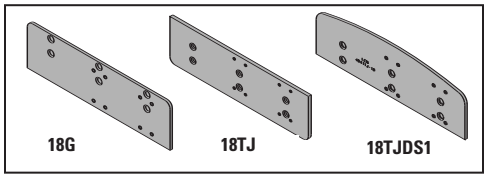


PLATE, 4040-18G

Locates top jamb mounted closer flush with top of head frame face in flush ceiling condition. Plate requires 1 3/4" (44 mm) minimum head frame.

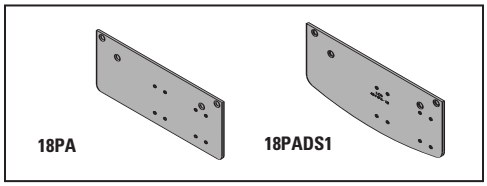
PLATE, 4040-18TJ/4040-18TJDS1

Centers top jamb mounted closer vertically on head frame where face is less than 3 1/2" (89 mm). Plate requires 1 3/4" (44 mm) minimum head frame. With Designer Series metal cover, use PLATE, 4040-18TJDS1



PLATE, 4040-18PA/4040-18PADS1

Required for parallel arm mounting where top rail is less than 5 1/2" (140 mm), measured from the stop. Plate requires 2" (51 mm) minimum top rail. With Designer Series metal cover, use PLATE, 4040-18PADS1



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INSTALLATION ACCESSORIES cont.

CORNER BRACKET, 4040-17
Designed to lower closer for clearance of certain auxiliary holders (consult factory).

CORNER BRACKET, 4040-16
For doors where top jamb or parallel arm mounting cannot be used (consult factory).

CUSH SHOE SUPPORT, 4040-30 provides anchorage for fifth screw used with CUSH arms, where reveal is less than 3 1/16" (78 mm).

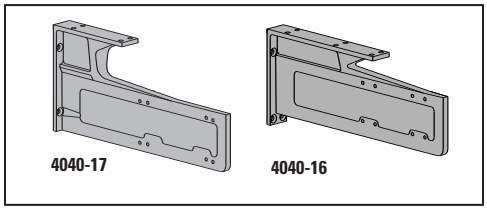
BLADE STOP SPACER, 4040-61 required to lower parallel arm shoe to clear 1/2" (13 mm) blade stop.

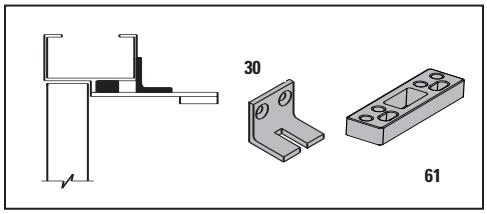
SOFFIT SHOE, 4040-65 adapts hinge side shoe to rounded or bull nose trim.

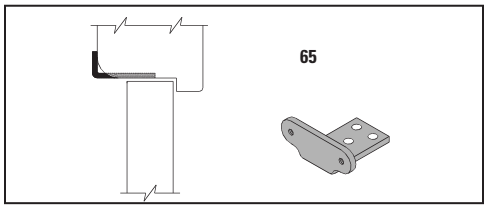
PA SHOE ADAPTER, 4040-418 provides horizontal mounting surface for parallel arm shoe on single rabetted or flush frame.

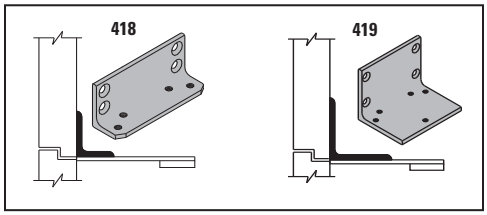
CUSH FLUSH PANEL ADAPTER, 4040-419 provides horizontal mounting surface for CUSH shoe on single rabetted or flush frame.

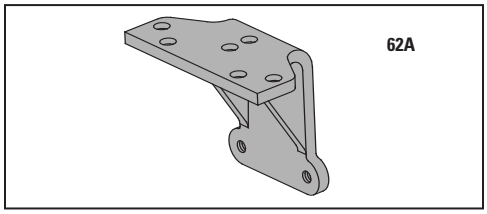
AUXILIARY SHOE, 4040-62A requires a top rail of 7" (178 mm). Optional shoe replaces -62PA for parallel arm mounting of regular arm with overhead holder/stop.











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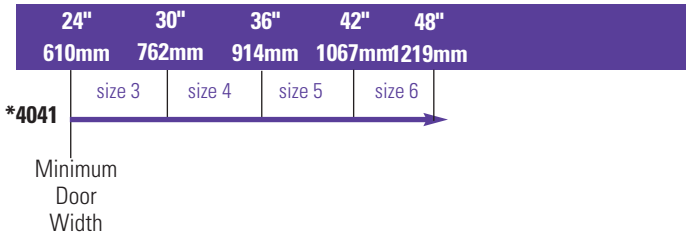
LCN 4040 SERIES

TABLE OF SIZES

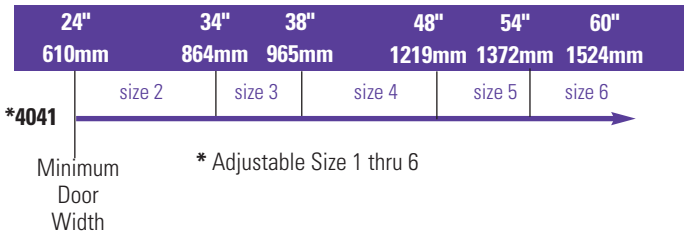
4041 cylinders are adjustable from size 1 through size 6 and is shipped set to size 3.
Closing power of 4040 series closers may be adjusted 50%.

→ Indicates recommended range of door width for closer size.

EXTERIOR (and VESTIBULE) DOOR WIDTH



INTERIOR DOOR WIDTH



REDUCED OPENING FORCE 4040 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.	4041	4041	4041
	5.0* lbs.	4041	4041	4041

** Maximum opening force*

HOW-TO-ORDER 4041 SERIES CLOSERS

1. SELECT FINISH.
☐ Standard Powder Coat _____
Aluminum, Dark Bronze , Tan, Statuary, Light Bronze, Black, Brass.

Closer will be shipped with:
- STANDARD COVER,
- REGULAR ARM,
- SELF-REAMING and TAPPING SCREWS, unless options listed below are selected.

CLOSER OPTIONS

CYLINDER
☐ Delayed Action (DEL)
COVER
☐ Lead Lined (LL)
☐ Metal (specify right or left hand) (MC)
☐ Designer Series Metal (non-handed) (DS1)
FINISH
☐ Custom Powder Coat (RAL) _____
(handed metal cover required)
☐ Plated Finish, US _____
(handed metal cover required)
☐ SRI primer
ARM
☐ 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)
☐ EDA (optional -62G or -145)
☐ HEDA (specify right or left hand, optional-62G or -145)
☐ 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, 4040-18
☐ Plate, 4040-18TJ
☐ Plate, 4040-18G
☐ Plate, 4040-18PA
☐ Plate, 4040-18DS1
☐ Plate, 4040-18TJDS1
☐ Plate, 4040-18PADS1
☐ CUSH Shoe Support, 4040-30
☐ Blade Stop Spacer, 4040-61
☐ Auxiliary Shoe, 4040-62A
☐ Soffit Shoe, 4040-65
☐ PA Shoe Adapter, 4040-418
☐ CUSH Flush Panel Adapter, 4040-419
SPECIAL TEMPLATE
☐ ST- _____

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LCN 4040 SERIES

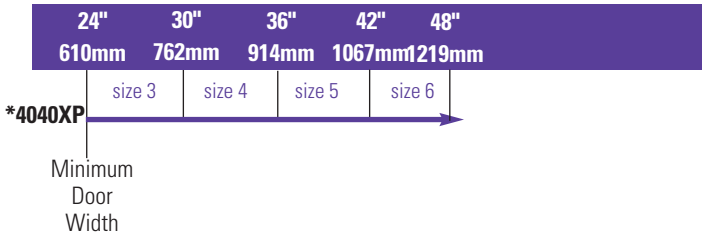
New 4040XP

TABLE OF SIZES

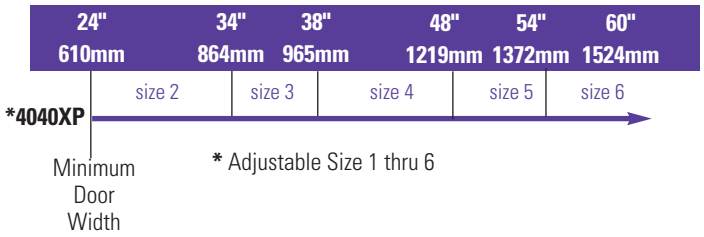
4040XP cylinders are adjustable from size 1 through size 6 and is shipped set to size 3.
Closing power of 4040 series closers may be adjusted 50%.

→ Indicates recommended range of door width for closer size.

EXTERIOR (and VESTIBULE) DOOR WIDTH



INTERIOR DOOR WIDTH



* Adjustable Size 1 thru 6

REDUCED OPENING FORCE 4040 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.	4041	4041	4041
	5.0* lbs.	4041	4041	4041

** Maximum opening force*

ORDERING INFORMATION

HOW-TO-ORDER 4040XP SERIES CLOSERS

1. SELECT FINISH.
☐ Standard Powder Coat _____
Aluminum, Dark Bronze , Tan, Statuary, Light Bronze, Black, Brass.

Closer will be shipped with:
- STANDARD COVER,
*- **EDA ARM**,*
- SELF-REAMING and TAPPING SCREWS, unless options listed below are selected.

CLOSER OPTIONS

COVER
☐ Lead Lined (LL)
☐ Metal (specify right or left hand) (MC)
☐ Designer Series Metal (non-handed) (DS1)

FINISH
☐ Custom Powder Coat (RAL) _____
(handed metal cover required)
☐ Plated Finish, US _____
(handed metal cover required)
☐ SRI primer

ARM
☐ Regular (Rw)
☐ 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)
☐ EDA -62G or -145
☐ HEDA (specify right or left hand, optional-62G or -145)
☐ 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, 4040-18
☐ Plate, 4040-18TJ
☐ Plate, 4040-18G
☐ Plate, 4040-18PA
☐ Plate, 4040-18DS1
☐ Plate, 4040-18TJDS1
☐ Plate, 4040-18PADS1
☐ CUSH Shoe Support, 4040-30
☐ Blade Stop Spacer, 4040-61
☐ Auxiliary Shoe, 4040-62A
☐ Soffit Shoe, 4040-65
☐ PA Shoe Adapter, 4040-418
☐ CUSH Flush Panel Adapter, 4040-419

SPECIAL TEMPLATE
☐ ST- _____

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1279

Five Knuckle
Plain Bearing
Standard Weight





Application:

- ANSI A8133
- Non-rising removable pin with button tip and plug
- With door closer use ball bearing hinge
- For use with medium frequency doors or doors requiring low frequency service

PRODUCT SPECIFICATIONS

MATERIAL:
- Steel with Steel pin

FINISHES:
- LS, H2H, USP, US3, US4, US10, US10A, US10B, US15, US26, US26D

OPTIONS:
- NRP - Non-removable pin

PRODUCT SIZE OPTIONS

HINGE SIZE (INCHES)	HINGE SIZE (MM)	GAUGE OF METAL	HOLE COUNT	SCREW SIZE (MACHINE)	SCREW SIZE (WOOD)
2 x 2	51 x 51	0.083	4	-	3/4 x 8
2 1/2 x 2 1/2	64 x 64	0.089	6	-	3/4 x 8
3 x 3	76 x 76	0.097	6	-	1 x 9
3 1/2 x 3 1/2	89 x 89	0.119	6	1/2 x 10-24	1 x 9
4 x 4	102 x 102	0.129	8	1/2 x 12-24	1 1/4 x 12
4 1/2 x 4	114 x 102	0.134	8	1/2 x 12-24	1 1/4 x 12
4 1/2 x 4 1/2	114 x 114	0.134	8	1/2 x 12-24	1 1/4 x 12
5 x 4	127 x 102	0.145	8	1/2 x 12-24	1 1/4 x 12
5 x 4 1/2	127 x 114	0.145	8	1/2 x 12-24	1 1/4 x 12
5 x 5	127 x 127	0.145	8	1/2 x 12-24	1 1/4 x 12
6 x 4 1/2	152 x 114	0.160	10	1/2 x 1/4-20	1 1/2 x 14
6 x 5	152 x 127	0.160	10	1/2 x 1/4-20	1 1/2 x 14
6 x 6	152 x 152	0.160	10	1/2 x 1/4-20	1 1/2 x 14

SECUREALL SECURITY REINVENTED℠

Cylindrical Door Reader SA-CDR



Electrical specifications

Users	Up to 70,000
Audit Trail	6 mos. data stored in server, typical
Credential Verification Time	< 50ms
Visual/Audible Interface	LED and audio beeper
System Interface	SA-*Guardian* Application Server
Power Supply	3 or 4 standard AA alkaline batteries; depends on keying option
Battery Life	4 years, typical
Exterior Operating Temperature	-10° C to +70° C or +14° F to +158° F
Interior Operating Temperature	-10° C to +55° C or +14° F to +131° F
Certifications/Compliance	FCC Part 15 B&C
Reader Technology	Hands-free, wireless
Reader Frequency	2.4 GHz
Reader Range	1" to 30 ft, programmable
Communication Security	PKI, AES-128
Encryption Keys	Device specific, customer controlled
Wireless Communication Protocol	Proprietary: Extreme low power (ELP) protocol & 802.15.4
Reader/Router Handshake	Automatic
Firmware Updates	PKI; over-the-air
Electrical Warranty	2 years

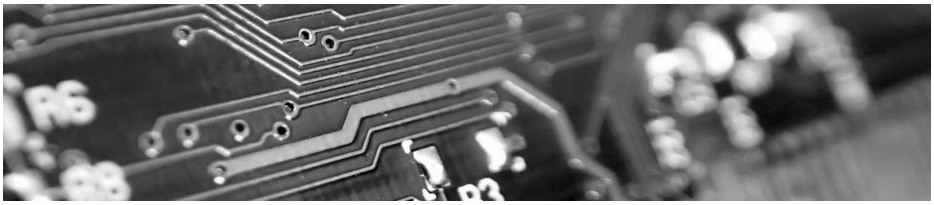
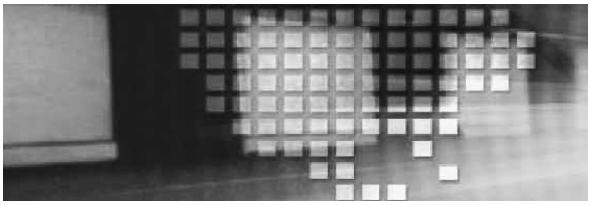
Features & Benefits

- **Hands-free, multi-distance access**
- **Long range, hands-free asset tracking**
- **Real-time, extreme low power communication => long battery life**
- **All access decisions at the door; does not require server link**
- **Multi-layer hard encryption: PKI +AES**
- **Device specific encryption keys, controlled by system owner**
- **Remote & local lockdown**
- **Over-the-air firmware upgrades**
- **Manual & programmable office mode**
- **Integrated door ajar and tamper sensor**
- **Remote unlock**
- **No software or lease licenses**

Mechanical specifications

Handing	Universal, non-handed; ADA compliant
Certifications/Compliance	ANSI/BHMA A156.2 Grade 1; UL10c-3 hour
Door Thickness	1-5/8" to 2"
Backset	2-3/4"
Latches	Stainless steel, 17/32" throw
Lever Design	Sentinel
Lever Functionality	Clutched (free wheeling)
Strikes	ASA strike
Keying	Hands-free U-Key™
Function	Passage, privacy, entry, classroom, storeroom; other functions available upon request
Case Material	Satin stainless steel (630)
Dimensions	O/S 9-3/8" x 3-1/8" x 27/32"
Vandal Protection	Integrated tamper sensors
Door Ajar Alarm	Integrated deadlatch sensor
Mechanical Warranty	2 years

SecureALL Corporation
Panic Hardware Reader Installation Guide

Version 5.0

SecureALL Corporation
PHR Installation Guide

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Revision History

Version	Date	Author	Revision Description
1.0	1-3-2014	RAS	Initial version
2.0	9-27-2014	RAS	Text modified for UL approval
3.0	1-16-2015	RAS	New design for full 3 hour fire rating
4.0	2-11-2015	RAS	Add option for battery holder unit
5.0	12-11-2017	RAS	Delete cardboard sleeve battery option

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Introduction

These instructions are intended to show you how to install a SecureALL Panic Hardware Reader (SA-PHR) door assembly. This document assumes you have door hardware with a UL Certified Von Duprin Series 98/99 fire-exit device. If you have any other door lock, contact SecureALL for additional assistance. This installation guide applies to all door types requiring 3 hour fire rating.

Required Tools

1. Phillips screwdriver
2. Power drill
3. Dremel tool
4. Utility knife
5. M5 screw tap
6. Pliers
7. Sensor tester
8. Flashlight (optional)

Check the Materials

Verify you have the following materials needed for installation and that there is no damage to anything from the packing, shipping, etc. If you find any damaged or missing items, contact SecureALL immediately for assistance.

The following components are included with each door reader kit:

1. Back escutcheon unit
2. Front lock/antenna assembly
3. Microswitch sensor assembly and cabling
4. Metal pushbutton lockdown switch
5. Battery holder
6. Back mounting plate
7. Assorted screws and connectors

Installation Steps

1. Remove the entire pushbar from inside the door. There are 3 screws in the endcap and 4 screws in the latch cover plate (Figures 1 and 2). After this is done, screws on the inside of the pushbar unit attached to the door are removed to allow it to become free (Figure 3). This will also allow the front lock to be removed (Figure 4).

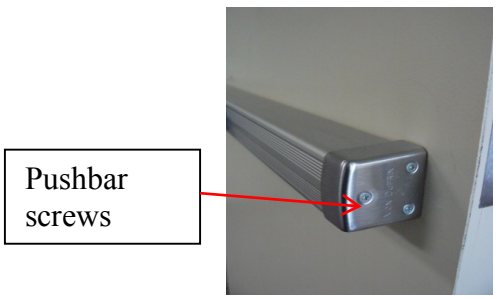


Figure 1

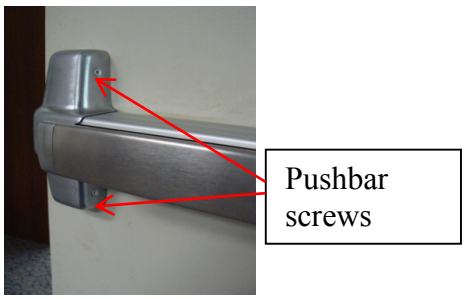


Figure 2

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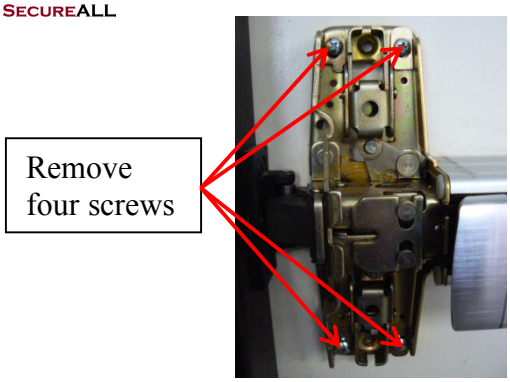


Figure 3



Figure 4

2. Slide the top rail of the pushbar unit away from the pushbar to expose the cavity area (Figure 5).

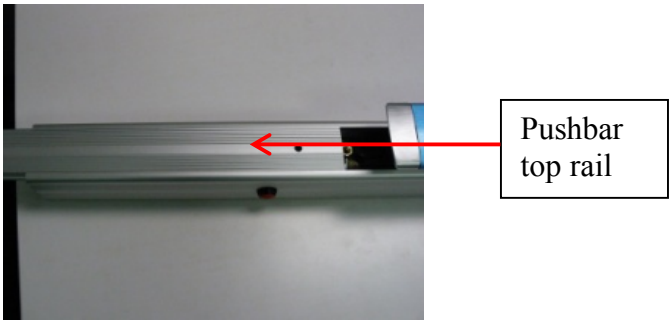


Figure 5

3. Lay the pushbar unit on its side and drill a 5/8” hole in the middle of the underside, (Figure 6).

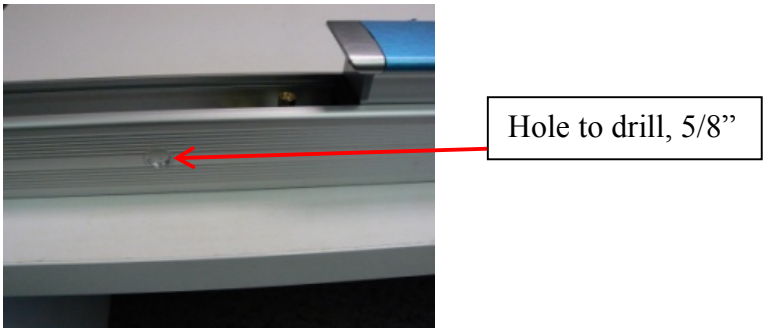


Figure 6

4. Take the Metal Pushbutton Lockdown Switch (Figure 7) and remove the nut. Insert the switch into the hole drilled in Step 3. Fasten it with the nut (Figure 8).

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Figure 7

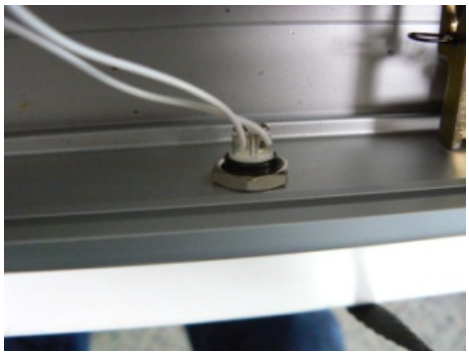


Figure 8

5. The battery box is installed next to the Lockdown Switch, with the spring toward the open end of the pushbar unit (Figure 9). On the outside of the rail, vertically center the battery box and use it as a template to mark locations of two screw holes (the battery box has 4 holes in the corners; pick 2 holes in opposite corners). Drill pilot holes using a #40 or #38 bit. Orient the battery box inside the rail, aligned with the pilot holes, and attach using sheet metal screws supplied in the battery holder bag. Do not install the batteries until the wires are connected (Step 14).

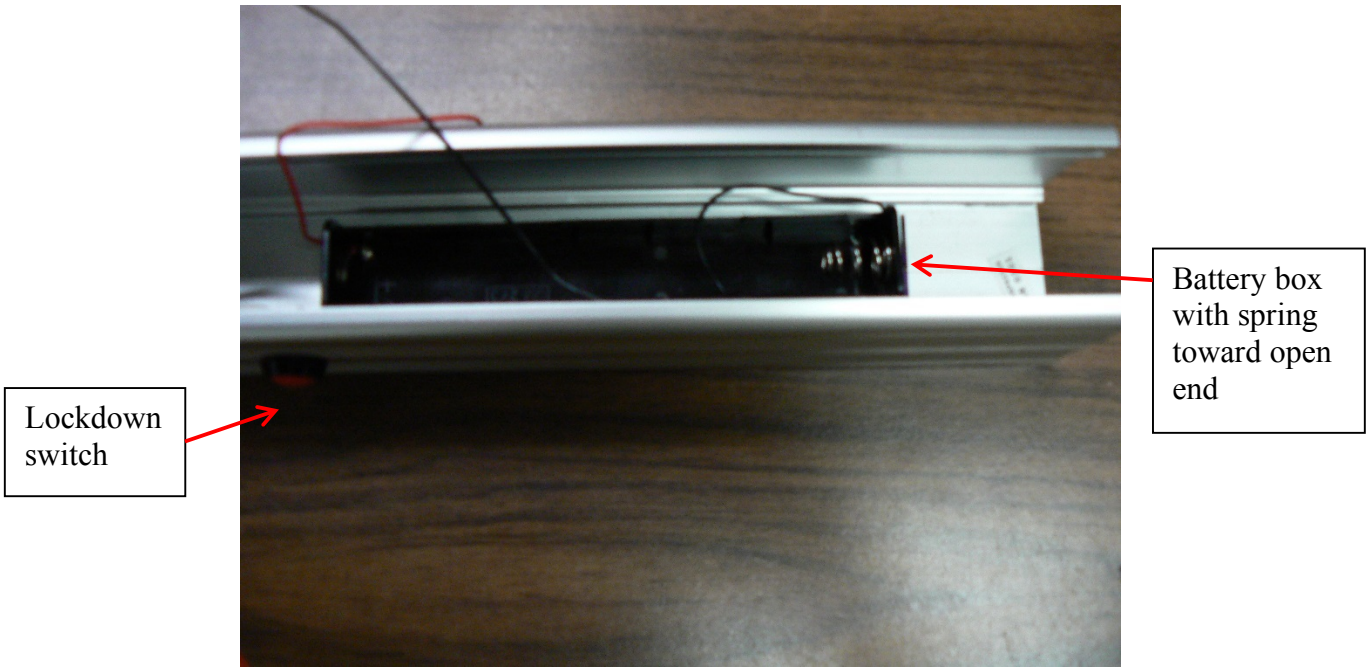


Figure 9

6. Remove the rail from the bottom of the pushbar unit as shown in Figure 10.

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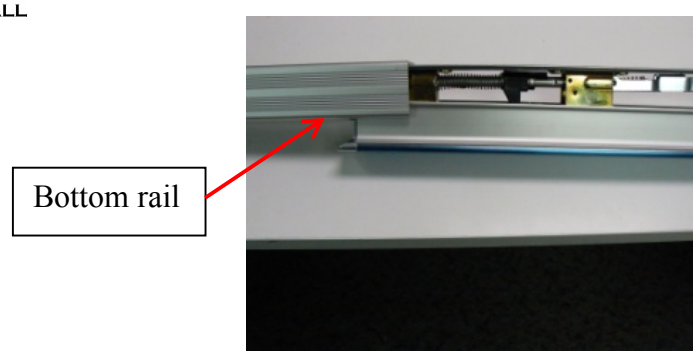


Figure 10

7. Turn the pushbar unit right side up, exposing the latching mechanism. There are two holes at the top of the latch, right next to the pushbar. These need to be tapped using an M5 screw tap (Figure 11).

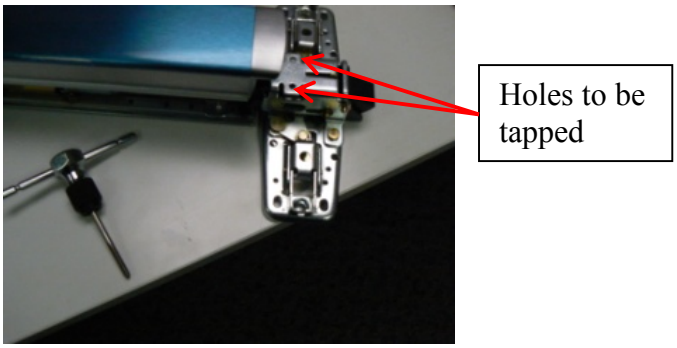


Figure 11

8. A microswitch sensor assembly needs to be installed. Figure 12 shows the sensor assembly being placed at an angle on top of the two tapped screw holes and then rotated into place in Figure 13. This is required to ensure the microswitch is in the closed position when the latch is extended.

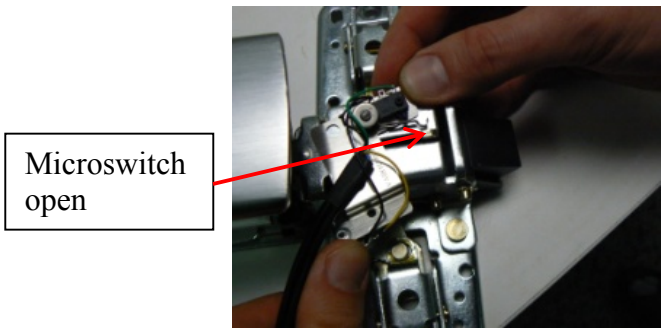


Figure 12

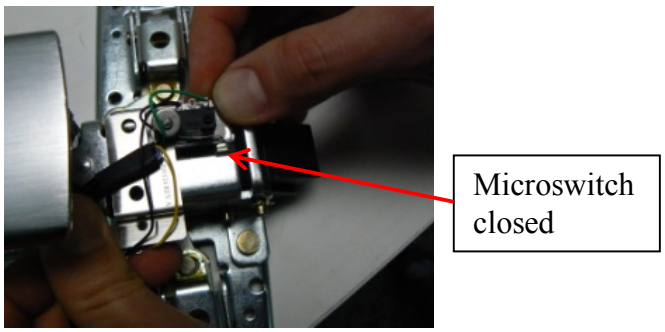


Figure 13

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9. Secure the microswitch with screws and lock washers. The top hole uses a screw, a lock washer, and a regular washer (Figure 14). The bottom hole uses a clip to capture the cable with flying leads, which is held in place with another screw and lock washer (Figure 15).

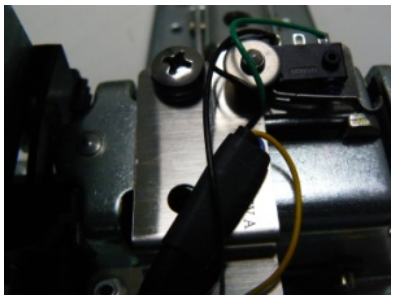


Figure 14

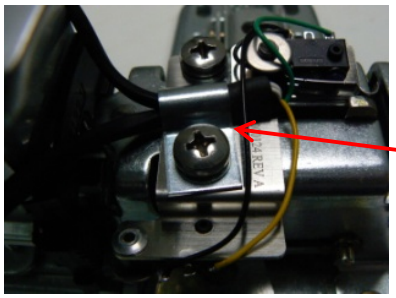


Figure 15

10. The cable being held in place by the clip is routed along the side of the pushbar, just behind the latch assembly (Figure 16), and then fed along the bottom of the pushbar unit (Figure 17).

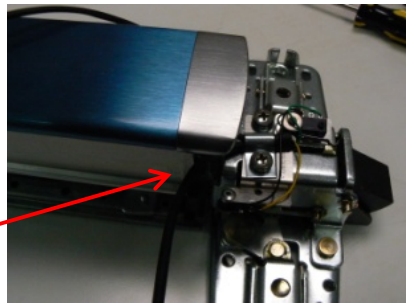


Figure 16

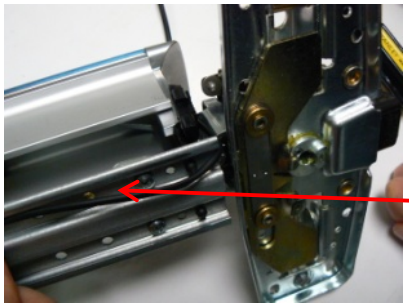


Figure 17

11. The end of the cable is fished under the bottom rail and pulled through until it reaches the Lockdown Switch (Figures 18 and 19).



Figure 18

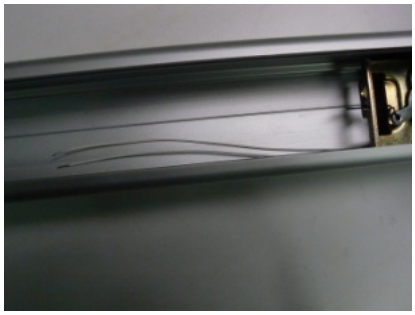


Figure 19

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12. Hold the ends of the wires that are shown in Figure 19 and pull them lightly to tension the cable while sliding the bottom rail back onto the pushbar unit. Make sure that the cable remains seated in the channel between the rail and the pushbar unit.
13. The end of the cable and the Lockdown Switch are now connected using the fasteners in Figure 20. Place one white wire from both the Switch and the cable into a fastener and crimp it using a pair of pliers (Figure 21). Repeat for the second set of white wires.



Figure 20

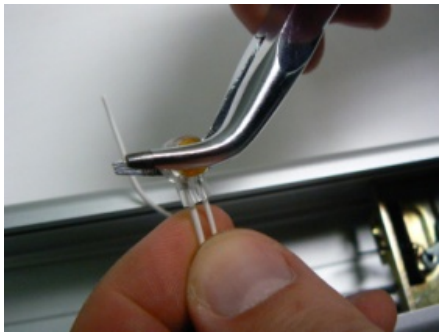


Figure 21

14. The same procedure is carried out to connect the cable and the battery holder. Connect the red battery wire to the red cable wire and the black battery wire to the black cable wire. Install the batteries, being careful to ensure correct polarity (negative at the spring connection).

15. Install the first mounting bracket that is used to attach the pushbar unit to the door (Figure 22).



Figure 22

16. Place the bracket as shown in Figure 23 and secure with screws per Figure 24.

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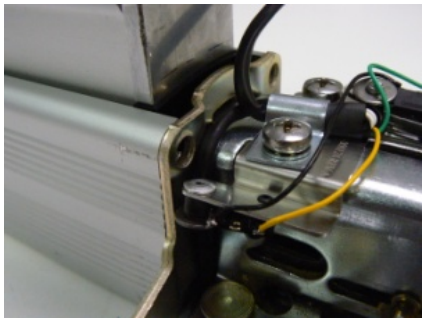


Figure 23

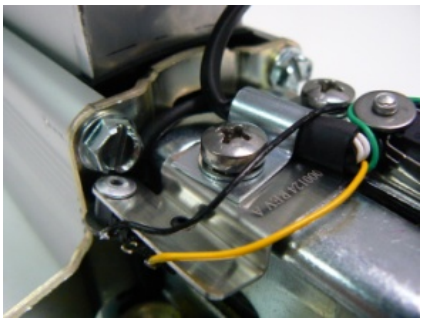


Figure 24

17. Take the cable in the sensor assembly with the connector and fish it through the bottom of the bracket installed in Step 16 (Figure 25). The cable should always come out on the top side when mounted on the door. Use a tie-wrap to secure the cable and the bracket.

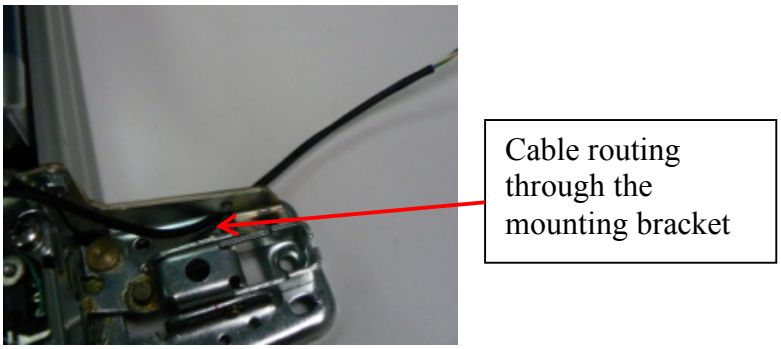


Figure 25

18. Test the functionality of the latch sensors and the Lockdown Switch. Place the cable from Step 17 into the sensor tester as shown in Figure 26. The LED on the left hand side of the board will light. As the lever, deadlatch and Lockdown Switch are depressed, a different LED will light on the right hand side of the board. If any of the LEDs does not light, check to make sure all connections are in place. If everything is as designed, replace the sensor cable.

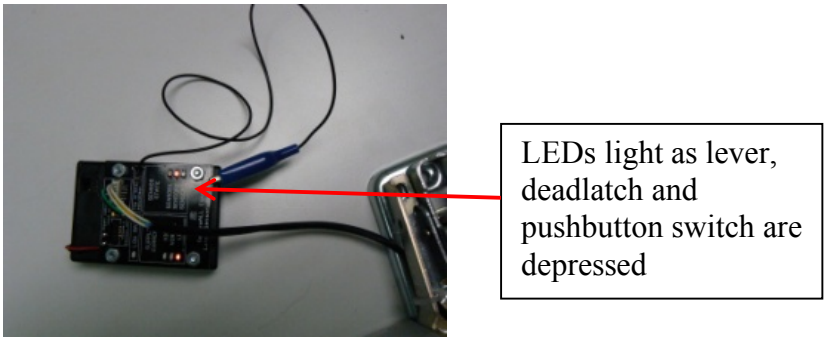


Figure 26

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19. The hole pattern in the door that mounts the exit unit must be modified slightly to accept the SecureALL hardware. Use an electric drill or Dremel tool to modify the holes per the supplied template (See Appendix A).

20. SecureALL supplies the "front lock/antenna assembly" (Figure 27, outside view; Figure 28, inside view).



Figure 27



Figure 28

21. Take the cables that are extending from the front lock/antenna assembly and feed it through the central hole in the uppermost set of holes on the door (Figure 29). Push the four metal posts into the top and bottom holes in the door until the unit is flush against the door (Figure 30). Make sure the cable is fully extended and not caught between the front lock/antenna assembly and the door.



Figure 29



Figure 30

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22. Mount the back mounting plate (Figure 31). Attach with four screws. For improved fire safety, a fire barrier caulk, such as 3M's CP 25WB+, can be injected into the large upper hole.

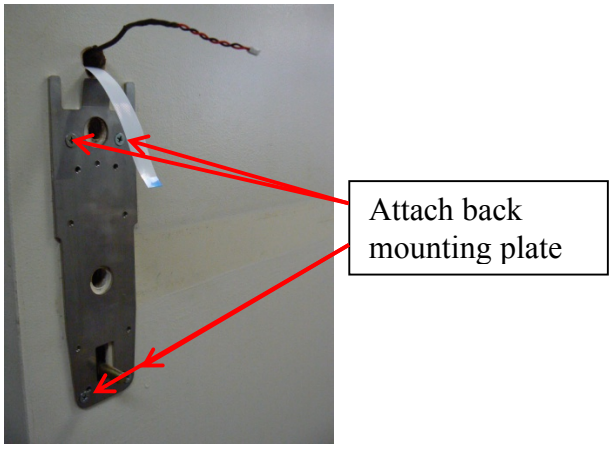


Figure 31

23. Remount the pushbar unit on the door. Slide the non-latch side into the mounting bracket at the far end (Figure 32) and push the latch side onto the spindle that extends from the back mounting plate (Figure 33).

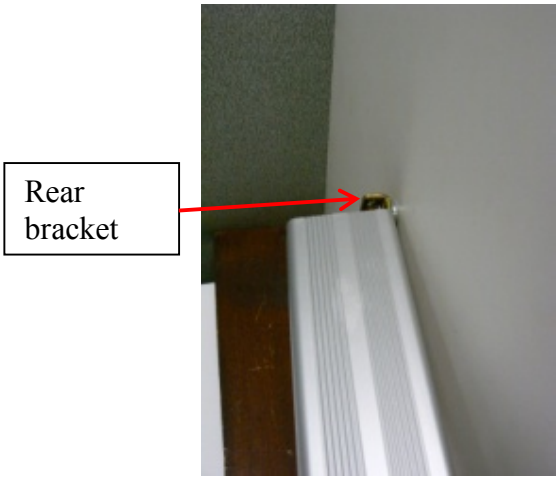


Figure 32

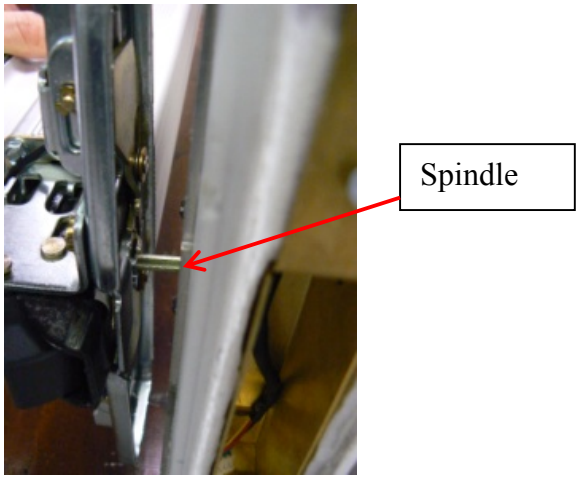


Figure 33

24. Screw the lever end of the pushbar unit to the door as shown in Figure 34 and tighten the screws that attach the rear bracket to the door. Replace the endcap over the rear bracket (Figure 35).

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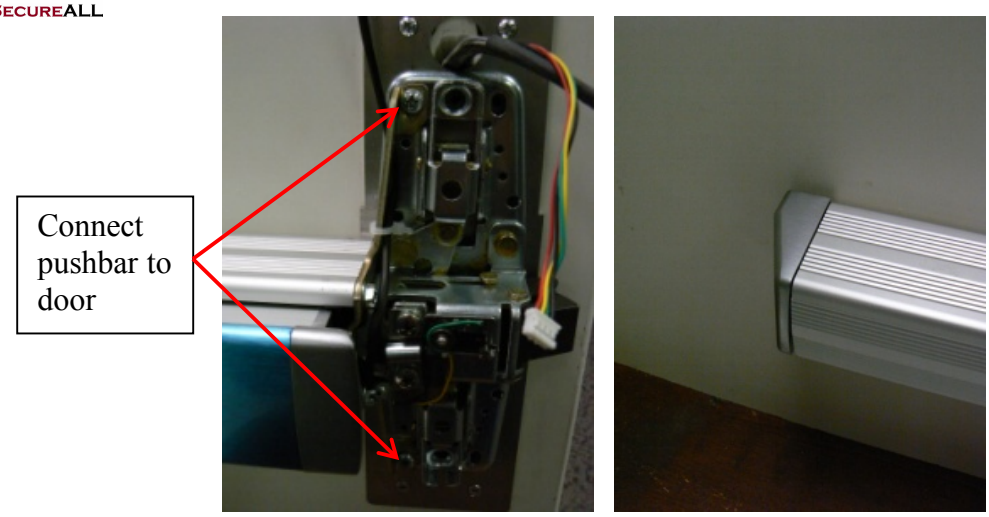


Figure 34 Figure 35

25. Insert the second (outside) mounting bracket (Figure 36) into the lever end of the pushbar (Figure 37) and screw to the door (Figure 38).

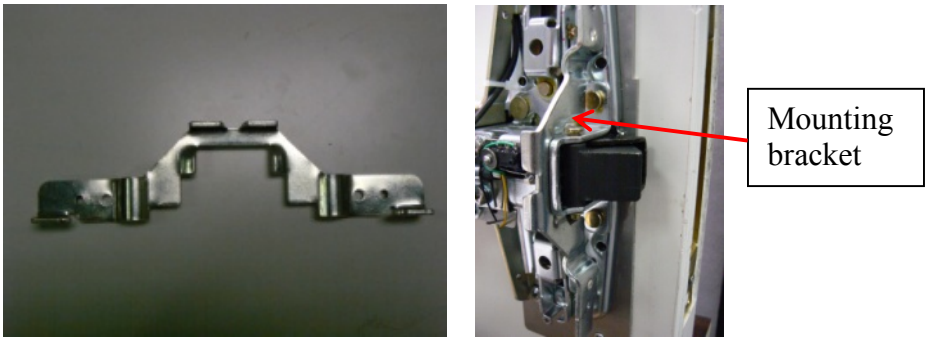


Figure 36 Figure 37

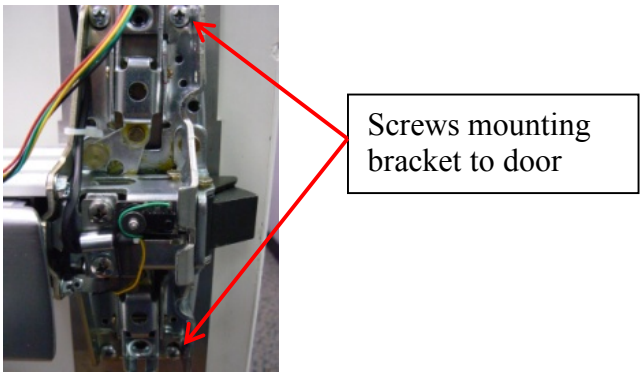


Figure 38

26. Using the Dremel tool, cut a small slot in the metal cover that goes over the lever portion of the pushbar. The slot is located on the inside, top portion of the cover (Figure 39). The slot should be only be as large as the sensor cable diameter.

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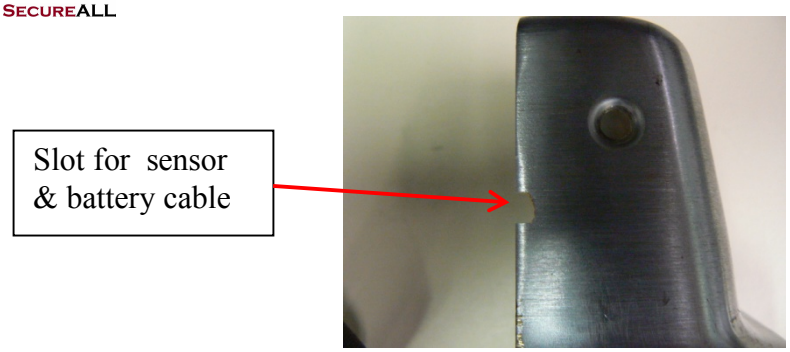


Figure 39

27. Slide the metal cover in Figure 39 over the lever portion of the pushbar, feeding the sensor cable that extends from under the first mounting bracket through the slot (Figure 40). Note that this cable contains connectors for both the deadlatch sensor and the battery holder.

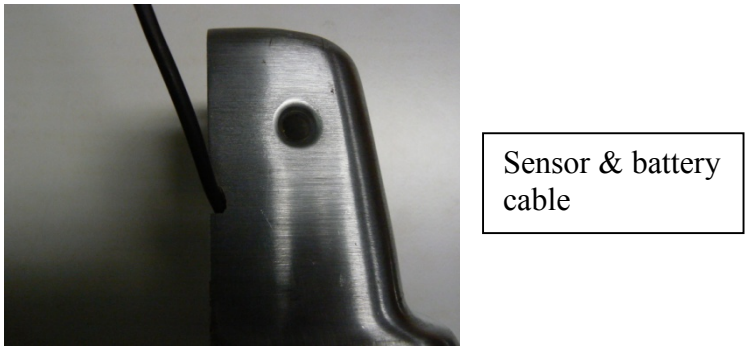


Figure 40

28. Screw the metal cover plate onto the lever portion of the pushbar using just the two screws at the bottom (Figure 41). Use the short thread-cutting screws that came with the pushbar unit.

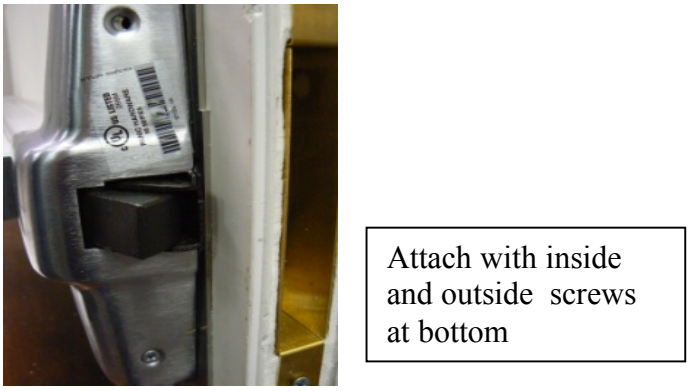


Figure 41

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29. The back escutcheon unit has a printed circuit board mounted in it (Figure 42). The sockets on the board are a) front electronic connection (flat cable), b) solenoid, c) sensors and d) battery. Take the two cables that extend through the door and connect them to the two lower sockets, running both cables above the metal mounting bracket. Take the sensor/battery cable from the slot cut in the cover plate, run it below the metal mounting bracket and then connect the two leads to the two upper sockets. Always remember to connect the battery cable last. Observe the LED. It should come on solid red for approximately one second and then go out. If it stays on for more than that time, unplug all the cables and repeat this section. IMPORTANT CAUTION: This unit should never run hot. If it feels warm to the touch, immediately remove all the cables and repeat this section. If the problem reoccurs, set the unit aside for analysis.

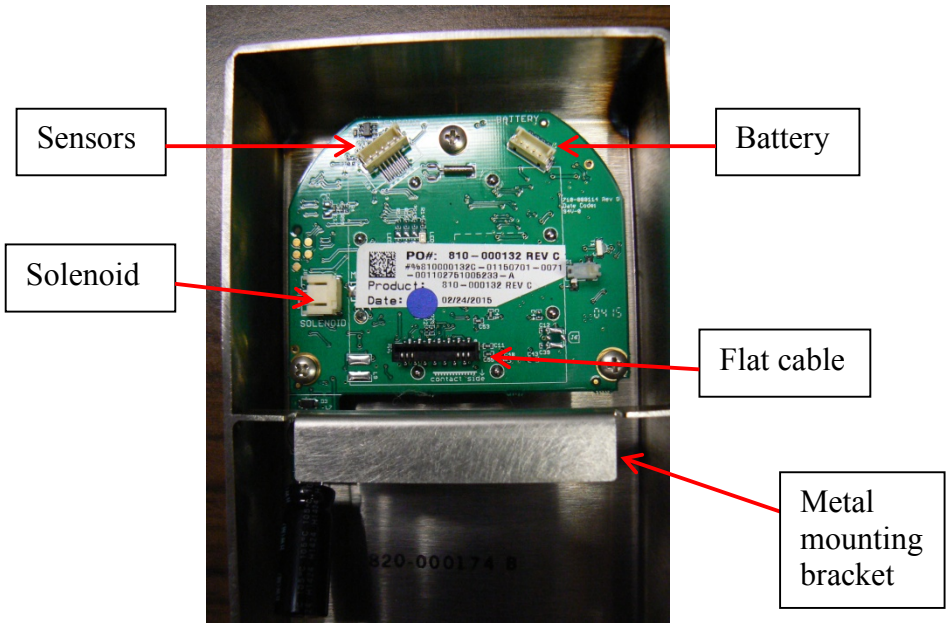


Figure 42

30. Complete installation by sliding the metal mounting bracket on the back escutcheon unit onto the metal mounting plate, making sure that the cables are not pinched. Put the two long thread-cutting screws (supplied by SecureALL) into the top holes of the metal cover (Figures 43 and 44).

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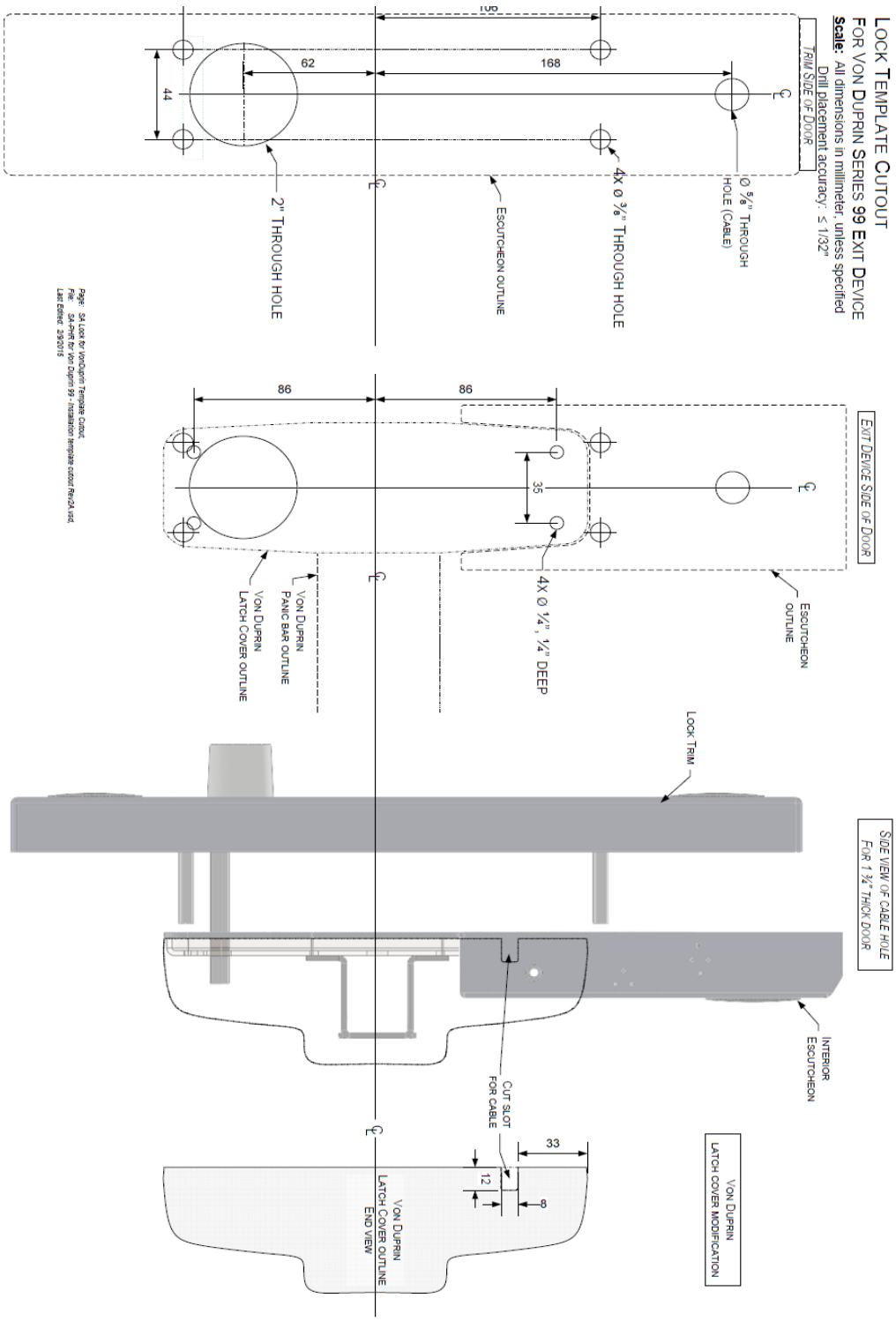
Figure 43



Figure 44

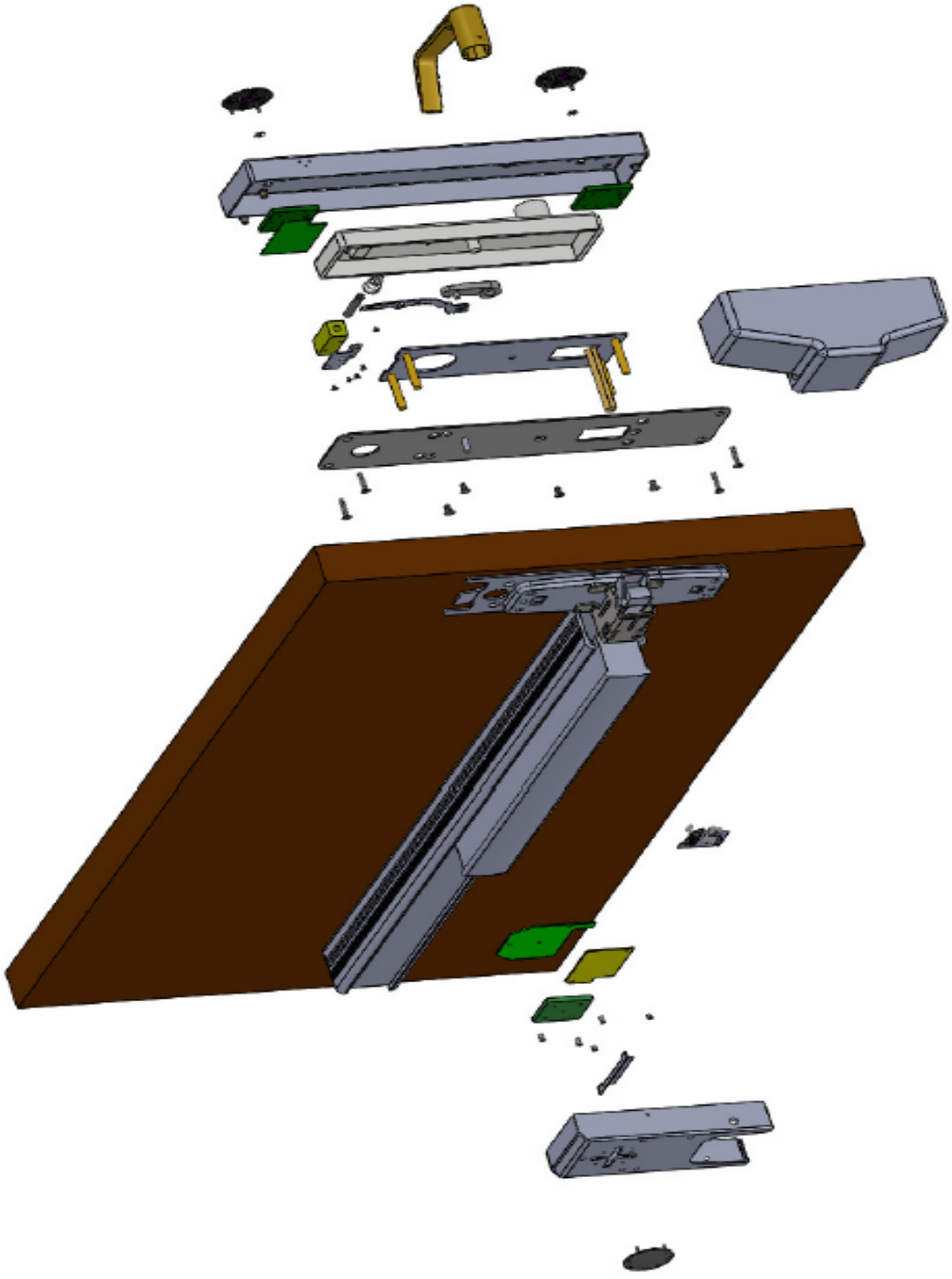
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APPENDIX A - INSTALLATION TEMPLATE



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APPENDIX B - PANIC HARDWARE READER, EXPLODED VIEW

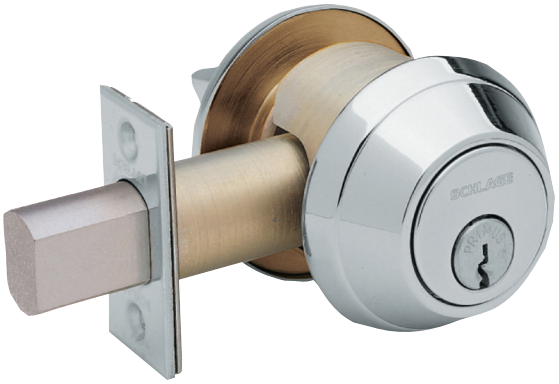


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SCHLAGE

Grade 1 deadbolts

B600/700/800 Series





Overview

Schlage® commercial grade 1 deadbolts are designed for security, durability and beauty. They feature a thick, anti-saw hardened steel bolt with anti-pry, anti-wrench and other protections to make it one tough lock.

600 Series: Grade 1 deadbolt furnished with conventional cylinder standard. Also available with full size interchangeable core cylinder or small format interchangeable core (SFIC) cylinder.

700 Series: Grade 1 deadbolt furnished with Primus XP controlled access cylinder for patented key control, geographical exclusivity and resistance to picking and impressioning. Also available with Primus XP full size interchangeable core cylinder.

800 Series: Grade 1 deadbolt with Primus XP high security cylinder. Cylinder is UL437 listed to resist drilling and other forms of physical attack. Not available in interchangeable core.

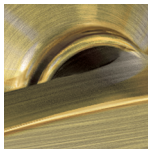
Finishes



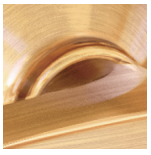
605
Bright Brass



606
Satin Brass



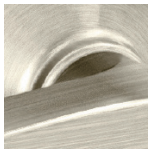
609[1]
Antique Brass



612
Satin Bronze



613
Oil Rubbed Bronze



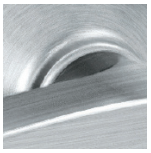
619
Satin Nickel



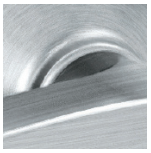
622
Matte Black



625
Bright Chrome



626
Satin Chrome



626AM
Satin Chrome, Antimicrobial



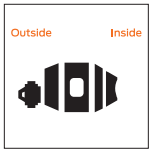
643e
Aged Bronze

e = an equivalent finish to the BHMA standard.

ALLEGION™

Functions

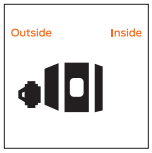
Schlage functions beginning B6 offer a standard pin and tumbler mechanism. Those beginning with B7 feature Primus XP geographic exclusivity in the key system, and B8 further improve Primus XP security using UL 437 listed high security cylinders.



Schlage B660, B760, B860
ANSI E0151

Single cylinder deadbolt

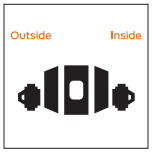
- Deadbolt thrown or retracted by key outside or thumbturn inside



Schlage B661, B761, B861
ANSI E0161

One-way deadbolt

- Deadbolt thrown or retracted by key outside
- Blank plate with exposed screws inside

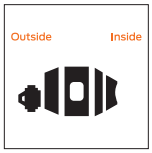


Schlage B662, B762, B862
ANSI E0141

Double cylinder deadbolt

- Deadbolt thrown or retracted by key on either side

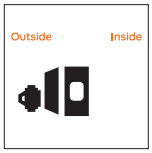
Caution: Double cylinder locks on residences and any door, in any structure, which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.



Schlage B663, B763, B863
ANSI E0171

Classroom deadbolt

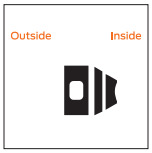
- Deadbolt thrown only by key outside.
- Deadbolt retracted by key outside or thumbturn inside



Schlage B664, B764, B864
ANSI E0101

Cylinder only deadbolt

- Deadbolt thrown or retracted by key one side
- No trim on inside
- 1 ½" bore only



Schlage B680
ANSI E0191

Door bolt

- Deadbolt thrown or retracted by thumbturn inside
- No trim on inside
- 1 ½" bore only

Key Thumbturn

ALLEGION

Cylinders

Conventional cylinder	
P	6-pin Conventional (standard)
Z	SL 7-pin Conventional (A2 pinning)
L	Less Conventional

Full size interchangeable core (FSIC)	
R	6-pin FSIC
M	SL 7-pin FSIC (A2 pinning)
J	Less FSIC
T	Refundable FSIC construction core

Small format interchangeable core (SFIC)	
G	7-pin SFIC (A2 pinning)
B	Less SFIC
BDC	Disposable SFIC construction core
H	Refundable SFIC construction core

Specifications

Chassis	
Material	Solid, sintered steel cylinder housing; 7/8" standoff, wrought brass or bronze trim ring over solid zinc spin ring.
Door thickness	Standard: 1 5/8" – 2" conventional cylinder or FSIC; 1 3/4" - 2" SFIC; 1 3/8" - 2 1/2" door bolt only.
Deadbolt	
Backset	2 3/4" fixed backset standard. Options available.
Faceplate	1 1/8" x 2 1/4", Square corner faceplate standard. Options available.
Bolt	Solid, sintered steel bolt with hardened steel anti-saw pin insert; 1" housing diameter, 1" throw.
Strike	1 1/8" x 2 3/4", Square corner, metal dust box. Options available.
Keying	
Cylinder format	6-pin Conventional (standard); also available in FSIC, SFIC and 7-pin SL cylinder formats.
Keyway	Patented Everest 29 S123 (standard); also available in open, and restricted keyway families. Primus XP security levels available along with master keying and construction keying.
Attachment	
	Three 3" screws anchor metal dustbox to frame. 1/4" machine screws through bolt to firmly anchor lock to door and use hardened steel ball bearings to protect bolts from drill attacks.
Warranty	
	3-year limited mechanical warranty. See price book for details.
Certifications	
ANSI/BHMA	ANSI A156.36, Grade 1. When installed with FSIC cylinder, Grade 2; SFIC cylinder, Grade 3.
UL/cUL	All functions UL 10C listed for 3-hour fire door.
Florida Building Code	Complies with Florida Building Code TAS 201, 202, 203 (wind and impact zone (HVHZ)) and ANSI-ASTM E330 (wind only)
Federal	BAA compliant, all functions.
Other	ADA compliant thumbturn.

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www.allegion.com/us

SCHLAGE

Grade 1 cylindrical locks

ND Series



Overview

The Schlage® ND Series is ANSI/BHMA Grade 1 certified and performs beyond the Grade 1 standards. The lock withstands 3,100 in-lb. of abusive lever torque, as well as 1,600 lbs. of offset lever pull for protection against pry bar attacks. The lock is not only strong from attacks, but it also shows nearly zero droop or wobble after 16 million cycles.

All ND Series locks come in 10 finishes, nine lever designs and use an ANSI 161 door preparation, commonly used with cylindrical locks. They are ideal for all new construction and retrofit applications.

Finishes



605
Bright Brass



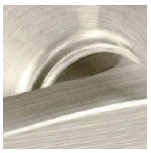
606
Satin Brass



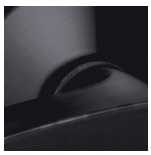
612
Satin Bronze



613
Oil Rubbed Bronze



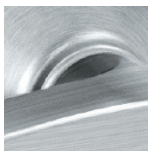
619
Satin Nickel



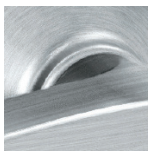
622
Matte Black



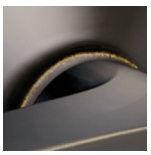
625
Bright Chrome



626
Satin Chrome



626AM
Satin Chrome, Antimicrobial



643e[1]
Aged Bronze

[1] e = an equivalent finish to the BHMA standard

ALLEGION™

Lever styles



Athens (ATH)
Athens with milled tactile warning (8AT)



Boardwalk (BRK)
Boardwalk with knurled tactile warning (8BK)



Broadway (BRW)
Broadway with knurled tactile warning (8BY)



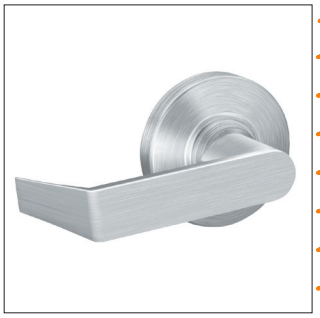
Latitude (LAT)
Latitude with milled tactile warning (8LT)



Longitude (LON)
Longitude with milled tactile warning (8LN)



Omega (OME)



Rhodes (RHO)[1]
Rhodes with milled tactile warning (8RO)[1]



Sparta (SPA)
Sparta with milled tactile warning (8SP)



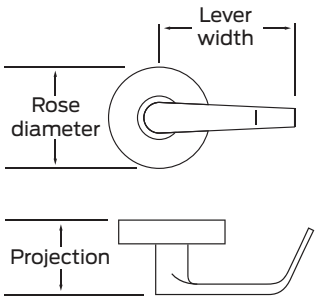
Tubular (TLR)
Tubular with knurled tactile warning (8TR)

Dimensions

Lever	Width	Projection
Athens (ATH)	4 9/16"	3 5/16"
Boardwalk (BRK)	4 15/16"	3 1/16"
Broadway (BRW)	4 1/2"	3 1/16"
Latitude (LAT)	4 1/2"	3 1/8"
Longitude (LON)	4 15/16"	3 1/8"
Omega (OME)	5 1/16"	3 5/16"
Rhodes (RHO)	4 9/16"	2 15/16"
Sparta (SPA)	4 15/16"	3 1/2"
Tubular (TLR)	4 15/16"	3"

Rose	Diameter
Standard	3 7/16"

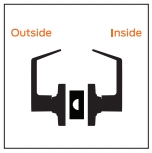
Return to door meets 1/2" requirement for Boardwalk (BRK), Longitude (LON), Omega (OME), Rhodes (RHO), Sparta (SPA) and Tubular (TLR) levers



[1] Optional break away lever available

ALLEGION

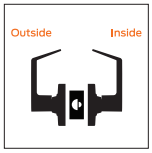
Mechanical non-keyed functions



Schlage **ND10**
ANSI **F75**

Passage latch

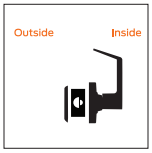
- Both levers always unlocked.
- Available with Request to Exit (RX) function.



Schlage **ND12**
ANSI **F89**

Exit lock

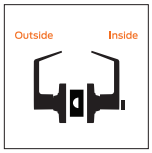
- Outside lever always fixed.
- Inside lever always free for immediate egress.
- Available with Request to Exit (RX) function.



Schlage **ND25**
ANSI **-**

Exit lock

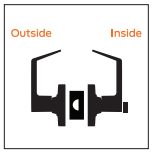
- Blank plate outside.
- Inside lever always free for immediate egress.



Schlage **ND30**
ANSI **-**

Patio lock

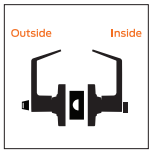
- Push button locking.
- Turning inside lever or closing door releases button, preventing a lock-out.
- Inside lever always free for immediate egress.



Schlage **ND40**
ANSI **F76**

Bath/bedroom privacy lock

- Push-button locking.
- Unlocked from outside with a small screwdriver.
- Turn inside lever or close door to release button.
- Inside lever always free for immediate egress.



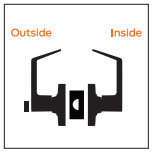
Schlage **ND44**
ANSI **-**

Hospital privacy lock

- Push-button locking.
- Unlocked from outside by turning emergency turn-button.
- Turn inside lever or close door to release button.
- Inside lever always free for immediate egress.

Key | Pushbutton | Turn/push button | Springlatch | Deadlatch

Mechanical non-keyed functions



Schlage **ND45**
ANSI **-**

Time out lock with Vandlgard

- Pushing and holding outside button disengages inside spindle, allowing inside lever to free-wheel without retracting latch.
- Release of outside button allows free egress from inside.

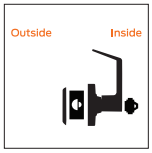


Schlage **ND170**
ANSI **-**

Single dummy trim

- Dummy trim for one side of door.
- Used for door pull or as matching inactive trim.

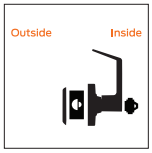
Mechanical keyed functions



Schlage **ND25 x 70**
ANSI **-**

Classroom exit lock

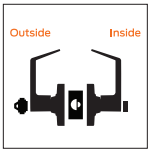
- Blank plate outside.
- Key locks or unlocks inside lever.



Schlage **ND25 x 80**
ANSI **-**

Storeroom exit lock

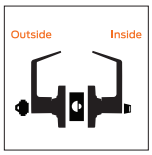
- Blank plate outside.
- Key in fixed inside lever retracts latch.



Schlage **ND50**
ANSI **F82**

Entrance/office lock

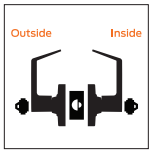
- Push-button locking.
- Push-button locks outside lever until it is unlocked with key or by turning inside lever.
- Inside lever always free for immediate egress.



Schlage **ND53**
ANSI **F109**

Entrance lock

- Turn/push-button locking: Pushing and turning the button locks the outside lever, requiring use of a key until the button is manually unlocked.
- Push-button locking: Pushing button locks outside lever until unlocked by key or by turning the inside lever.
- Inside lever always free for immediate egress.



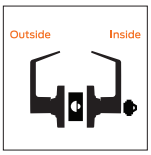
Schlage **ND60**
ANSI **F88**

Vestibule lock

- Latch retracted by key from outside when outside lever is locked by key in inside lever.
- Inside lever always free for immediate egress.

Available with an optional indicator rose that clearly identifies key rotation direction for rapid lockdown. 626 finish only.





Schlage **ND60**
ANSI **-**

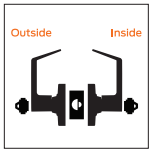
Vestibule with closed outside lever

- Same as ND60 except outside lever is closed.
- Inside lever always free for immediate egress.

Key | Pushbutton | Turn/push button | Springlatch | Deadlatch

ALLEGION

Mechanical keyed functions

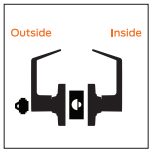


Schlage ND66
ANSI F91

Store lock

- Key in either lever locks or unlocks both levers.

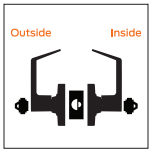
Caution: Double cylinder locks on any door, in any structure, which is used for egress can create a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.



Schlage ND70
ANSI F84

Classroom lock

- Outside lever locked and unlocked by key.
- Inside lever always free for immediate egress.

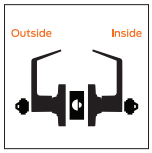


Schlage ND70 x 80
ANSI -

Classroom by storeroom lock

- Key locks and unlocks outside lever.
- Key in fixed inside lever retracts latch.

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

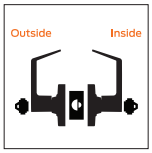


Schlage ND72
ANSI -

Communicating lock

- Key in either lever locks and unlocks respective lever.

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

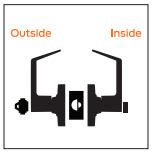


Schlage ND72
ANSI -

Communicating lock with Vandlgard

- Communicating, ND72, lock with Vandlgard.
- Key in either lever locks and unlocks own lever.
- Both inside and outside levers are clutching.

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



Schlage ND73
ANSI F90

Corridor lock

- Locked or unlocked by key from outside.
- Push-button locking from inside.
- Turn inside lever or close door to release button.
- When outside lever is locked by key it can only be unlocked by key.
- Inside lever always free for immediate egress.


Key

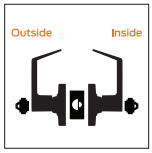

Pushbutton


Turn/push button


Springlatch


Deadlatch

Mechanical keyed functions



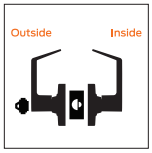
Schlage **ND75**
ANSI **-**

Classroom security lock

- Key in either lever locks or unlocks outside lever.
- Inside lever always free for immediate egress.

Comes standard with an indicator rose that clearly identifies key rotation direction for rapid lockdown. 626 finish only. Other finishes receive a standard rose.

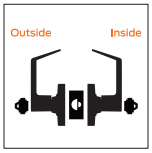




Schlage **ND80**
ANSI **F86**

Storeroom lock

- Outside lever is fixed.
- Entrance by key only.
- Inside lever always free for immediate egress.
- Available with Request to Exit (RX) function.

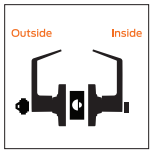


Schlage **ND82**
ANSI **F87**

Institution lock

- Both levers always fixed.
- Entrance by key in either lever.

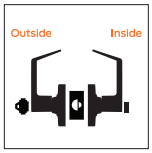
Caution: Double cylinder locks on any door, in any structure, which is used for egress can create a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.



Schlage **ND85**
ANSI **-**

Faculty restroom lock

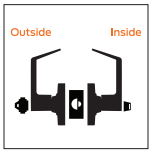
- Outside lever is fixed.
- Entrance by key only.
- Visual occupancy indicator, allowing only emergency key to operate.
- Turn inside lever or close door to unlock.
- Rotation of inside spinner-button enables lock-out feature.
- Inside lever always free for immediate egress.
- Not available with interchangeable core cylinders.



Schlage **ND91**
ANSI **F82**

Entrance/office lock with Vandlgard

- Push-button locking.
- Push-button disengages outside lever until unlocked with key or by turning inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

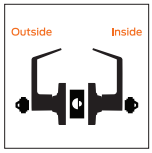


Schlage **ND92**
ANSI **F109**

Entrance lock with Vandlgard

- Turn/push-button locking: Pushing and turning button disengages outside lever, requiring using of key until button is manually unlocked.
- Push-button locking: Pushing button disengages outside lever until unlocked by key or by turning inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Mechanical keyed functions



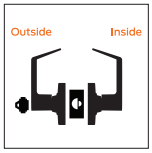
Schlage ND93
ANSI F88

Vestibule lock with Vandlgard

- Latch retracted by key from outside when outside lever is disengaged by key in inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Available with an optional indicator rose that clearly identifies key rotation direction for rapid lockdown. 626 finish only.

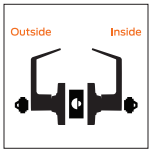




Schlage ND94
ANSI F84

Classroom lock with Vandlgard

- Outside lever disengaged and unlocked by key.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.



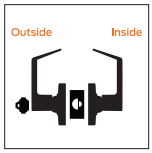
Schlage ND95
ANSI -

Classroom security lock

- Key in either lever locks or unlocks outside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Comes standard with an indicator rose that clearly identifies key rotation direction for rapid lockdown. 626 finish only. Other finishes receive a standard rose.

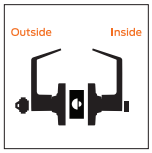




Schlage ND96
ANSI F86

Storeroom lock with Vandlgard

- Outside lever always disengaged.
- Entrance by key only.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.
- Available with Request to Exit (RX) function.



Schlage ND97
ANSI F90

Corridor lock with Vandlgard

- Locked or unlocked by key from outside.
- Push-button locking from inside.
- Turning inside lever or closing door releases button.
- When outside lever is locked by key it can only be unlocked by key.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

 Key

 Pushbutton

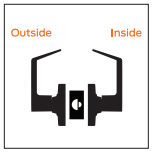
 Turn/push button

 Springlatch

 Deadlatch

ALLEGION

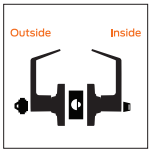
Wired electrified functions



Schlage ND12EL
ND12EU
ANSI -

Keyless electrified exit

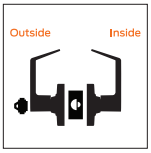
- Outside lever continuously locked (EL) or unlocked (EU) by 12-24V DC.
- EL is fail safe (power fail unlocks outside lever).
- EU is fail secure (power fail locks outside lever).
- Inside lever always free for immediate egress.
- Available with Request to Exit (RX) function.



Schlage ND80EL
ND80EU
ANSI -

Electrified storeroom

- Outside lever continuously locked (EL) or unlocked (EU) by 12-24V DC.
- EL is fail safe (power fail unlocks outside lever).
- EU is fail secure (power fail locks outside lever).
- Key outside serves as mechanical override.
- Inside lever always free for immediate egress.
- Available with Request to Exit (RX) function.



Schlage ND96EL
ND96EU
ANSI -

Electrified storeroom with Vandlgard

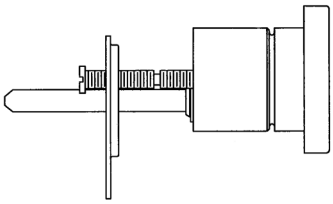
- Adds Vandlgard to ND80EL/EU.
- Vandlgard allows outside spindle to disengage from latch when locked, limiting the ability of vandals to apply excessive force to the chassis.
- Available with Request to Exit (RX) function.

FSIC cylinders for exit devices, aluminum doors, etc.

Interchangeable core rim cylinders for exit devices

Number	Core mechanism
20-057	Standard pin and tumbler
91-170	SL (restricted Everest 29 R and Everest B only)
20-757	Primus
20-757-XP	Primus XP
91-870-XP	Primus XP SL (restricted Everest 29 R and Everest B only)
20-079	Housing only, less core





Cylinders for Adams Rite MS and 4700 Series Lori 4500 Series and Corbin Russwin DL3000 Series

Number	Core mechanism	Collar
26-098	Standard pin and tumbler	Compression ring and spring
20-062	Standard pin and tumbler	3/16" + 3/8" blocking rings
91-174	SL	3/16" + 3/8" blocking rings
20-766	Primus	3/16" + 3/8" blocking rings
20-766-XP	Primus XP	3/16" + 3/8" blocking rings
91-874-XP	Primus XP SL	3/16" + 3/8" blocking rings
20-060	Housing only, less core	None

Note: These cylinders include set screw pack B220-050 for Adams Rite locks.





K510-711
Adams Rite
MS cam

Cylinders for Adams Rite 4070 Series deadlocks

Number	Core mechanism	Collar
20-091	Standard pin and tumbler	3/16" + 3/8" blocking rings
91-175	SL	3/16" + 3/8" blocking rings
20-722	Primus	3/16" + 3/8" blocking rings
20-722-XP	Primus XP	3/16" + 3/8" blocking rings
91-875-XP	Primus XP SL	3/16" + 3/8" blocking rings
20-090	Housing less core	None

Note: All cylinders are 1 1/2" long.



B520-378
Adams Rite
4070 cam

Finish options



Bright brass (605)	Satin brass (606)	Antique brass (609)	Satin bronze (612)	Oil rubbed bronze (613)	Satin nickel (619)	Matte black (622)	Bright chrome (625)	Satin chrome (626)	Aged bronze (643e)
Housing	Housing and core	Housing	Housing	Housing	Housing	Housing and core	Housing	Housing and core	Housing and core

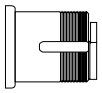
Full size interchangeable cores

FSIC mortise cylinders for L Series





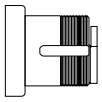
L & N escutcheons (cylinders with compression ring)



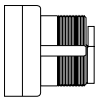
Cylinder only



Sectional trim (cylinder with compression ring, spring and 3/8" blocking ring)



Compression ring and spring



With blocking ring

FSIC cylinders for Schlage L Series mortise locks

Design	Function	Core mechanism				
		Standard pin and tumbler	SL cylinder[1]	Primus Primus XP	Primus XP SL cylinder[1]	Housing less core
L and N escutcheons (cylinders with compression ring)	All except below	30-008	91-163	20-798 20-798-XP	91-863-XP	30-007
	L9060 outside	30-030	91-165	20-782 20-782-XP	91-865-XP	30-032 + 36-083
	L9485, L9486 faculty restroom	30-010[2]	N/A	N/A	N/A	N/A
Sectional trim (cylinder with compression ring, spring and 3/8" blocking ring). 9060 requires 1/2" blocking ring.	All except below	30-138	91-169	20-776 20-776-XP	91-869-XP	30-137
	L9060 outside	30-030 + 36-082-050	91-165 + 36-082-050	20-783 20-783-XP	91-865-XP + 36-082-050	30-032 + 36-083 + 36-082-050
	L9485, L9486 faculty restroom	30-140[2]	N/A	N/A	N/A	N/A

1 For restricted Everest 29 R and Everest B only.

2 Faculty restroom function cores are handed. Specify hand of door.



L583-255
Cam for all functions except L9060 outside



K510-680
Cam for L9060 outside

FSIC cylinders with straight cam for exit devices

Number	Core mechanism	Collar
26-091	Standard pin and tumbler	Compression ring and spring
20-061	Standard pin and tumbler	3/8" blocking rings + compression ring and spring
91-173	SL	3/8" blocking rings + compression ring and spring
20-763	Primus	Compression ring and spring
20-763-XP	Primus XP	Compression ring and spring
20-771	Primus	3/8" blocking rings + compression ring and spring
20-771-XP	Primus XP	3/8" blocking rings + compression ring and spring
91-873-XP	SL Primus XP	3/8" blocking rings + compression ring and spring
20-059	Housing less core	None
26-064	Housing less core	Compression ring and spring

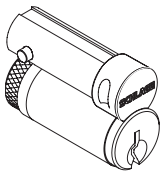
Note: All cylinders are 1 1/2" long.



K510-730
Straight cam, other applications

FSIC, core only, cylinders

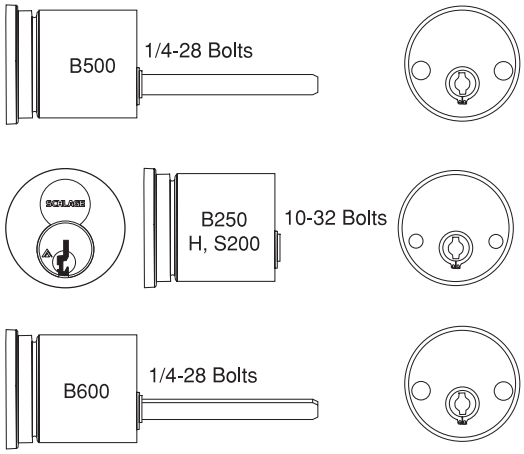
Number	Pins	Cylinder mechanism
23-030	6	Standard pin and tumbler
23-031	6	Standard pin and tumbler, less logo
91-161	7	SL cylinder (restricted Everest 29 R and Everest B only)
91-162	7	SL cylinder, less logo (restricted Everest 29 R and Everest B only)
20-740	6	Primus
20-741	6	Primus, less logo
20-740-XP	6	Primus XP
20-741-XP	6	Primus XP, less logo
91-861-XP	7	SL cylinder (restricted Everest 29 R and Everest B only)
91-862-XP	7	SL cylinder, less logo (restricted Everest 29 R and Everest B only)
30-120	6	Faculty restroom standard pin and tumbler (specify hand)
30-121	6	Faculty restroom standard pin and tumbler, less logo (specify hand)



Full size (FSIC)

FSIC housings for bored deadlocks, less core

Lockset series	Description	Number	Specify finish
B500 Series	Outside	B610-203 (single) B610-205 (double)	605, 606, 609, 612, 613, 619, 625, 626, and 643e
	Inside	B610-028[1]	See note below
B250	Outside	22-061	605, 606, 609, 613, 625, 626
	Inside of B252	22-062	
H, S200 Series	Outside	5306-135	605, 606, 609, 612, 613, 625, 626
B600 / 700 Series	Outside	B610-203 (single) B610-205 (double)	605, 606, 609, 612, 613, 619, 625, 626, 643e
	Inside	B610-028	See note below

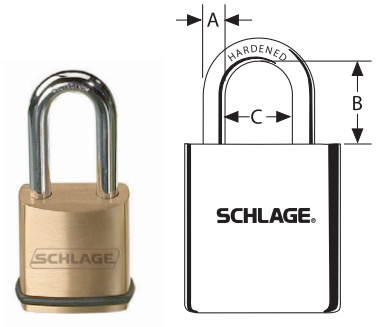


Specify finish of B610-031 inside snap-on faceplate ordered separately for B662/762, and B562.

1 Inside housing does not include snap-on faceplate.

FSIC padlocks

Brass lock body number	Shackle dimensions		
	A	B	C
Less - full size interchangeable core			
KS43D3200	3/8"	1 1/2"	3/4"
KS43F3200	3/8"	2"	3/4"



KS43F

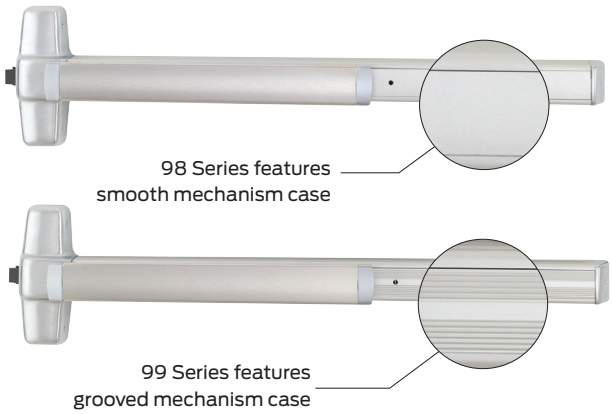
VON DUPRIN®

Exit device

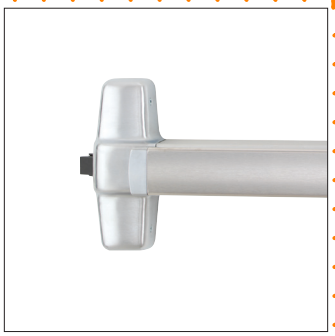
98/99 Series

Overview

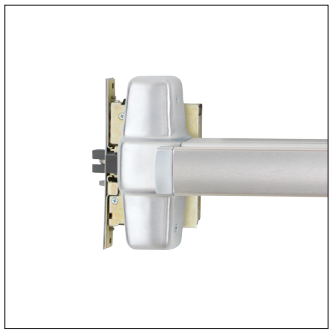
The 98/99 Series devices are heavy-duty push pads. The 98 Series has a smooth mechanism case, while the 99 Series has a grooved mechanism case. The 98/99 Series has been certified to the highest industry standards and are used in schools, hospitals and government buildings.



Device types



Rim device



75 Mortise lock device

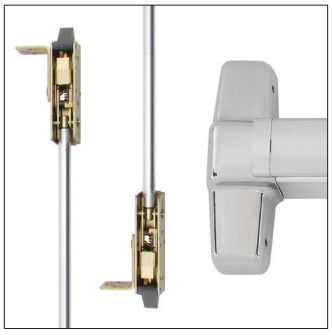


27 Surface mounted vertical rod device [1]

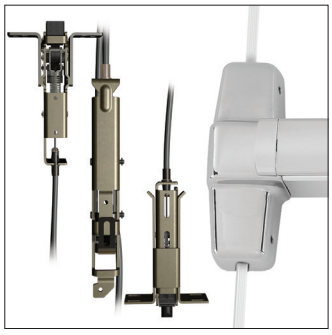


47 Concealed vertical rod device, 5/16" throw [1]

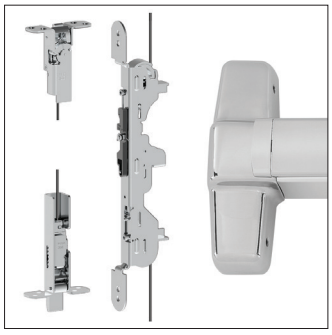
48 Concealed vertical rod device, 5/8" top, 1 1/2" bottom throw



47WDC Concealed vertical rod wood door device [1]



49 Concealed vertical cable device [2]



50WDC Concealed vertical cable wood door device



57 Three-point latch device

[1] Also available less bottom rod (LBR)
[2] Also available less bottom latch (LBL)

ALLEGION™

VON DUPRIN®

Exit device
98/99 Series

Finishes



605
Bright Brass



606
Satin Brass



612
Satin Bronze



619
Satin Nickel



622
Matte Black

625
Bright Chrome



626
Satin Chrome



626AM
Satin Chrome, Antimicrobial



628
Aluminum, Clear Anodized



630
Satin Stainless



630AM
Satin Stainless, Antimicrobial



643e
Aged Bronze



693
Black

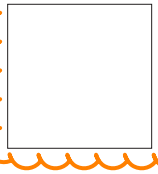


710
Dark Brown, Anodized

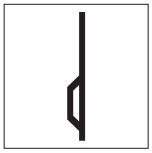
Due to the many variations in monitors and printers, color samples may appear different than the physical product. Contact your local sales representative for a physical color sample.

ALLEGION™

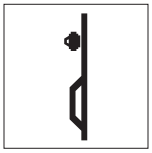
Trim functions



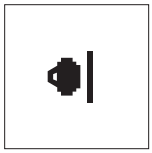
EO **No outside trim**
- Exit only



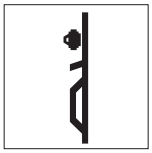
DT **Dummy trim**
- Pull when dogged (not recommended for fire device)



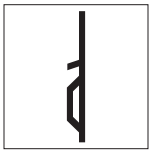
NL **Night latch**
- Key retracts latchbolt
- Rim and 1 ¼" mortise cylinder



NLOP **Night latch**
- Key retracts latchbolt, pull required



TP **Thumbpiece**
- Key locks and unlocks
- Rim and 1 ¼" mortise cylinder

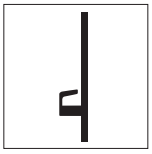


TPBE **Thumbpiece, blank escutcheon**
- Blank escutcheon always operable (no cylinder, use with DT trim)



L **Lever**

K **Knob**
- Key locks and unlocks
- Rim and 1 ¼" mortise cylinder
- Handed, reversible lever
- Electrified lever operation available



LDT **Lever, dummy trim**

KDT **Knob, dummy trim**
- Pull when dogged



LNL **Lever, night latch**

KNL **Knob, night latch**
- Key retracts latchbolt
- Rim and 1 ¼" mortise cylinder
- Handed, reversible lever

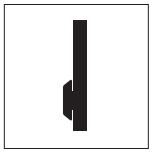


LBE[1] **Lever, blank escutcheon**

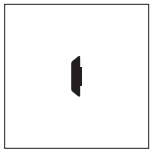
KBE **Knob, blank escutcheon**
- Always operable (no cylinder)



TL **Turn lever**
- Key locks and unlocks (use with DT trim)
- 1 ¼" mortise cylinder



TLBE **Turn lever, blank escutcheon**
- Blank escutcheon always operable (no cylinder, use with DT trim)



TLOP **Turn lever, optional pull**



HL **Hospital latch**
- Key locks and unlocks
- 1 ¼" mortise cylinder

Trim styles



990



996



696



697
3/4" (19mm) diameter pull



392-7



HL



374



VR910



VR914

Dimensions

Trim style	Width	Height	Thickness	Projection
990	3"	14 3/16"	3/32"	2"
996 Knob	2 3/4"	10 3/4"	27/32"	3 1/4"
996 Lever	2 3/4"	10 3/4"	27/32"	2 7/8"
696	1 5/8"	13 1/2"	3/16"	2 1/6"
697	1 5/8"	13 1/2"	3/16"	3"
392-7	3/4" inch round stainless steel with 7" center to center that matches the 98/99 center case. 3 1/2" offset with 1 1/2" clearance.			
HL	2 9/16"	7 7/8"	-	2 5/8"
374	2 3/4"	10 3/4"	27/32"	
VR910/914 with RIM/verticals	5 1/2"	11"	-	
VR910/914 with mortise	7 1/4"	11"	-	

Lever styles

Decorative levers



M51
- Knurling available



M52
- Knurling available



M53



M54



M55



M56



M57[1]



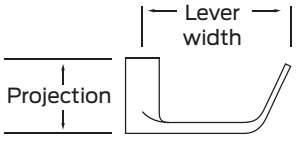
M61
- Handed



M62[1]
- Handed

Dimensions

Lever	Width	Projection
M51	4.5"	2.5"
M52	4.5"	2.4"
M53	4.4"	2.4"
M54	4.4"	2.3"
M55	4.4"	2.7"
M56	4.5"	2.3"
M57	4.5"	2.7"
M61	4.5"	2.7"
M62	4.6"	2.4"



[1] Available in stainless steel substrate only

Lever styles

Decorative levers



M63
- Handed



M81
- Knurling available



M82



M83



M84



M85
- Handed



ME1[1]
- Handed



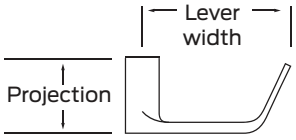
ME2[1]
- Handed



ME3[1]

Dimensions

Lever	Width	Projection
M63	4.6"	2.6"
M81	4.8"	2.5"
M82	4.9"	2.5"
M83	4.7"	2.25"
M84	5.1"	2.2"
M85	4.9"	2.7"
ME1	5.4"	2.6"
ME2	5.2"	2.4"
ME3	5"	2.8"



[1] Designed with Gensler as product design consultant

VON DUPRIN®

Exit device
98/99 Series

Lever styles

Standard levers



01



02
- Knurling available



03
- Knurling available



05



06
- Default lever
- Suites with Schlage Rhodes
- Knurling available



07
- Suites with Schlage Athens



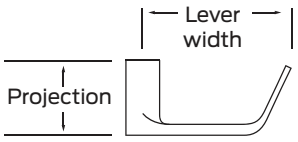
12
- Handed



16
- Suites with Schlage Omega

Dimensions

Lever	Width	Projection
01	4.0"	2.1"
02	4.75"	2.3"
03	4.75"	2.813"
05	3.75"	2.8"
06	4.7"	2.1"
07	4.6"	2.3"
12	4.3"	2.9"
16	5.05"	2.66"



ALLEGION™

Lever styles

Standard levers



17
- Suites with Schlage Sparta
- Knurling available



18



Accent (ACC)
- Handed



Asti (AST)
- Handed



Merano (MER)
- Handed



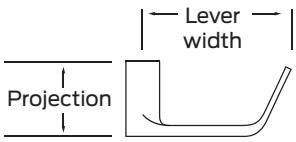
Latitude (LAT)



Longitude (LON)

Dimensions

Lever	Width	Projection
17	4.7"	2.3"
18	4.75"	2.4"
Accent (ACC)	4.4"	3.1"
Asti (AST)	4.2"	2.5"
Merano (MER)	4.1"	2.5"
Latitude (LAT)	4.6"	2.3"
Longitude (LON)	4.9"	2.3"



Electromechanical device options

Switches

LX — **Latchbolt monitoring**

LX-LC — **Latchbolt monitoring, low current**
- Signals use of an opening
- SPDT switch to monitor latch bolt
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

RX — **Request to exit**

RXLC — **Request to exit - low current**

RX2 — **Double request to exit - 2 RX switches**

WP-RX — **Waterproof request to exit**

RX-AUX — **RX to RX-2 conversion**
- Signals use of an opening
- SPDT switch to monitor pushpad
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

LX-RX — **Request to exit/latchbolt monitoring combination**

LX-RX-LC — **Request to exit/latchbolt monitoring combination, low current**
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

SS — **Signal switch**
- Monitors pushpad and latchbolt
- Signals unauthorized use of an opening
- Switch makes latch bolt tamper-resistant
- Up to 2.0 A @ 24VDC

Latch retraction

EL — **Electric latch retraction**

SD-EL — **Electric latch retraction with special center case dogging**
- Enables remote unlatching
- Alternative to manual dogging
- Voltage: 24VDC (continuous duty)
- Current: 16.0 A inrush / 0.3 A holding

QEL — **Quiet electric latch retraction**

HD-QEL — **Quiet electric latch retraction with hex dogging**

SD-QEL — **Quiet electric latch retraction with special center case dogging**
- Bolt retraction via switch
- Converts exit door to push-pull operation
- Voltage: 24VDC
- Current: 1.0 A inrush (0.5 sec.) / 0.14 A holding

Delayed egress

CX — **Chexit delayed exit**
- Meets NFPA 101 requirements
- Self-contained controls, locking, alarm
- Input voltage: 24VDC
- Input current inrush: 1.25 A
- Input current holding: 390 mA
- Alarm relay and secure relay contact ratings: 24 VDC, 1 A

CX-RCM — **Chexit remote module**
- Chexit for smaller doors that can not accommodate a standard Chexit device
- Size: 3.75” x 5.57” x 2.50”
- Input voltage: 24VDC
- Input current inrush: 1.25A
- Input current holding: 390mA
- Alarm relay and secure relay contact ratings: 24 VDC, 1 A

Miscellaneous

ALK — **Alarm exit kit**
- Unauthorized opening triggers 85-decibel horn
- Set in armed or disarmed mode by key
- Assembly includes both a 24VDC input and external inhibit

Electromechanical device options

CON — **Allegion Connect**

- Common connectors to connect various door hardware all the way to the power supply

E996 — **Electric locking and unlocking trim**

- Remains latched while unlocked
- Remote electrical control
- Voltage: 24VDC (Continuous Duty)
- Current: 0.22 amps

E7500 — **Electric mortise lock device**

- Voltage: 12 or 24VDC
- Current: 0.60 amps @ 12VDC, 0.30 amps @ 24VDC

Electromechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Switches									Latch retraction					Delayed egress		Misc			
	LX	LX-LC	RX	RXLC	RX2	WP-RX	LX-RX	LX-RX-LC	SS	EL	SD-EL	QEL	HD-QEL	SD-QEL	CX	CX-RCM	ALK	CON	E996	Mortise
98 99	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
98F 99F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
XP98 XP99		■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	
XP98-F XP99-F		■	■	■	■	■	■	■		■		■			■	■	■	■	■	
9875 9975			■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
9875-F 9975-F			■	■	■	■			■	■		■			■	■	■	■	■	■
9827 9927	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9827-F 9927-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9857 9957	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9857-F 9957-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9847 9947	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9847-F 9947-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9848 9948	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9848-F 9948-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9849 9949	■[1]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9849-F 9949-F	■[1]	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9847WDC 9947WDC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9847WDC-F 9947WDC-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9850WDC 9950WDC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9850WDC-F 9950WDC-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	

[1] For 98/9949 devices, LX switch monitors trim input or electric dogging of EL/QEL devices. LX switch does not monitor latchbolt condition.

Mechanical device options

Dogging

CD — **Cylinder dogging, panic only**

CD-CX — **Center case cylinder dogging for Chexit devices**

CI — **Cylinder dogging indicator**
- Battery-operated dogging indicator in cylinder format with red light visible from over 75 feet away

DI — **Dogging indicator**
- Battery-operated dogging indicator in hex format with red light visible from over 75 feet away

LD — **Less dogging**

SD — **Special center case dogging**
- Center case cylinder dogging

Classroom security

-2 — **Double cylinder**
- Inside key cylinder locks/unlocks outside trim

-2SI — **Double cylinder with security indicator**
- Inside key cylinder locks/unlocks outside trim with visible indicators that provide status of door

CDSI — **Cylinder dogging with indicator**
- Provides visible lock/unlock indicators showing whether device is dogged or undogged

HDSI — **Hex dogging with indicator**
- Provides visible lock/unlock indicators showing whether device is dogged or undogged

Environmental

PN — **Pneumatic latch retraction**
- For areas where electrical devices banned
- Special linkage for mechanical or pneumatic dogging

QM — **Quiet mechanical option**
- Provides damper-controlled relatching of device

INS — **Insulclad kits**
- Kits with longer fasteners or parts for Insulclad doors

AM — **Anti-microbial finish**

Weatherized

WH — **Weep holes**
- Drainage (weep) holes in mechanism case

WS — **Windstorm**
- Severe weather certified/tested
- FEMA and ICC compliant
- Tornado and hurricane tested

California code

AX — **Accessible device**
- UL certified to meet new 5 lb. maximum operating force requirement
- Exceeds ANSI/BHMA requirements

Latches

PL — **Pullman latch**
- Latches are always extended
- Most commonly used in conjunction with electric strikes and LBR-less bottom rod application

Mechanical device options

Touch bar trim

RSS — **Red silk screen**
- Red silk-screened lettered touchbar trim

PUSH — **PUSH**
- Touchbar trim embossed PUSH

SG — **Safety glow**
- Self-illuminating touchpad
- Glows brightly during low or no light conditions

KN — **Knurled touchbar**
- Tactile warning applied to device

BRAILLE — **Braille**
- Vision impaired touchpad
- Raised letter and Braille

Mechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Dogging						Classroom security				Environmental				Weatherized		CA code
	CD	CD-CX	CI	DI	LD	SD	-2	-2SI	CDSI	HDSI	PN	QM	INS	AM	WH	WS	AX
98 99	■	■	■	■	■	■	■	■	■	■	■	■		■	■		■
98F 99F							■	■			■	■		■	■		■
XP98 XP99	■	■	■	■	■	■	■	■	■	■				■	■		■
XP98-F XP99-F							■	■						■	■		■
9875 9975	■	■	■	■	■	■	■		■	■	■			■	■		
9875-F 9975-F							■				■			■	■		
9827 9927	■	■	■	■	■	■			■	■	■	■		■	■	■	■ LBR
9827-F 9927-F											■	■		■	■	■	■ LBR
9857 9957	■	■	■	■	■	■			■	■	■			■	■	■	
9857-F 9957-F											■			■	■	■	
9847 9947	■	■	■	■	■	■			■	■	■		■	■	■		■ LBR
9847-F 9947-F											■			■	■		■ LBR
9848 9948	■	■	■	■	■	■			■	■	■			■	■		
9848-F 9948-F											■			■	■		
9849 9949	■	■	■	■	■	■			■	■	■		■	■	■		■ LBL
9849-F 9949-F											■			■	■		■ LBL
9847WDC 9947WDC	■	■	■	■	■	■			■	■	■			■	■		
9847WDC-F 9947WDC-F											■			■	■		
9850WDC 9950WDC	■	■	■	■	■	■			■	■	■			■	■		■ LBL
9850WDC-F 9950WDC-F											■			■	■		■ LBL

Mechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Latches	Touch bar trim				
	PL	RSS	PUSH	SG	KN	BRAILLE
98 99		■	■	■	■	■
98F 99F		■	■	■	■	■
XP98 XP99		■	■	■	■	■
XP98-F XP99-F		■	■	■	■	■
9875 9975		■	■	■	■	■
9875-F 9975-F		■	■	■	■	■
9827 9927	■	■	■	■	■	■
9827-F 9927-F		■	■	■	■	■
9857 9957		■	■	■	■	■
9857-F 9957-F		■	■	■	■	■
9847 9947	■	■	■	■	■	■
9847-F 9947-F		■	■	■	■	■
9848 9948		■	■	■	■	■
9848-F 9948-F		■	■	■	■	■
9849 9949		■	■	■	■	■
9849-F 9949-F		■	■	■	■	■
9847WDC 9947WDC		■	■	■	■	■
9847WDC-F 9947WDC-F		■	■	■	■	■
9850WDC 9950WDC		■	■	■	■	■
9850WDC-F 9950WDC-F		■	■	■	■	■

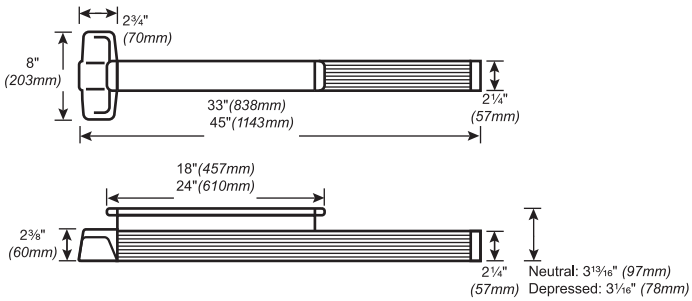
VON DUPRIN®

Exit device
98/99 Series

Specifications

Accessibility	▪ Force to depress push pad – AX device: 5 lbs – Standard device: 15 lbs ▪ Push pad projection – Neutral: 3 13/16" (97 mm) – Depressed: 3 1/16" (78 mm)
Certifications/ approvals	All Von Duprin 98/99 exit devices are ANSI/BHMA Certified. Please refer to the BHMA Certified Products Directory for specific listings.
Mounting height	39 13/16" (1011 mm) 39 11/16" (1008 mm) with mullion
Warranty	36 months from the date of placing the product in operation

Dimensions



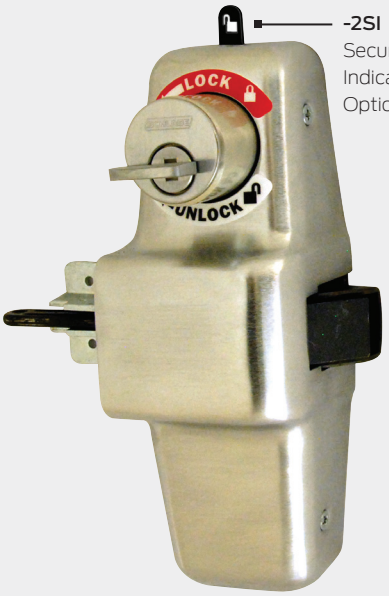
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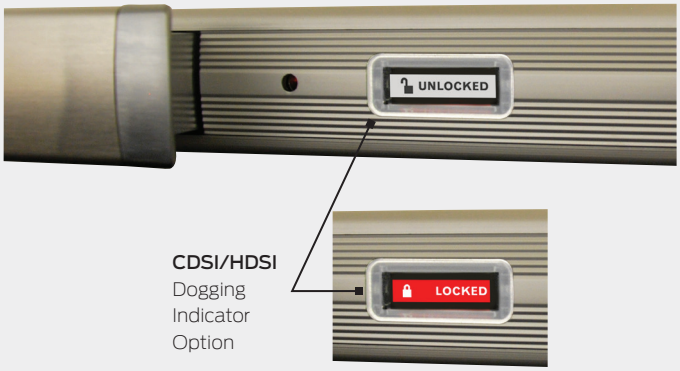
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VON DUPRIN®

Security Indicators



-2SI
Security
Indicator
Option



CDSI/HDSI
Dogging
Indicator
Option

Designed for high use and abuse institution environments, such as schools and hospitals, these Von Duprin products are recommended for the following applications:

- Visual Verification - Reduce the time it takes to tour your facility and ensure each door is secure by installing the Von Duprin security indicator to provide at-a-glance visual verification.
- Lockdown - Lock down high occupancy areas such as auditoriums, cafeterias and gymnasiums, from inside the room with the Von Duprin security indicator that provides positive visual confirmation.

The **CDSI/HDSI Dogging Indicator** provides an at-a-glance verification of the status of the door from inside of the room. Visible "LOCKED" and "UNLOCKED" indicators show whether the device is undogged or dogged. This feature can be used with Hex key (HDSI) or Cylinder dogging (CDSI) options on various device types – rim, mortise and vertical systems.

The **-2SI Security Indicator** provides an at-a-glance verification of the LOCKED/UNLOCKED status of the door from inside of the room. This option can be ordered as a new product or as a retrofit conversion kit to an existing 98/99 rim device. Indicator in "UNLOCKED" state presents a 1/2" x 1/2" metal flag (unlock icon, laser cut into flag) at top of device head. Indicator in "LOCKED" state has no flag present.

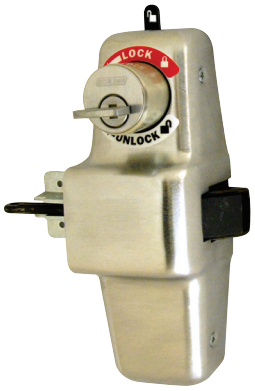
Features and Benefits

- Lockdown solution that meets fire and life safety codes for free egress.
- Modular conversion kits allow you to quickly and easily upgrade your existing devices

-2SI security indicator with double cylinder
- Thumbturn or key cylinder with LOCK/UNLOCK labels provide a clear direction of rotation to secure opening
- Available for 98/99 Series rim devices

CDSI/HDSI dogging indicator
- Hex or cylinder dogging options
- Visual indication of whether the exit device is dogged or undogged.
- Available for 98/99 & 33A/35A Series panic devices

Product availability



-2SI Security Indicator

NEW DEVICES

Options	Device	How to Order
Classroom Security Double Cylinder with Security Indicator	98/99 Rim only	Suffix = -2SI Double Cylinder with Security Indicator

Above applications available with L, TP, or K functions only. Specify handing. Rim cylinder (3216) sold separately. Rim cylinder with T-Turn available from Schlage, order part number XB 11-979



CDSI/HDSI Dogging Indicator

NEW DEVICES

Options	Device	How to Order
Cylinder Dogging Security Indicator	Panic devices: 33A/35A Series 98/99 Series	Prefix = CDSI
Hex Dogging Security Indicator	Panic devices: 33A/35A Series 98/99 Series	Prefix = HDSI

Above options can not be used with fire-rated devices and are recommended for use in combination with the following trim functions - DT, K-DT, L-DT, EO, NL, K-NL, L-NL, NL-OP

-2SI Security Indicator: Conversion options

CONVERSION KITS

Part Number	Description
051883	98/99-2SI Conversion Kit RHR
051884	98/99-2SI Conversion Kit LHR
971220-00	Lock/Unlock Label Only

Dogging Indicator: Conversion options

CONVERSION KITS

Part Number	Description
040070 / 040071	33A CDSI Conversion Kit 3' / 4'
040072 / 040073	33A HDSI Conversion Kit 3' / 4'
040074 / 040075	35A CDSI Conversion Kit 3' / 4'
040076 / 040077	35A HDSI Conversion Kit 3' / 4'
040078 / 040079	98 CDSI Conversion Kit 3' / 4'
040080 / 040081	98 HDSI Conversion Kit 3' / 4'
040082 / 040083	99 CDSI Conversion Kit 3' / 4'
040084 / 040085	99 HDSI Conversion Kit 3' / 4'

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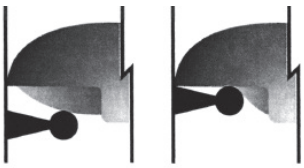
Mechanical options

AX Accessible device

The AX device is a UL certified exit device designed to meet the progressive requirements of the California Building Code for accessible openings. This device meets the 5 lbs of operating force requirement called for in chapter 11B-309.4. The AX device also exceeds ANSI/BHMA requirements. Available devices include: AX98/99, AX98/99-F, AX98/9949LBL, AX98/9949-F LBL, AX98/9949-F LBLAFL. Additionally, all AX devices will be shipped with a new UL label clearly stating “Meets California building Code (2013) Sec. 11B-309.4” and an “AX” identifier label on device center case. See images below for reference.



XP Extra performance



For increased security the XP98/99 Rim exit device has a static load force resistance of more than 2,000 pounds, twice that of standard rim exit devices. The two-piece latch bolt forms a 90° latch-to-strike contact. The “smart” latch changes shape when subjected to external forces. This design enables the exit door to withstand an external attack and remain secure. Additionally, the patented latch bolt design provides a greater, longer-lasting latch bolt to strike contact which is not easily affected by the twisting motion of a weakened frame, resulting in an opening that will remain strong.

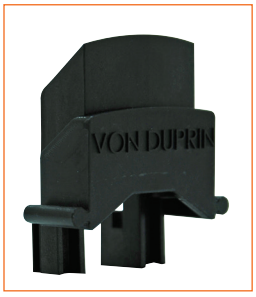
With a door loaded to 250 pounds, XP98/99 requires less than 40 pounds of pressure to open, 25% less than the safety code requires.

XP98/99 is available for panic or fire exit hardware applications. Dimensions, finishes and trim options are equal to the standard 98/99 series rim exit device.

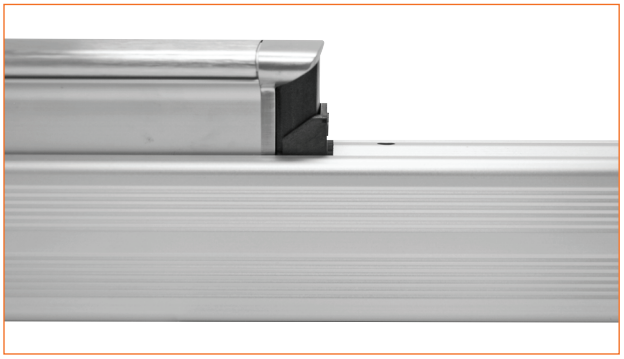
Note: The 909 strike is to be used for all applications.
The exception occurs with the use of fire rated double door applications, in this instance the 954 strike is required.

PA Pushpad armor

Built to absorb impact, the pushpad armor stands up to the wear and tear of demanding high-traffic areas. This composite accessory provides added support, while protecting the pushpad on the hinge side of the device. Available for 33A/35A and 98/99 series exit devices. See images below for reference.







Mullions

Mullions

Removable steel mullions Mullions provide single door performance in double door openings with rim devices. Mullions are easily removed by loosening bottom set screw and removing top fitting cover. The top mullion fitting is attached to the frame and is concealed by the fitting cover.

Steel mullions are 2" (51mm) wide and 3" (76mm) deep, with a wall thickness of 1/8" (3mm).

Mullions are shipped with mounting screws and prepared for strikes. Strikes are not included except where indicated.

Steel mullions are available in SP28 and SP313 finishes. Consult factory for other powder coat finish options.

KR – Keyed removable steel mullions makes removal faster and easier by a single operation of the mortise cylinder. Once mullion is removed, large equipment or furniture can freely pass through the opening. The unit will self lock when re-installed, without use of the cylinder key. Uses a 1 1/4" mortise cylinder with a straight cam (Schlage cam reference B502-191). Cylinders are sold separately. Prefix mullion model with "KR".

Removeable aluminum mullions are 1 1/16" (27mm) wide on face closest to the door and 2 3/8" (60mm) at the widest point. The depth is 3 1/8" (79mm) with a wall thickness of 1/8" (3mm).

Aluminum mullions are available in US4, US10, US28, 313 and 315 finishes. Consult factory for other powder coat finish options.

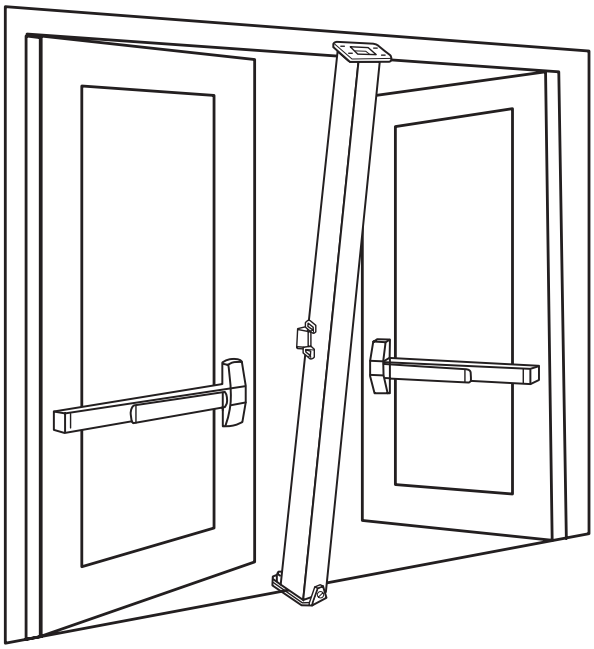
Stock Hollow Metal Applications for devices mounted to cover ANSI 161 cutouts are higher than the standard mullion strike location. Consult the factory for special strike preparation or order a blank mullion. See below.

Blank Mullions are furnished without strike preparation. They are used to mount devices at a strike height different from the standard mullion preparation.

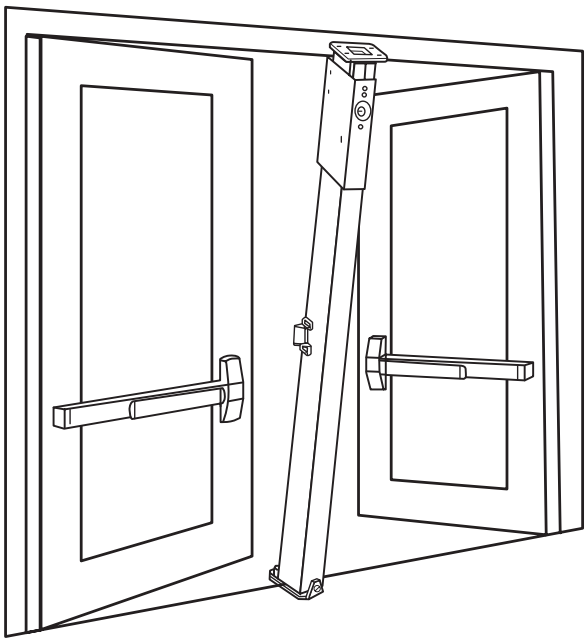
To order, specify:

1. For keyed Removable option on steel mullions, prefix model number with "KR"
2. Model number.
3. Height of opening
4. Finish
5. Handing if required.
6. Centerline deviation (refer to device template for standard centerline).
7. Strikes, when required, should be ordered with device.
8. For keyed Removable option on steel mullions, prefix model number with "KR"

Removable mullions



Keyed removable steel mullions



Mullions

Steel mullions

1654 Prepared for two 1606 strikes. **If 1606 strikes are not specified on the order, two per mullion will be added. Additional charges apply.**

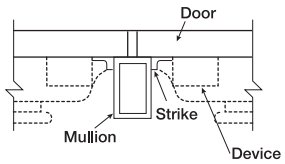
4954 Prepared for 264 or 299 strikes. For use with all Von Duprin Panic rim devices. **Note: specify strike choice with device.**

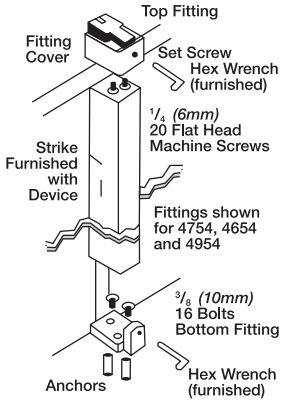
9954 Prepared for and must be used with two 268 strikes (88-F device), or two 499F (22-F, 98-F, 99F devices). UL fire labeled mullion for up to 3 hour opening using Von Duprin fire exit rim devices. This mullion is not easily removed due to special fittings.

22-F and 88-F devices are rated up to 8' x 8" (2438mm x 2438mm).

98-F and 99-F devices are rated up to 10'0" (3048mm).

Note: If 268 or 499F strikes are not specified on the order, two per mullion will be added. Additional charges apply.



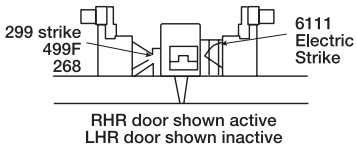


4754 Prepared for two 4263 monitor strikes.

4854 Prepared for one 299 and one 6111 electric strike. Indicate handing for electric strike.

9854 Prepared for one 268 or 499F strike and one 6111 electric strike. Indicate handing for electric strike. UL fire labelled mullion for up to 3 hour openings up to 8' x 8' (2438mm x 2438mm) using Von Duprin Fire Exit Rim Devices

4854/9854 – Using one electric strike



Aluminum mullions

5654 Prepared for two 264 or 299 strikes with weatherstripping. Includes one set of 154 stabilizers.

5754 Prepared and furnished with one 1408 double door strike. Includes one 154 stabilizer set. Note: specify device "less strike".

Sizes for mullions

1654, 4954, 4754, 4854, 5654	**9854, 9954**
7' 2" (2184mm)	7' 3" (2210mm)
*8' 2" (2489mm)	8' 3" (2475mm)
*10' 2" (3099mm)	10' 3" (3124mm)

KR1654, KR4954, KR4754, KR4854	**KR9854**, KR9954***
7' 6" (2286mm)	7' 5" (2261mm)
8' 6" (2591mm)	*8' 5" (2565mm)
10' 6" (3200mm)	*10' 5" (3175mm)

* Only qualifying applications will be provided with UL Label.
** Fire rated same as 9854
*** Fire rated same as 9954



Angle plate is used with narrow transom frames. The plate attaches to the transom extending the surface area needed to mount the mullion. Must be ordered separately. Specify finish.

154 Stabilizer is a two-piece interlocking set. One piece mounts on the mullion with the top mounting hole 5 3/16" (148mm) below the centerline of the strike; the other piece mounts on the door. Shims are provided to adjust for misalignment between the door and mullion.



The set maintains integrity between the door and mullion to prevent vandalism and to ensure contact between the device and strike as the doors expand and contract with temperature changes.

Furnished standard on aluminum mullions; optional for steel and all blank steel mullions.

MT54 Storage kit is a set of floor and wall brackets that provide convenient storage of the keyed removable mullion when removed from the opening.

To order, specify

1. Model MT54.
2. Finish SP28, SP313, or SPBLK

Appendix D

Plumbing Cutsheets

K-5452-ET-0

Dexter™ 0.125 gpf.

1-Pint Urinal

K-5452-ET

Features

- Washout urinal.
- 3/4" top spud.
- 1-pint or 0.125 gpf (0.47 lpf).
- Includes inlet and outlet spuds and hangers.
- Includes anti-backsplash wall.
- 14-3/4" (375 mm) extended rim.



Material

- Vitreous china.

Water Conservation & Rebates

- WaterSense® compliant when used with WaterSense flushometer.

Components

Additional included component/s: 3/4" Inlet Spud, 2" Outlet Spud, and Hanger (1 required).

ADA

Codes/Standards

ASME A112.19.2/CSA B45.1
DOE - Energy Policy Act 1992
EPA WaterSense®
ADA
ICC/ANSI A117.1

KOHLER® One-Year Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

Color tiles intended for reference only.

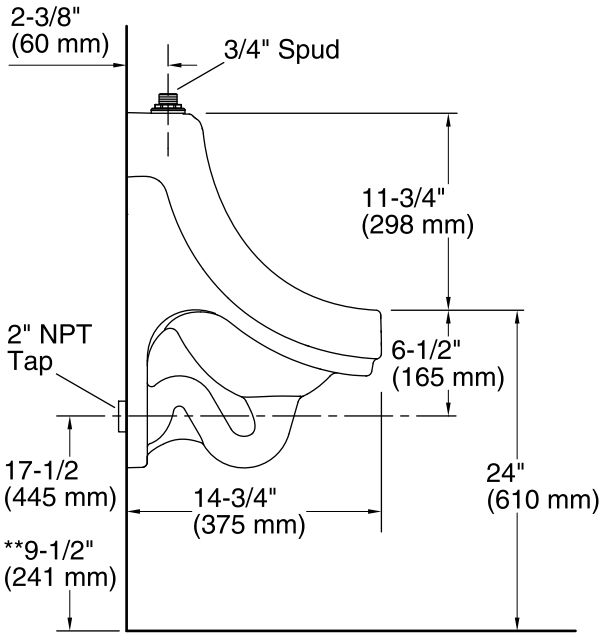
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	7	Black Black™

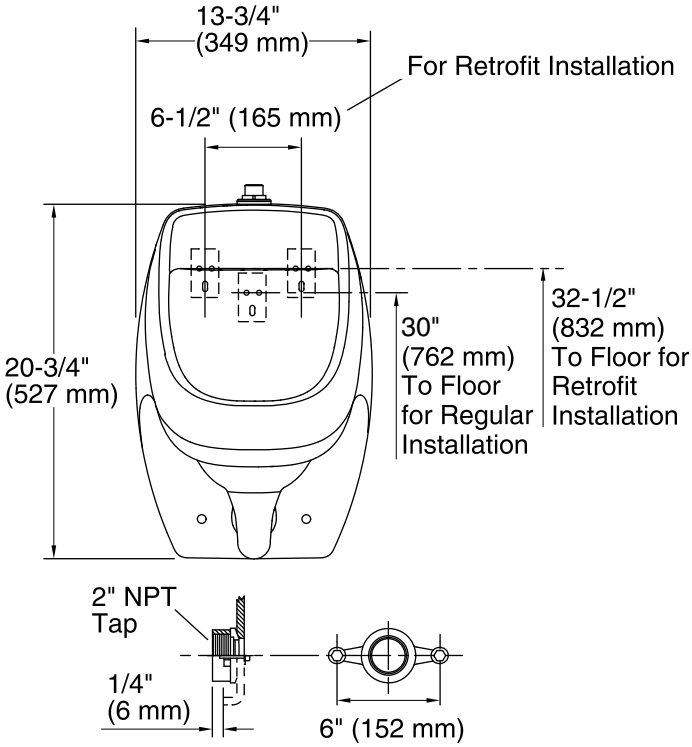
Dexter™ 0.125 gpf.

1-Pint Urinal

K-5452-ET

* Urinal complies with ADA
**Recommended outlet height for ADA compliance.





Spud Detail

Technical Information

All product dimensions are nominal.

Flush outlet technology:	Washout
Spud size:	3/4", Inlet, Top
Min. Water per Flush:	0.125 gal (0.5 L)
Max. Water per Flush:	0.125 gal (0.5 L)

Designed for the above water use when installed with a water-saving flushometer.

Pressure and Supply Requirements

Fixture pressure min (static):	25 psi (172.4 kPa)
Fixture pressure max (static):	80 psi (551.6 kPa)

Notes

Designed only for use with a 0.125 gpf (0.5 lpf) flushometer.

Install this product according to the installation instructions.

ADA compliant when installed to the specific requirements of these regulations.

ROYAL 111 DFSM-1.6/1.1-HW-LT

CODE NUMBER

3910286

DESCRIPTION

1.6/1.1 gpf, Polished Chrome Finish, Fixture Connection Top Spud, Single Flush, Hardwired, Royal® Exposed Sensor Water Closet Flushometer.

DETAILS

- Flush Volume: 1.6/1.1 gpf (6.0/4.2 Lpf)
- Finish: Polished Chrome (CP)
- Power Type: Hardwired (HW)
- Valve: Diaphragm
- Valve Body Material: Semi-red Brass
- Fixture Type: Water Closet
- Fixture Connection: Top Spud
- Rough-In Dimension: 11 ½" (292mm)
- Spud Coupling: 1 ½" (38mm)
- Supply Pipe: 1" (25mm)

FEATURES

- Non-Hold-Open True Mechanical Override Full Flush/Dual Flush Buttons
- If the user is present flush than one minute and leaves the sensing zone chooses the small GREEN override button, a reduced flush initiates (1.1 gpf/4.2 Lpf) eliminating liquid and paper waste, saving 1/2 gallon of water
- If the user is present greater than one minute and leaves the zone chooses the large BLACK override button, the full flush initiates (1.6 gpf/6.0 Lpf) eliminating solid waste and paper
- “User in View” Flashing LED
- 72-Hour Sentinel Flush
- Sweat Solder Adapter w/Cover Tube and Cast Wall Flange w/Set Screw
- No External Volume Adjustment to Ensure Water Conservation
- ADA Compliant Battery Powered Infrared Sensor Automatic “Hands-free” operation
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields high and low target detection
- 1” I.P.S. Screwdriver Bak-Chek® Angle Stop with Free Spinning Vandal Resistant Stop Cap
- Diaphragm, Stop Seat and Vacuum Breaker to be molded from PERMEX® rubber compound Chloramine resistance



COMPLIANCES & CERTIFICATIONS

(ADA Compliant, BAA Compliant, BREEAM Water Credit, cUPC Certified, cUPC Green Certified, Green Globes Water Credit, UL Certified)

RECOMMENDED SPECIFICATION

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi- Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2.

ELECTRICAL SPECIFICATIONS

- Transformers:
  - EL-451 (up to 6 flushometers)
  - EL-386 (Up to 1 flushometer)

VALVE OPERATING PRESSURE (FLOWING)

15–80 PSI (103–552 kPa). Specific fixtures may require greater minimum flowing pressure - consult manufacturer requirements.

DOWNLOADS

- EBV-500/550-A Installation Instructions
- EL-700/750-A Installation Instructions
- Control Stop Repair and Maintenance Guide
- Flush Connections Flanges Repair and Maintenance Guide
- Tail Piece Repair and Maintenance Guide
- Additional Downloads

NOTES

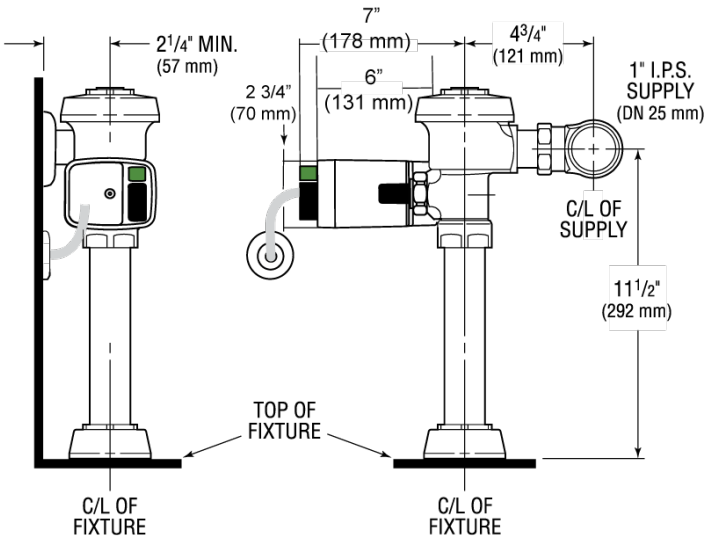
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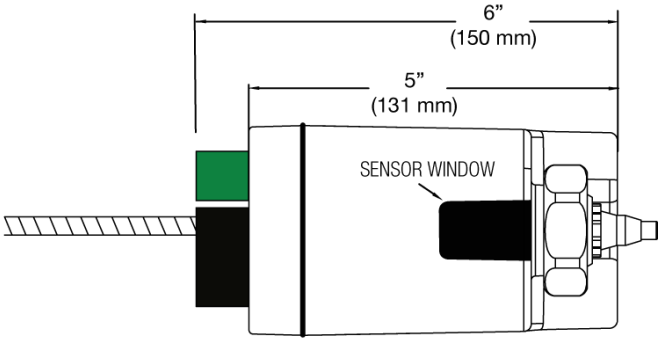
Looking for other variations of the ROYAL 111 DFSM product? View the general spec sheet with all options.

Find a compatible urinal for this flushometer.
Find a compatible water closet for this flushometer.

Sloan 10500 Seymour Ave, Franklin Park, IL 60131
Phone: 800.982.5839 • Fax: 800.447.8329 • sloan.com

ROUGH-IN





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Code 3910286 • Downloaded 11/29/21 • 08/03/21 • View Latest Version

Kingston™
Top spud flushometer bowl
K-4325

Features
- Vitreous china.
- Elongated bowl offers added room and comfort.
- Siphon jet.
- Wall-mount.
- 1½" (38 mm) top spud.
- 1.28 or 1.6 gpf (4.8 or 6.0 lpf) depending on flushometer specified.
- 10-1/2" (267 mm) x 9" (229 mm) water area.
- Will replace K-4330 and K-4330-L bowls.

Installation
- This product is not designed or intended for bariatric use.

Recommended Replacements
- This product is replaced by 84325.

Included Components
Additional Components:
Spud



ADA | **CSA B651** | **OBC**

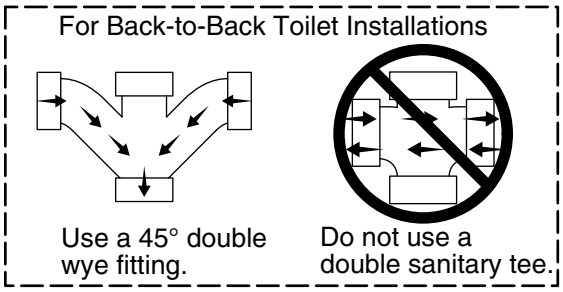
Codes/Standards
ASME A112.19.2/CSA B45.1
DOE - Energy Policy Act 1992
EPA WaterSense®
California Energy Commission (CEC)
ADA
ICC/ANSI A117.1
CSA B651
OBC

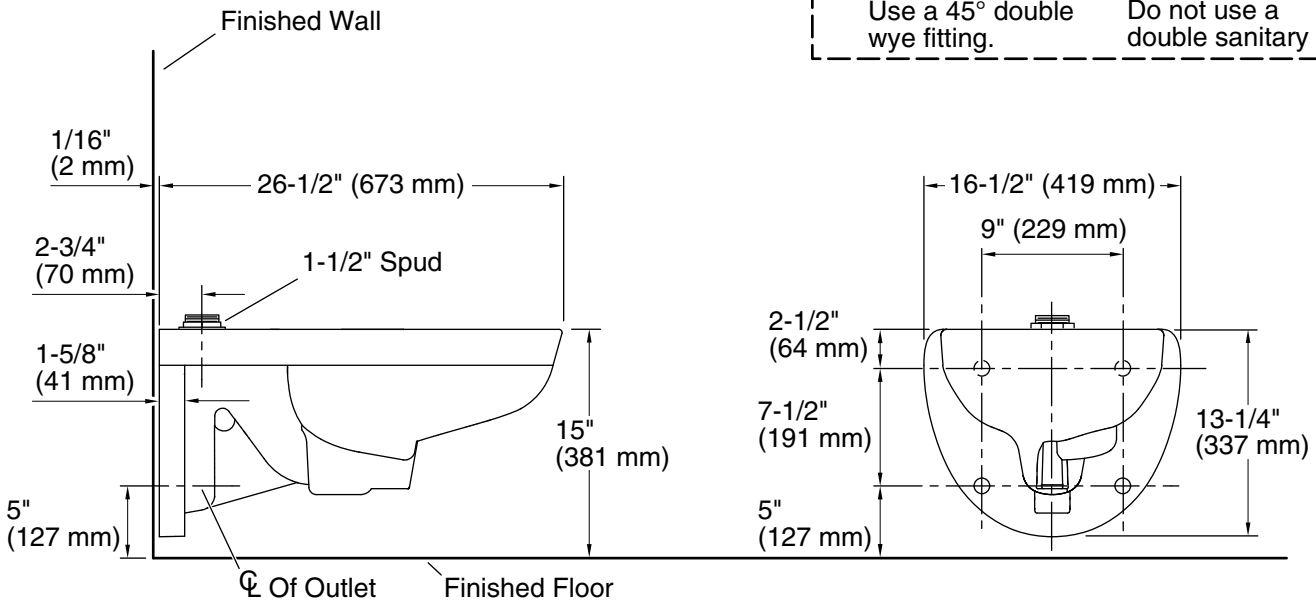
KOHLER® One-Year Limited Warranty
See website for detailed warranty information.

Available Colors/Finishes
Color tiles intended for reference only.

Color	Code	Description
	0	White
	96	Biscuit

Kingston™
Top spud flushometer bowl
K-4325





Technical Information

All product dimensions are nominal.

Toilet type:	Flushometer, Wall-mount
Waste Outlet:	Wall
Bowl shape:	Elongated
Spud size:	1-1/2", Inlet, Top
Trap passageway:	2-1/8" (54 mm)
Water Consumption	
Full:	1.6 gpf (6 lpf)
Reduced:	1.28 gpf (4.8 lpf)
Water surface size:	10-1/2" x 9" (267 mm x 229 mm)
Rim to water surface:	5-1/4" (133 mm)
Seat-mounting holes:	5-1/2" (140 mm)

Fixture Supply Requirements

Min static pressure:	35 psi (241.3 kPa)
Max static pressure:	80 psi (551.6 kPa)
Min flowing pressure:	25 psi (172.4 kPa)
Min flow rate:	25 gpm (94.6 lpm)

Notes

Install this product according to the installation instructions.

Refer to manufacturer's instructions and local codes for flushometer requirements.

For back-to-back toilet installations: Use only a 45° double wye fitting.

Ensure valve is braced properly.

Ensure pressure and flow are correct.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

Plumbing codes may require elongated toilets and elongated, open-front seats in public bathrooms.

Accessibility standards may require controls to be located on the open side of the toilet.

K-2005-0

KOHLER®

Kingston™

Wall-Mount Bathroom Sink

K-2005

Features

- With hanger.
- With overflow.
- 4" (102 mm) centers.
- 21-1/4" (540 mm) x 18-1/8" (460 mm).

Material

- Vitreous china.

Installation

- Wall-mount

Recommended Accessories

K-8998 P-Trap

Components

Additional included component/s: Hanger.



ADA | **CSA B651**

Codes/Standards

ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1
CSA B651

KOHLER® One-Year Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

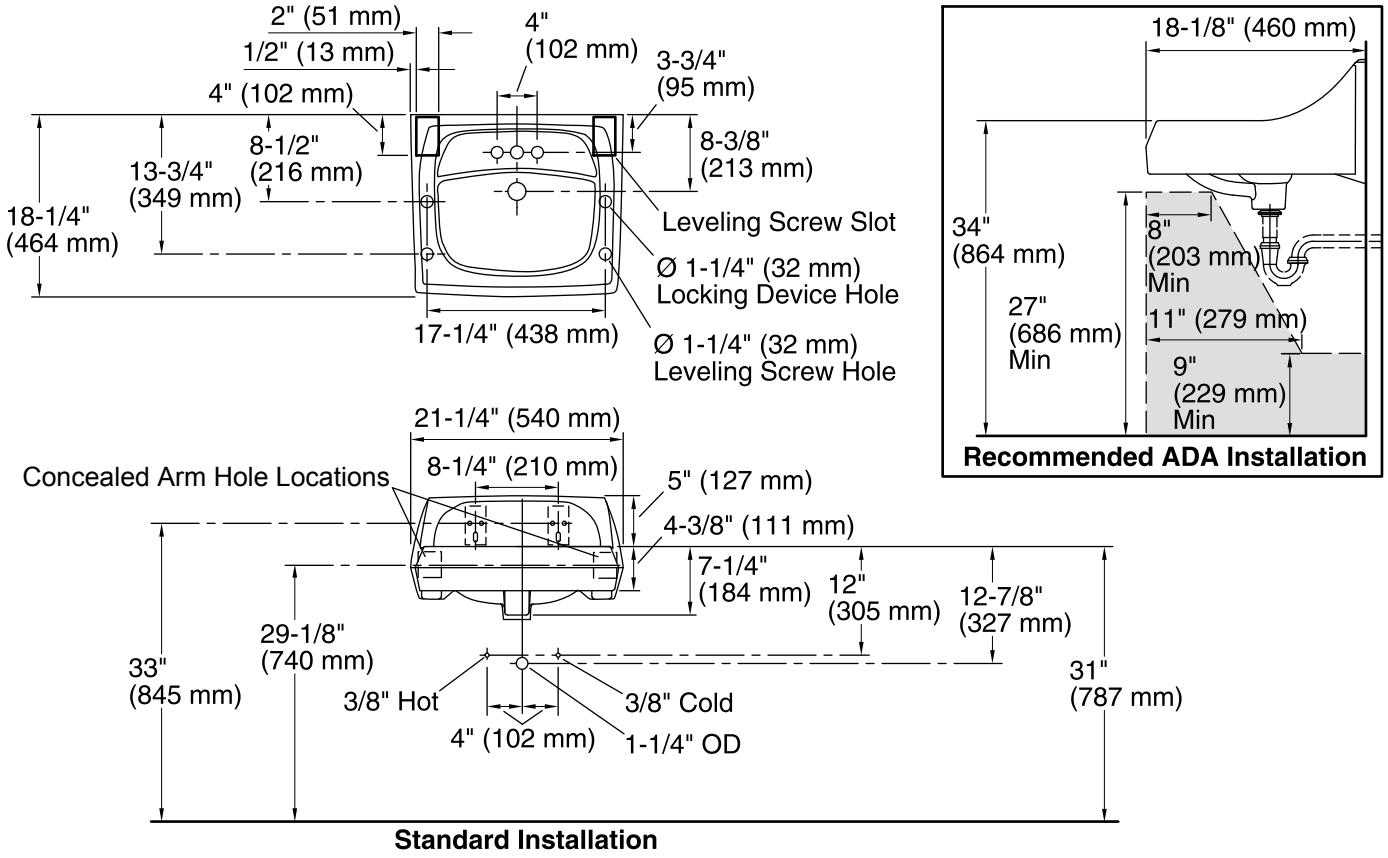
Color tiles intended for reference only.

Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	7	Black Black™

Kingston™

Wall-Mount Bathroom Sink

K-2005



Technical Information

All product dimensions are nominal.

Bowl configuration:	Single
Installation:	Wall-mount
Bowl area (Only)	Length: 16" (406 mm) Width: 10" (254 mm) With overflow: Yes Water depth: 3-1/8" (79 mm)
Bowl area	With overflow: Yes
Number of deck holes:	3
Soap/Lotion hole:	1-1/4" (32 mm)
Drain hole:	1-3/4" (44 mm)

Notes

Install this product according to the installation instructions.

ADA, CSA B651 compliant when installed to the specific requirements of these regulations.

OPTIONS

Power Type

- ☐ Hardwired

Body Type

- ☐ Gooseneck

Mounting

- ☐ Deck

Power Supply

- ☐ Plug Adapter (PLG)

Sensor Type

- ☐ Infrared (IR)

Flow Rate

- ☐ 1.0 gpm (4 Lpm) (1.0GPM)
- ☐ 1.5 gpm (6 Lpm) (1.5GPM)
- ☐ 2.2 gpm (8 Lpm) (2.2GPM)
- ☐ 0.35 gpm (1 Lpm) (0.35GPM)
- ☐ 0.5 gpm (2 Lpm) (0.5GPM)

Spray Type

- ☐ Laminar (LAM)
- ☐ Multi-Laminar (MLM)

Trim Plate

- ☐ 4" (102mm) (4)

Finish

- ☐ Polished Chrome (CP)

Control Access

- ☐ Below Deck

Mixer

- ☐ Back-Check Tee (TEE)
- ☐ Below Deck Manual Mixing Valve (BDM)

Special Features

- ☐ Battery Backup

Compliances & Certifications

- ☐ ADA Compliant
- ☐ ASME A112.18.1 Compliant
- ☐ Proposition 65
- ☐ TAS
- ☐ UPC Certified
- ☐ UPC Low Lead Compliant
- ☐ cUPC Certified
- ☐ cUPC Low Lead Compliant



Image for a standard SF-2200 shown

DESCRIPTION

Sloan® Hardwired-Powered Deck-Mounted Gooseneck Body Faucet

FEATURES

Commercial Grade, ADA Compliant, Electronic, Sensor-Activated, Brass Gooseneck Hand Washing Faucet with the following features:

- Adjustable Infrared Sensor Range
- 36” (914 mm) Long Sensor Cable
- 24” (610 mm) Long Flex Hose
- Filtered Solenoid Valve with serviceable Strainer Filter
- Includes Four (4) AA-size Batteries
- Includes appropriate Mounting Hardware
- 1 Year limited warranty

DOWNLOADS

- SF Series Installation Instructions
- SF Series (FR) Installation Instructions
- SF Series (SP) Installation Instructions
- SFP 35-A Installation Instructions
- Trim Plate Guide
- Sloan 2100/2150 Repair and Maintenance Guide
- Additional Downloads

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- ☐ CEC Compliant
- ☐ NYC604.4

NOTES

For product line drawings, view model-specific spec sheets.

All information contained within this document subject to change without notice.

Find a matching soap dispenser for this faucet.
Find a compatible sink for this faucet.

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Phone: 800.982.5839 • Fax: 800.447.8329 • sloan.com

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K-2007-0

Kingston™

Wall-Mount Bathroom Sink

K-2007

Features

- Made from premium materials that withstand high-volume usage
- Constructed of vitreous china
- 21-1/4"L x 18-1/8"W
- Wall-mount installation
- Faucet not included
- Includes wall hanger
- Drilled for concealed arm carrier

Recommended Accessories

K-8998 P-Trap

Components

Additional included component/s: Hanger (2 Required).



ADA | **CSA B651** | **OBC**

Codes/Standards

ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1
CSA B651
OBC

See website for detailed warranty information.

Available Color/Finishes

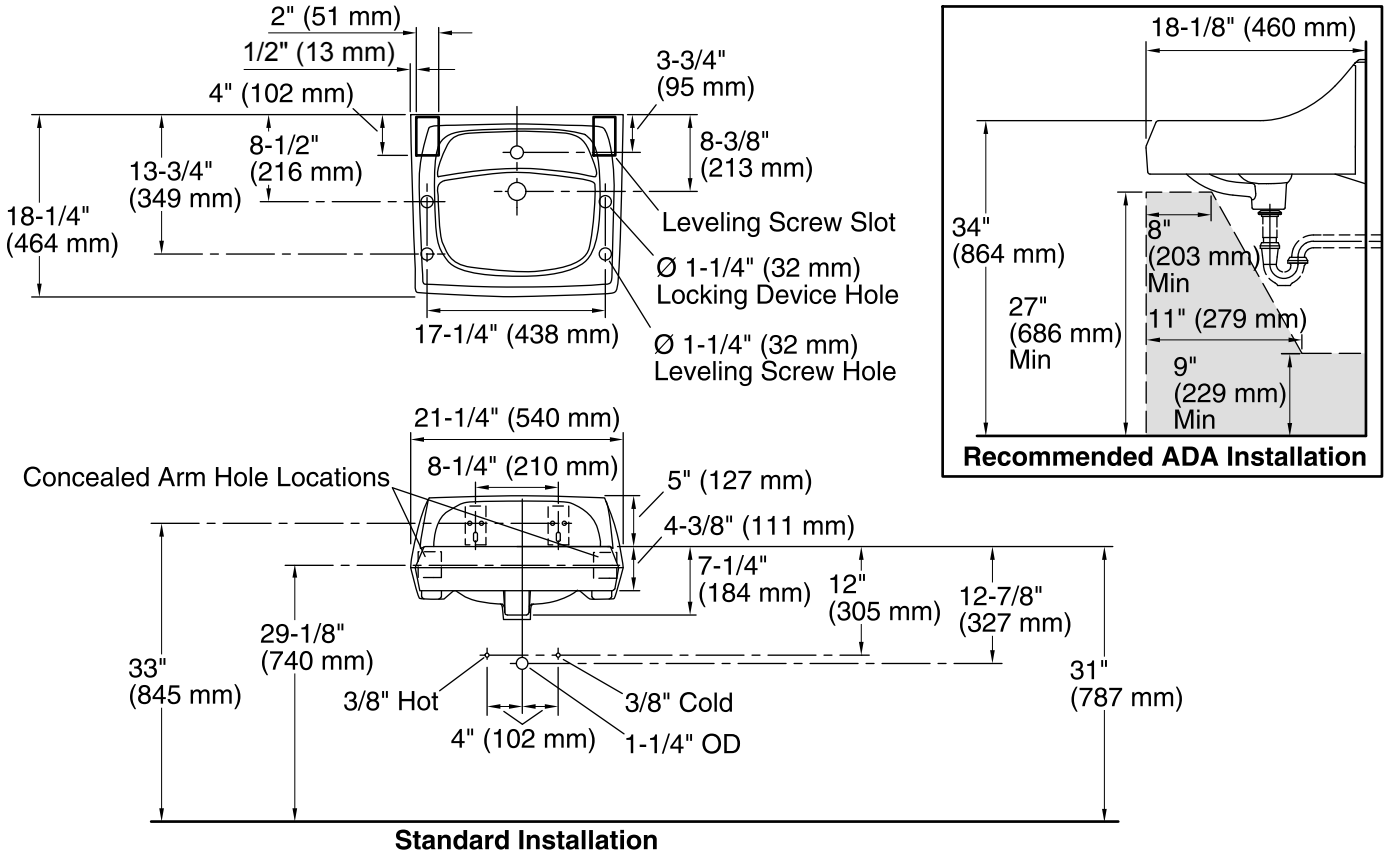
Color tiles intended for reference only.

Color	Code	Description
	0	White
	47	Almond

Kingston™

Wall-Mount Bathroom Sink

K-2007



Technical Information

All product dimensions are nominal.

Bowl configuration:	Single
Installation:	Wall-mount
Bowl area (Center)	Length: 10" (254 mm) Width: 15" (381 mm) With overflow: Yes Water depth: 3-1/4" (83 mm)
Bowl area	With overflow: Yes
Number of deck holes:	1
Faucet hole(s):	1-3/8" (35 mm)
Soap/Lotion hole:	1-1/4" (32 mm)
Drain hole:	1-3/4" (44 mm)

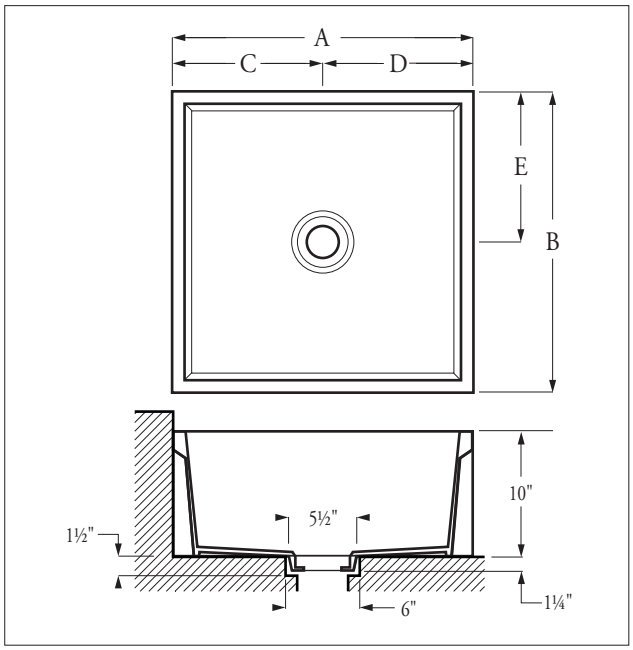
Notes

Install this product according to the installation instructions.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.



Molded one-piece construction for light weight and easy handling. Supplied with Wedge-Lok™ seal, integral drain and chrome strainer.



Model	A	B	C	D	E	WT.
MSR-2424	24"	24"	12"	12"	12"	50
MSR-3624	36"	24"	18"	18"	12"	72

Standards:

I.A.P.M.O.	International Association of Plumbing and Mechanical Officials File No. 2646.
ANSI	American National Standards Institute - Specifications Z-124.6.
HUD/FHA	National Specifications UN-73.
CSA TEST	Warnock Hersey Listed: CAN / CSA - B45.0 - CAN / CSA - B45.5

Florestone Models MSR-2424/MSR-3624 Molded Mop Receptors

Architect's Specifications

Furnish and install molded Mop Receptor Model MSR-2424 / MSR-3624 (specify) as manufactured by Florestone Products Co. Molding will be done under heat and pressure using matched metal dies. The unit will be one piece with no seams. Shoulders will be no less than 1" wide and 9½" inside. Receptor will have ribbed underbody and integral drain providing for a no-caulked connection to a 2" or 3" ABS pipe (specify drain size). Drain grid will be 18-gauge stainless steel, flat type, #430.

Molded mop sinks are supplied with Wedge-Lok® seal for use on ABS pipe only.

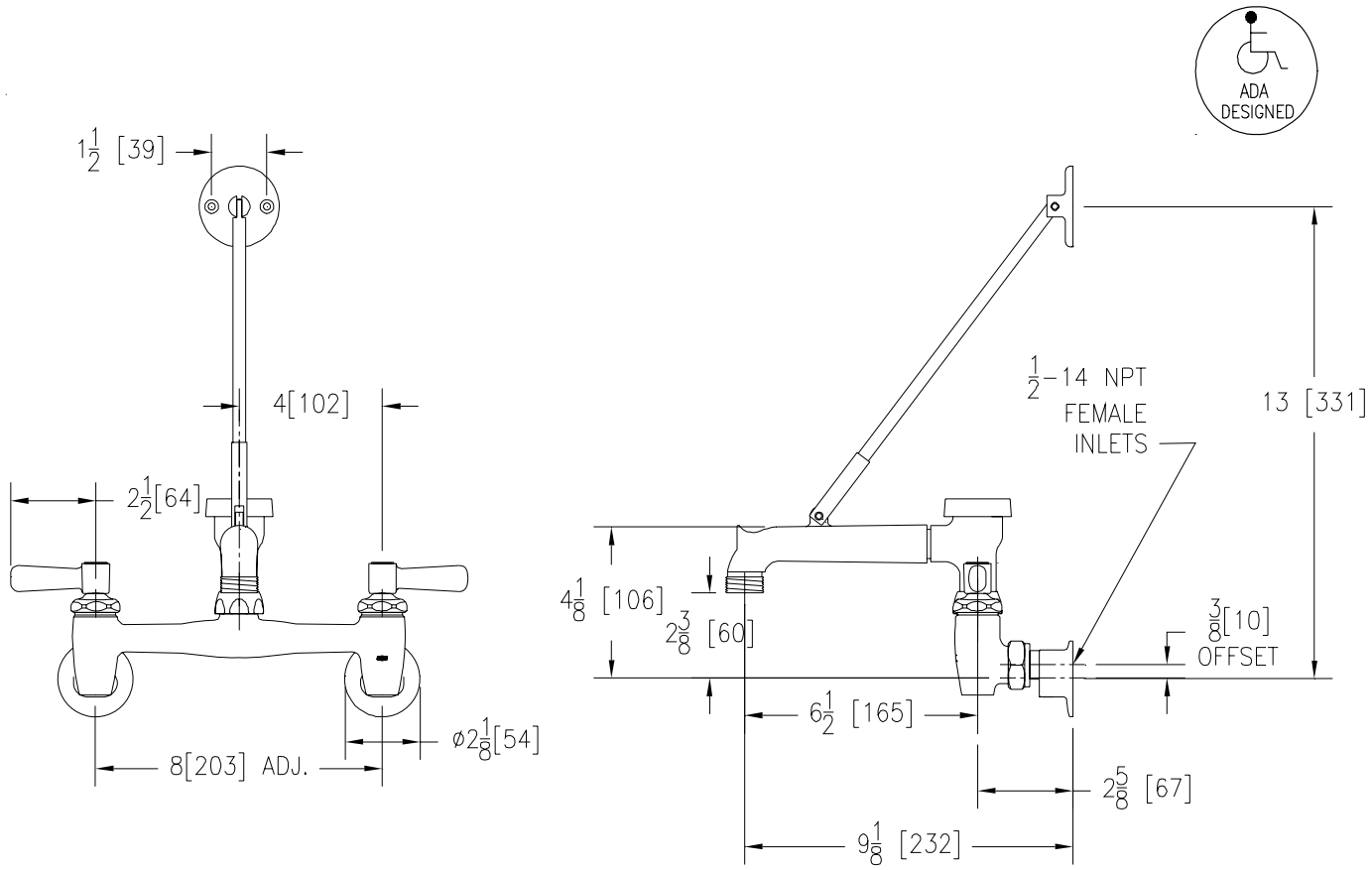
FLORESTONE
A Spec Above.™

FLORESTONE PRODUCTS CO., INC.
2851 Falcon Drive • Madera, CA 93637
T. 559.661.4171 • T. 800.446.8827
F. 559.661.2070 • florestone.com

SINK FAUCET
Z843M1-RC

TAG _____

Engineering Specifications: Zurn AquaSpec® Z843M1-RC
Rough chrome-plated cast brass 8" [203mm] sink faucet with quarter turn ceramic disc cartridges, 3/8" [10mm] short swivel inlets providing adjustable centers from 7-1/4" [184mm] to 8-3/4" [222mm], integral service stops and a 6" [152mm] centerline cast brass spout with chemical resistant vacuum breaker, 3/4" hose threaded outlet, pail hook and adjustable wall brace. Unit is furnished with 2-1/2" [64mm] vandal-resistant color-coded metal lever handles. (Note: Atmoshperic vacuum breaker not intended for continuous pressure applications.)



Note: *All dimensions are for reference only. Do not use for pre-plumbing*

OPTIONAL ACCESSORIES

Suffix	Description
__-CS	Check Stops
__-HCT	Hot/Cold Text Indexes
__-LSI	2-1/2" [64mm] Long Swivel Inlets
__-WHK	Wall Hook
__-5H	5' [152cm] Vinyl Hose
__-6P	Master Carton (Qty. 6)

ZURN INDUSTRIES, LLC ♦ COMMERCIAL BRASS OPERATION ♦ 2640 SOUTH WORK STREET ♦ FALCONER NY 14733
Phone: 1-800-997-3876 ♦ Fax: 1-919-775-3541 ♦ www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292

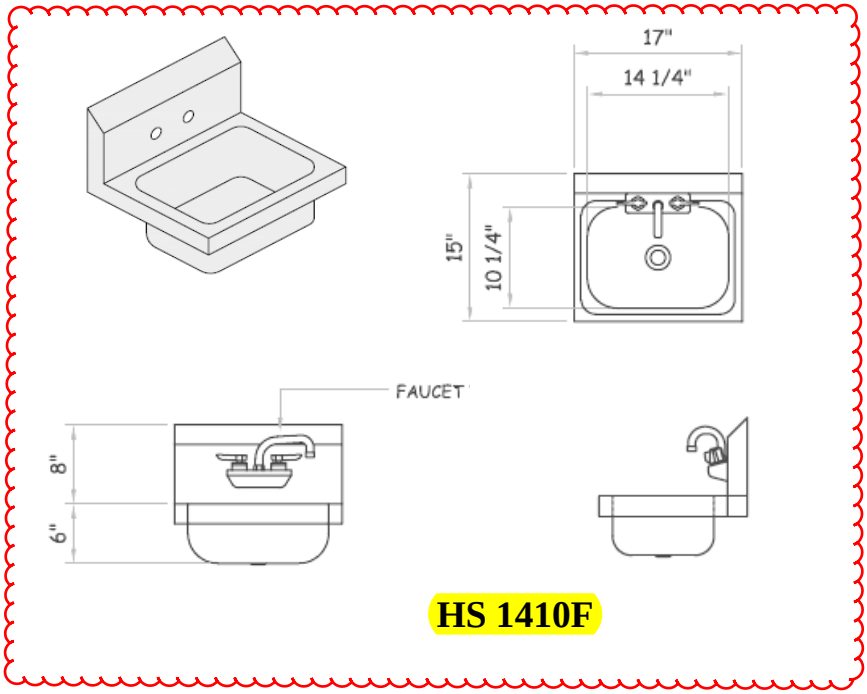
AquaSpec® is a registered trademark of Zurn Industries, LLC
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Rev. E Date: 10/19/11 C.N. No. 128251
Dwg. No. 69756 Product No. Z843M1-RC

West Star
The leader in service and quality

Standard Line Sinks
Hand Sinks

Item #: _____ **Qty #:** _____
Model #: HS 1410F
Project: _____

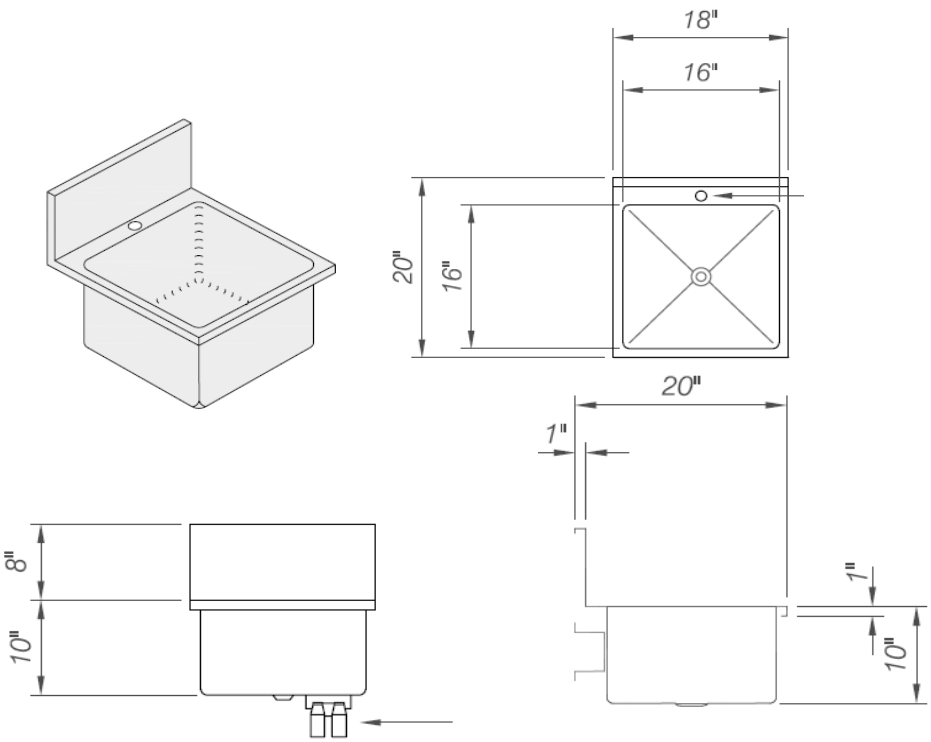


HS 1410F

Features:
- Die Formed, no-drip V-edge
- One piece seamless steel sheet
- Includes wall bracket, slotted holes

Construction:
- 20 ga., Type 304 stainless steel
- Drain hole is 3 5/8"
- Includes gooseneck faucet

Options
- [x] Endsplashes
- [ ] Other _____



HS 1616

Features:
- Fully welded and polished
- One piece seamless steel sheet
- Includes wall bracket
- Heavy duty construction

Construction:
- 16 ga., Type 304 stainless steel
- Includes 2" basket drain
- Includes gooseneck spout with knee valves

Options
- [ ] Endsplashes
- [ ] Other _____

www.weststarindustries.com
4445 E. Fremont Street / Stockton, CA 95215
Phone: 800-326-2288 Fax: (209) 955-8250 CL# 422322
Email: wsi@weststarindustries.com

Note: Specifications are subject to change without notice.

West Star
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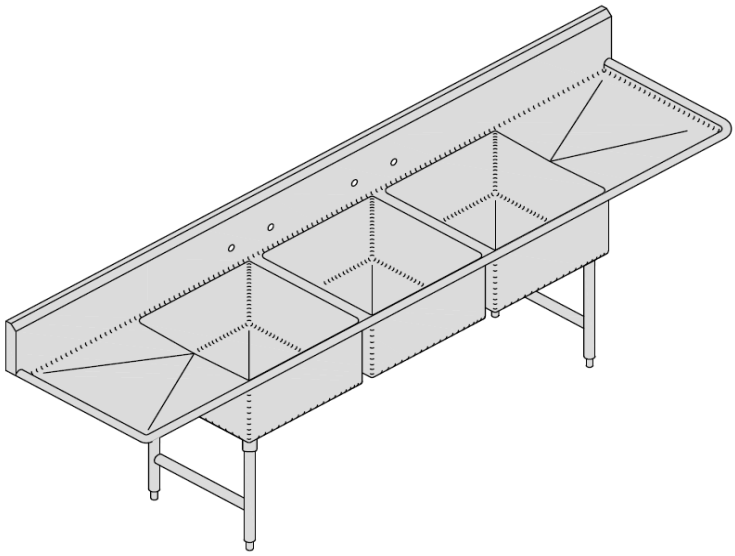
Premier Line Sinks

3 Compartment, 2 Drainboards

Item #: _____ **Qty #:** _____
Model #: _____
Project: _____

MADE in the USA

NSF



Features:

- Fully welded and polished tub
- Heavy duty construction
- Cross bracing adds strength and durability
- Includes mounting bracket for easy installation

Construction:

- All sinks are fully welded and polished to a smooth grained finish.
- Backsplash turns down for a simple, sanitary installation
- Includes s/s basket drain

Material:

Work Top: 14 gauge type "304" series stainless steel
Legs: 1 5/8" Ø stainless steel with adjustable feet
Gussets: Stainless steel

Note: Model number with an * are supplied with one set of 8" on center faucet holes

MODEL NUMBER	OVERALL DIMENSIONS		TUB SIZE		DRBD SIZE	WT. (LBS.)
	A	B	C	D	E	
*SP-3-1717-2D18	91"	22 1/2"	17"	17"	18"	120
*SP-3-1717-2D24	103"	22 1/2"	17"	17"	24"	130
*SP-3-1723-2D18	91"	28 1/2"	17"	23"	18"	150
*SP-3-1723-2D24	103"	28 1/2"	17"	23"	24"	160
SP-3-2323-2D24	121"	28 1/2"	23"	23"	24"	170
SP-3-2323-2D30	133"	28 1/2"	23"	23"	30"	180
SP-3-2923-2D30	151"	28 1/2"	29"	23"	30"	200
SP-3-2923-2D36	163"	28 1/2"	29"	23"	36"	220
SP-3-2929-2D30	151"	34 1/2"	29"	29"	30"	240
SP-3-2929-2D36	163"	34 1/2"	29"	29"	36"	250
CUSTOM	OVERALL DIMS.		TUB SIZE		DRBD SIZE	

WT. = Crated shipping weight

**Sinks with 36" drainboards are supplied with two sets of legs

Custom Sizes Available!

Options:

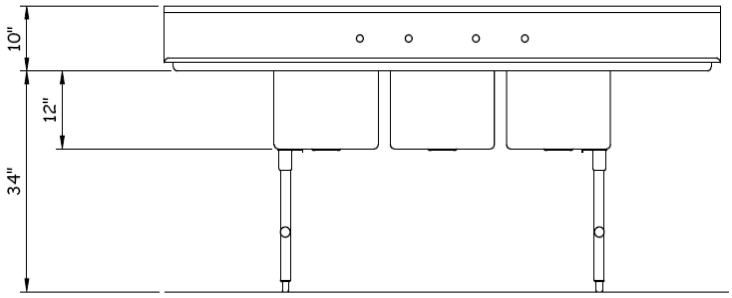
- ☐ Right Splash
- ☐ Left Splash
- ☒ Faucet 14" spout QTY 1
- ☐ Pre-rinse faucet QTY _____
- ☐ Add-on faucet QTY _____
- ☐ Leverwaste bracket
- ☐ Leverwastes
- ☐ Leverwastes w/ overflow
- ☐ Flange feet
- ☐ Hi-Lite Leading Edges
- ☐ Rack Slide QTY _____
- ☐ Sink Cover QTY _____
- ☐ Additional 8" on center faucet holes
- ☐ Apron
- ☐ Other _____

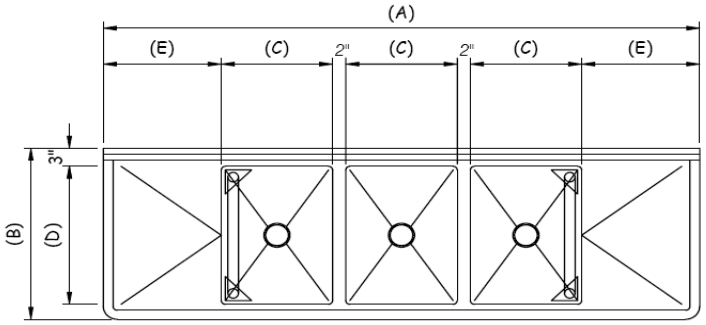
www.weststarindustries.com
4445 E. Fremont Street / Stockton, CA 95215
Phone: 800-326-2288 Fax: (209) 955-8250 CL# 422322
Email: wsi@weststarindustries.com

Note: Specifications are subject to change without notice.

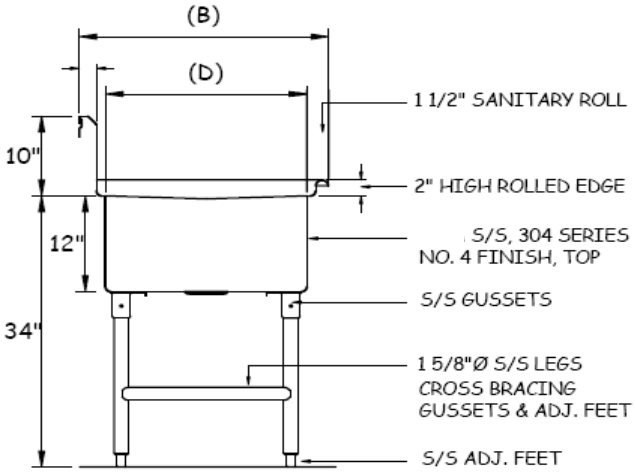
West Star
The leader in service and quality

Premier Line Sinks
Details and Specifications





Note: Model number with an * are supplied with one set of 8" on center faucet holes



Custom Sizes Available!

MODEL NUMBER	OVERALL DIMENSIONS		TUB SIZE		DRBD SIZE	WT. (LBS.)
	A	B	C	D	E	
*SP-3-1717-2D18	91"	22 1/2"	17"	17"	18"	120
*SP-3-1717-2D24	103"	22 1/2"	17"	17"	24"	130
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SP-3-2929-2D36	163"	34 1/2"	29"	29"	36"	250
CUSTOM	**OVERALL DIMS.**		**TUB SIZE**		**DRBD SIZE**	

WT. = Crated shipping weight
**Sinks with 36" drainboards are supplied with two sets of legs

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4445 E. Fremont Street / Stockton, CA 95215
Phone: 800-326-2288 Fax: (209) 955-8250 CL# 422322
Email: wsi@weststarindustries.com

Note: Specifications are subject to change without notice.

DAYTON
SPECIFICATIONS

Dayton Stainless Steel 25" x 21-1/4" x 6-9/16" Single Bowl Drop-in Sink
Model(s) D12521

PRODUCT SPECIFICATIONS

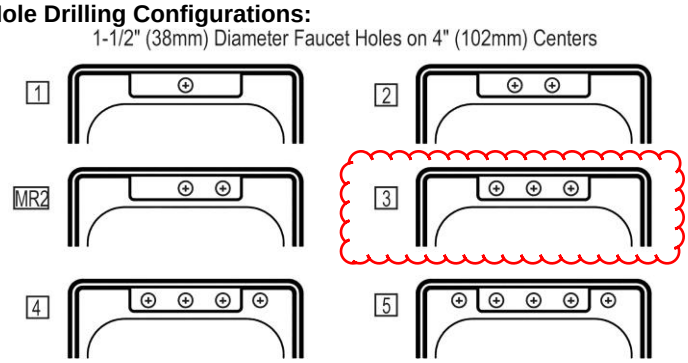
Dayton Stainless Steel 25" x 21-1/4" x 6-9/16", Single Bowl Drop-in Sink. Sink is manufactured from 22 gauge 300 series Stainless Steel with a Satin finish, Center drain placement, and Bottom only pads.

Installation Type:	Drop-in
Material:	300 series Stainless Steel
Finish:	Satin
Gauge:	22
Sound Deadening:	Bottom only pads
Number of Bowls:	1
Sink Dimensions:	25" x 21-1/4" x 6-9/16"
Bowl 1 Dimensions:	21" x 15-3/4" x 6-3/8"
Drain Size:	3-1/2" (89mm)
Drain Location:	Center
Minimum Cabinet Size:	30"
Mounting Hardware:	Part # 64090012 included for countertops up to 3/4" (19mm) thick
Cutout Template #:	1000001245

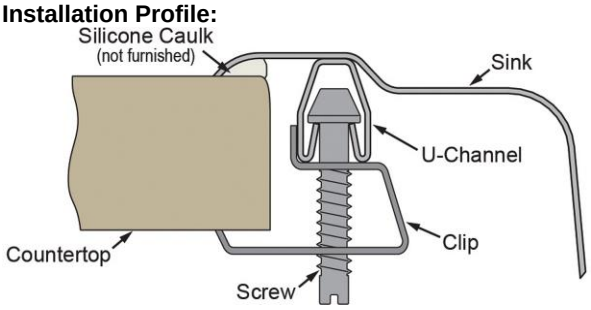
Template is available for download at elkay.com

Cutout Dimensions for Top Mount Installation:
24-3/8" x 20-5/8" (619mm x 524mm) with 1-1/2" (38mm) corner radius

Hole Drilling Configurations:



Installation Profile:





AMERICAN PRIDE. A LIFETIME TRADITION.
Like your family, the Elkay family has values and traditions that endure. For almost a century, Elkay has been a family-owned and operated company, providing thousands of jobs that support our families and communities.

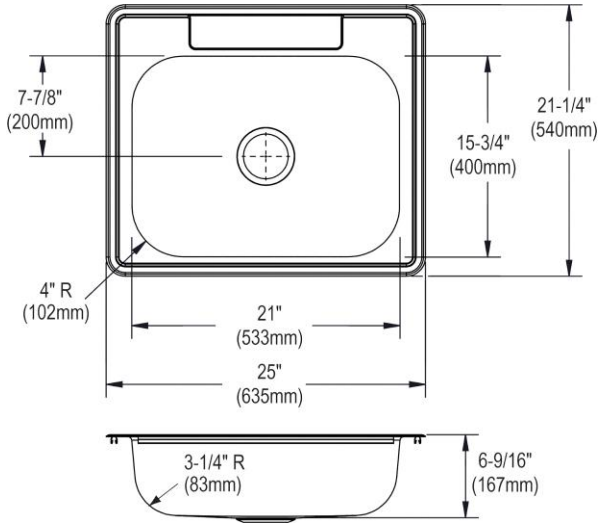
Product Compliance: ADA & ICC A117.1
ASME A112.19.3/CSA B45.4
BUY AMERICAN ACT

Sinks are listed by IAPMO® as meeting the applicable requirements of the Uniform Plumbing Code®, International Plumbing Code®, and National Plumbing Code of Canada.

Complies with ADA & ICC A117.1 accessibility requirements when installed according to the requirements outlined in these standards.

Clean and Care Manual (PDF)
Installation Instructions (PDF)
Limited Lifetime Warranty (PDF)

Similar models are available with: ADA Depths



PART:_____QTY: _____
PROJECT:_____
CONTACT:_____
DATE:_____
NOTES:_____
APPROVAL:_____

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

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OPTIONAL ACCESSORIES

Bottom Grid:	GBG2115SS
Cutting Board:	CB1516
Drain:	D1125
Hardware:	LK364, LK463
Sinkmate:	LKSMHSL

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

KITCHEN SINK FAUCET

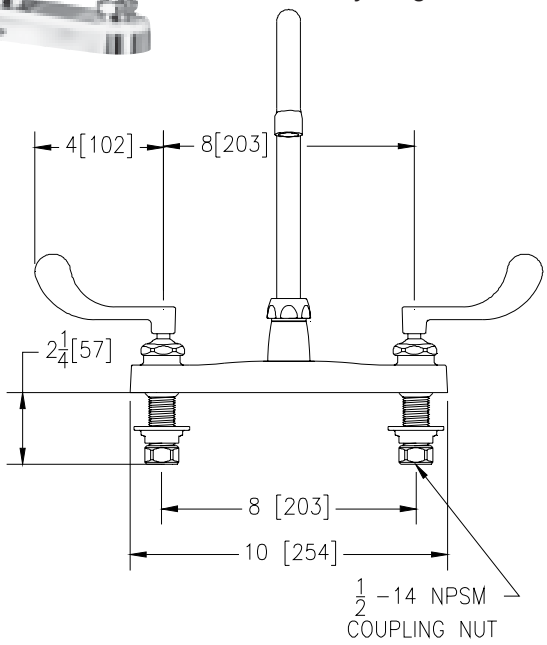
Z871B4-XL

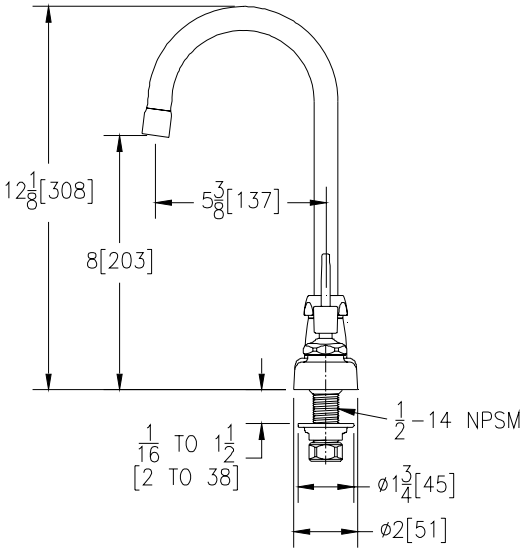
TAG _____



Engineering Specifications: Zurn AquaSpec® Z871B4-XL
Polished chrome-plated 8" [203mm] brass deck faucet with a 5-3/8" [137mm] centerline rigid or swing gooseneck spout and quarter turn ceramic disc cartridges. Unit is furnished with a 2.2 GPM [8.3 L] pressure compensating aerator (complying with ANSI A112.18.1 Standard for flow), 4" [102mm] vandal-resistant color-coded metal wrist blade handles, mounting hardware and 1/2" NPSM coupling nuts for standard lavatory risers.

Zurn Lead Free products (-XL), is the line of durable, high quality brass faucets and fixtures that are designed and manufactured to comply with state laws and local codes that mandate lead content levels. Zurn Lead Free products (-XL) are manufactured with less than one quarter of one percent (0.25%) total lead content by weighted average.





Note: *All dimensions are for reference only. Do not use for pre-plumbing*

OPTIONAL ACCESSORIES

Suffix	Description
__ -FC	2.0 GPM [7.6L] Laminar Flow Control in Base of Spout
__ -HCT	Hot/Cold Text Indexes
__ -HS	Hose and Spray
__ -PT	1-1/4" [32mm] Cast Brass P-Trap with a 7-1/2" [191mm] Long 17-Gauge Wall Bend
__ -2F	2.2 GPM [8.3 L] Vandal-Resistant Pressure Compensating Female Aerator
__ -3F	0.5 GPM [1.9 L] Vandal-Resistant Pressure Compensating Female Aerator
__ -4F	2.2 GPM [8.3 L] Vandal-Resistant Pressure Compensating Female Laminar Flow
__ -7F	1.0 GPM [3.8 L] Pressure Compensating Female Spray Outlet
__ -16F	1.0 GPM [3.8 L] Vandal-Resistant Pressure Compensating Female Spray Outlet
__ -17F	1.5 GPM [5.7 L] Vandal-Resistant Pressure Compensating Female Aerator
__ -18F	1.5 GPM [5.7 L] Vandal-Resistant Pressure Compensating Female Laminar Flow
__ -19F	1.5 GPM [5.7 L] Anti-Microbial Pressure Compensating Female Laminar Flow Outlet
__ -20F	1.0 GPM [3.8L] Vandal-Resistant Pressure Compensating Anti-Microbial Female Laminar Flow Outlet
__ -21F	1.0 GPM [3.8L] Female Laminar Flow Outlet

ADA DESIGNED

ZURN INDUSTRIES, LLC ♦ COMMERCIAL BRASS OPERATION ♦ 2640 SOUTH WORK STREET ♦ FALCONER NY 14733
Phone: 1-716-665-1132 ♦ Fax: 1-716-665-1135 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292

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Rev. Date: 4/2/09 C.N. No. 108473
Dwg. No. 93023 Product No. Z871B4-XL

575-CH

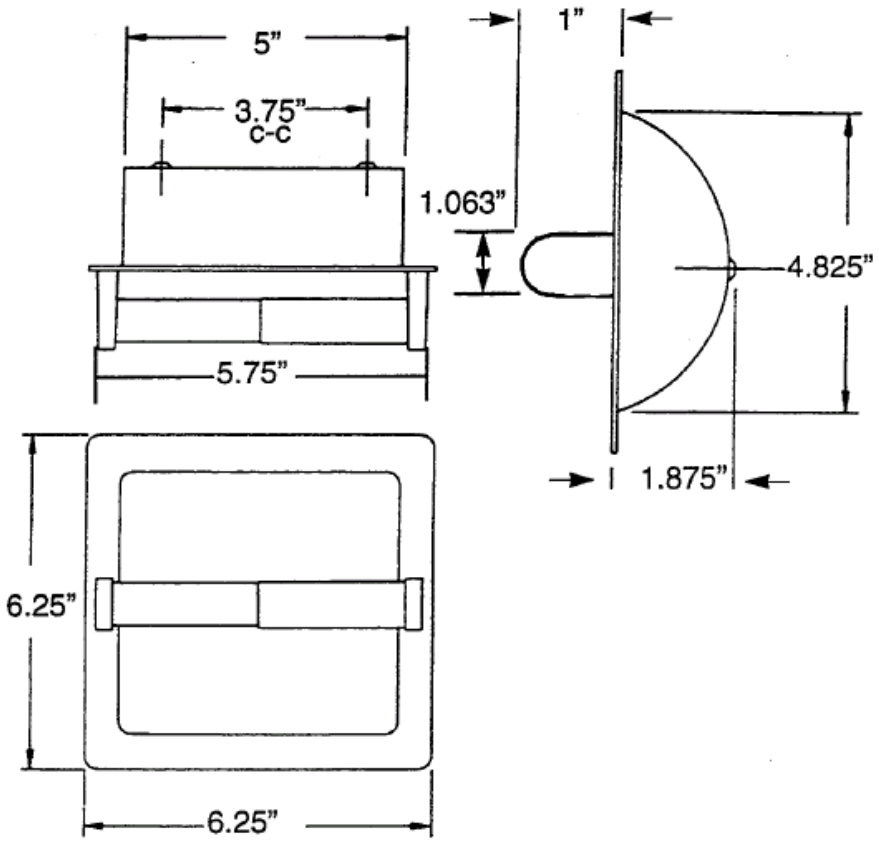
Recessed Fixtures Technical Specification

Recessed Paper Holders 575, 576

Stock Numbers:

- ❑ **575 – Recessed Paper Holder**
  Polished Chrome Finish
  Chrome Roller
- ❑ **576 – Recessed Paper Holder**
  Polished Chrome Finish
  White Roller

Dimensions:



Materials:

Recessed Paper Holder shell is stamped from a special alloy brass strip and finished with a triple plated polished chrome finish with a lacquer coat for added protection. Roller is plastic and spring loaded.

Installation Instructions:

Cut out wall opening 5 ¼" x 5 ¼" x 1 7/8" depth. If wood blocking is available, install recess shell into opening using 1 ¼" screws (provided). If wood blocking is not available, use optional installation clamp: BR587 or 588.

Stock Number:_____Recessed Paper Holder
By Creative Specialties

Creative Specialties® International
a Division of MOEN
Buy it for looks. Buy it for life.®

25300 AL MOEN DRIVE • NORTH OLMSTED, OH 44070
CORPORATE HEADQUARTERS: (800) 321-8809 • FAX: (800) 848-6636
INTERNATIONAL: (440) 962-2000 • FAX: (440) 962-2726
CUSTOMER SERVICE (USA): 800-882-0116 • FAX: (888) 379-2720
WWW.MOEN.COM

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BOBRICK

Technical Data

MIRROR WITH STAINLESS STEEL CHANNEL FRAME

B-165 SERIES



Designer's Notes:

1. Special-order sizes available on request.
2. Maximum size mirror available, 72" x 60" (183 x 152cm); minimum size, 12" x 12" (30 x 30cm).
3. All Bobrick framed mirrors are manufactured to overall width and height dimensions. EXAMPLE: A 24" x 36" (61 x 91cm) mirror will be furnished 24" x 36" (61 x 91cm) outside-of-frame to outside-of-frame.
4. To specify special sizes use Series Number followed by width then height in inches. EXAMPLE: B-165 2024.
5. Bobrick framed mirrors are manufactured to a tolerance 1/8" (3.2mm).
6. For sufficient space to lift mirror onto wall hanger(s), provide 3-1/4" (85mm) minimum clearance above center line of mounting screw holes.
7. Provide 1" (25mm) minimum clearance at bottom of mirror for engaging locking screws and 1" (25mm) clearance on each side.

Snap Locking Design

(Rear View)

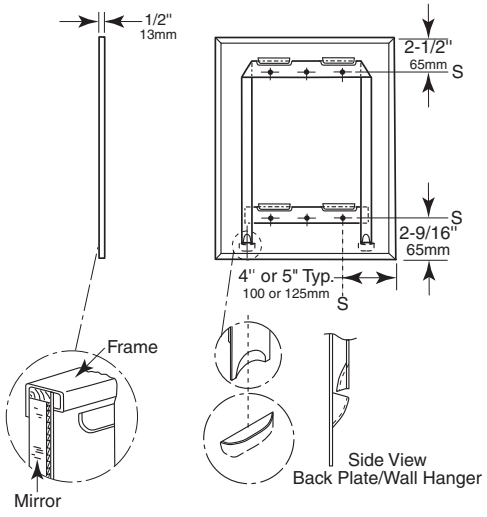


Figure: 1

STANDARD B-165 SERIES MIRRORS

MODEL NO.	OVERALL SIZE W	H
B-165 1824	18" (46cm)	24" (61cm)
B-165 1830	18" (46cm)	30" (76cm)
B-165 1836	18" (46cm)	36" (91cm)
B-165 2436	24" (61cm)	36" (91cm)

Lock Tab Design

(Rear View)

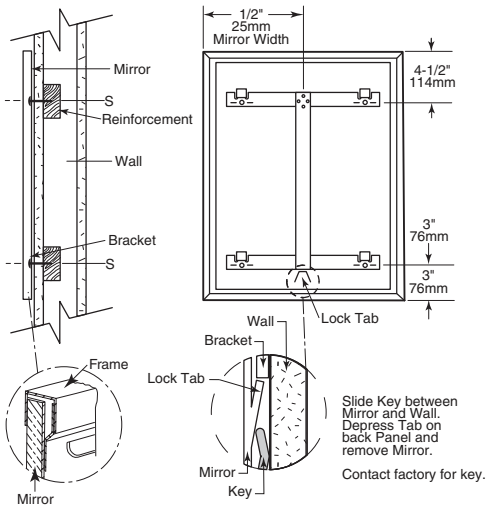


Figure: 2

STANDARD B-165 SERIES MIRRORS

MODEL NO.	OVERALL SIZE W	H
B-165 2448	24" (61cm)	48" (122cm)
B-165 2460	24" (61cm)	60" (152cm)

All Other Size Mirrors

MATERIALS:

Frame — Type-430 stainless steel, 1/2" x 1/2" x 3/8" (13 x 13 x 9.5mm) channel with 1/4" (6mm) return at rear for Snap Locking Design; 1/2" x 1/2" x 1/2" (13 x 13 x 13mm) channel for Lock Tab Design, with bright polished finish. One piece frame with 90 degree mitered corners. Galvanized steel back has integral horizontal hanging brackets near the top for hanging the mirror and near the bottom to prevent the bottom of the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger.

Mirror — No. 1 quality, 1/4" (6mm) select float glass: selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. Back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, polyethylene padding.

Concealed Wall Hanger — Fabricated of galvanized steel. Incorporates lower support member, which engages lower backplate louvers to keep bottom of mirror against wall.

continued . . .

The illustrations and descriptions herein are applicable to production as of the date of this Technical Data Sheet.
The manufacturer reserves the right to, and does from time to time, make changes and improvements in designs and dimensions.

Rev. 3/6/15 R/B Printed in U.S.A.
© 2015 by Bobrick Washroom Equipment, Inc.

INSTALLATION:

Mount wall hanger on wall with screws (not furnished) at points indicated by an *S*. For plaster or dry wall construction, provide backing to comply with local building codes, then secure wall hanger with screws (not furnished). When providing a concealed backing, allow backing to cover minimum range of mounting hole locations shown on drawing. For other wall surfaces, provide fiber plugs or expansion shields for use with screws (not furnished), or provide 1/8" (3mm) toggle bolts or expansion bolts. Hang mirror on wall hanger with all four backplate louvers engaged behind horizontal wall hanger members. Hang mirror on wall hanger with all four backplate louvers engaged behind horizontal wall hanger members. To do this, mirror must be centered in front of the wall hanger horizontally, pressed flat against the wall approximately 1" (25mm) above final position and then lowered into final position.

Snap Locking Design — Locking devices automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 4). Locking devices may be unlocked by inserting two flat blade screwdrivers behind each side of mirror near the bottom or under the bottom of the mirror and pulling mirror bottom forward and then up.

Lock Tab Design — Locking device automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 5). Locking device may be unlocked by sliding Key between mirror and wall and depressing tab on back panel. If key is required, please the factory.

Snap Locking Design

(Front View)

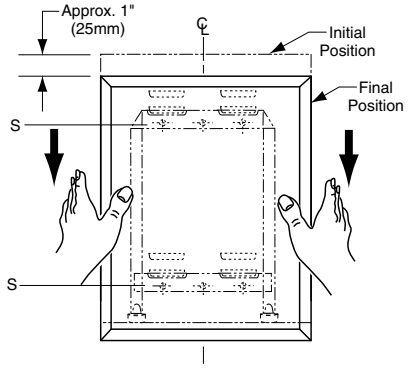


Figure: 4

Lock Tab Design

(Front View)

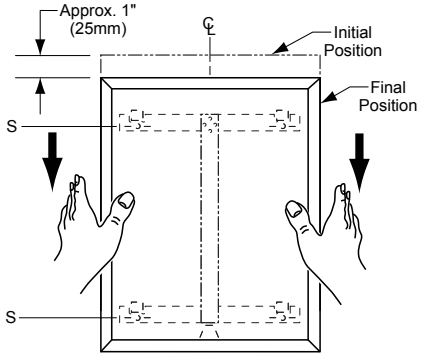


Figure: 5

SPECIFICATION:

Mirror shall have a one-piece type-430 stainless steel channel frame, with 90° mitered corners; all exposed surfaces shall have bright polished finish. Select float glass mirror shall be guaranteed for 15 years against silver spoilage. The back shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top and bottom for mounting on concealed wall hanger to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. Mirror shall be removable from the wall.

Framed Mirror shall be Model B-165 _____ (insert width and height) 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.

The illustrations and descriptions herein are applicable to production as of the date of this Technical Data Sheet.
The manufacturer reserves the right to, and does from time to time, make changes and improvements in designs and dimensions.

B-165 Rev. 3/6/15 R/B Printed in U.S.A.
© 2015 by Bobrick Washroom Equipment, Inc.

8736 or 8748

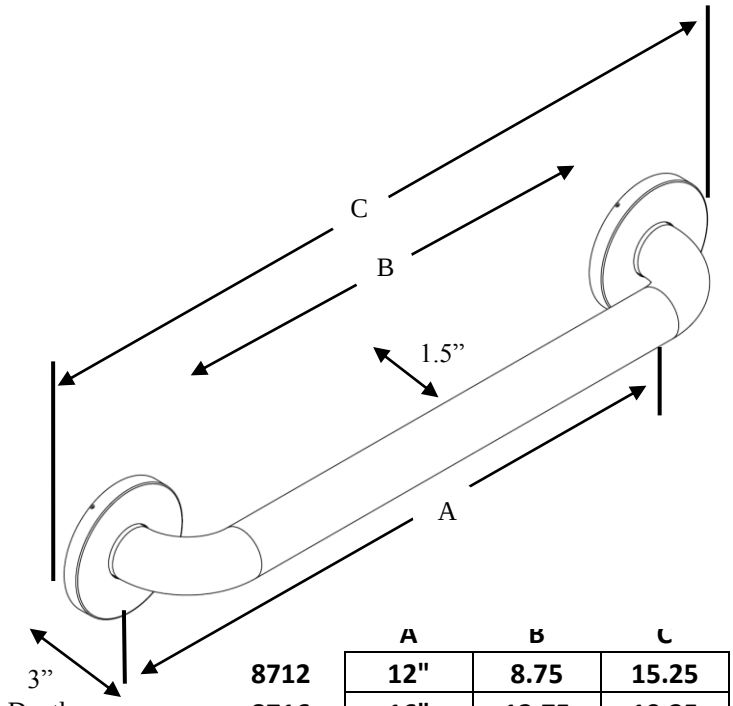
Home Care Technical Specification

1 ¼” Grab Bars – Concealed Screw 8700

Stock Numbers:

- **R8712W, DN8712, LR8712W – 12” Grab Bar**
  Stainless Steel or White Finish, 1 ¼” Bar
- **8716, R8716W, LR8716W – 16” Grab Bar**
  Stainless Steel or White Finish, 1 ¼” Bar
- **8718, L8718, R8718PS, LR8718PS, R8718PB, LR8718W, R8718W – 18” Grab Bar**
  Stainless Steel, Polished Stainless, Polished Brass, or White Finish, 1 ¼” Bar
- **8724, L8724, R8724PS, LR8724PS, LR8724W R8724PB, R8724W – 24” Grab Bar**
  Stainless Steel, Polished Stainless, Polished Brass, or White Finish, 1 ¼” Bar
- **8730, R8730W – 30” Grab Bar**
  Stainless Steel or White, 1 ¼” Bar
- **8732, R8732W – 32” Grab Bar**
  Stainless Steel or White Finish, 1 ¼” Bar
- **R8736PS, R8736W, 8736, L8736–36” Grab Bar**
  Polished Stainless or White Finish, 1 ¼” Bar
- **8742, R8742PS, R8742W, R8748W– 42” Grab Bar**
  Satin or Polished Stainless Finish, White Finish, 1 ¼” Bar
- **8748, R8748W – 48” Grab Bar**
  Satin Finish or White Finish, 1 ¼” Bar

Dimensions:



	A	B	C
8712	12"	8.75	15.25
8716	16"	12.75	19.25
8718	18"	14.75	21.25
8724	24"	20.75	27.25
8730	30"	26.75	33.25
8732	32"	28.75	35.25
8736	36"	32.75	39.25
8742	42"	38.75	45.25
8748	48"	44.75	51.25

Materials:

1 ¼” Grab Bar rods are formed from type 304 stainless steel tubing.
12” – 42” length is 20 gauge
48” length is 18 gauge

Compliance:

- ADA, ANSI, ASTM, CSA
- Tested to 500 lbs. pull

Installation Instructions:

1. Position unit on wall in desired location.
2. Mark mounting holes.
3. Drill starter holes.
4. Mount unit on wall using 2” screws (provided).
5. Snap flange covers into place.

Note: SecureMount Anchors are recommended for use in non-stud (hollow-wall) applications per installation instructions.
(Secure Mount Anchors are sold separately)

Stock Number:_____1 ¼” Grab Bars
By Creative Specialties

MOEN
Buy it for looks. Buy it for life.®

25300 AL MOEN DRIVE • NORTH OLMSTED, OH 44070
CORPORATE HEADQUARTERS: (800) 321-8809 • FAX: (800) 848-6636
INTERNATIONAL: (440) 962-2000 • FAX: (440) 962-2726
CUSTOMER SERVICE (USA): 800-882-0116 • FAX: (888) 379-2720
WWW.MOEN.COM

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XLERATOR® - Surface Mounted - Hand Dryers



XL-BW



XL-W



XL-GR



XL-C



XL-SB



XL-SI

Specifications

Construction

A. Cover shall be one of the following:

1. **Die-cast zinc alloy -** One-piece, heavy-duty, rib-reinforced, lightweight, unbreakable, rustproof and all exposed surfaces shall be bright chrome plated or finished with chip-proof, electrostatically applied epoxy paint.
2. **White BMC -** Thermoset polymer bulk molding compound. Lightweight, temperature resistant, rust-proof and extremely durable.
3. **Stainless Steel -** with a brushed finish.
4. **Special Image-** die-cast zinc alloy cover with protective clear coat applied over high resolution digital image. All covers will be fastened to a wall plate by two chrome plated tamper-proof bolts**.**

B. Hand dryer wall plate shall be equipped with (3) 7/8" (22 mm) diameter holes, one of which shall be suitable for use with surface conduit, for ease of wiring.

C. All internal hand dryer parts shall be coated according to Underwriters' Laboratories, Inc. requirements.

D. Entire mechanism shall be internally grounded.

E. Optional Recess Kit includes a wall box (22 GA) and dryer mounting plate (16 GA) made from 304 brushed stainless steel. A stainless steel cable is connected to the dryer mounting plate to hold the dryer in position when servicing.

Mechanism

A. Hand dryer motor shall be a series commutated through-flow discharge vacuum motor/blower (5/8 HP / 20,000 RPM) which provides air velocity of up to 18,000 LFM (linear feet per minute) at the air outlet and up to 16,000 LFM at the hands (4 inches [102 mm] below air outlet).

B. Hand dryer heating element (900 W) is constructed of Nichrome wire and mounted inside the blower housing, thereby being vandal proof. It shall be protected by an automatic resetting thermostat, which shall open whenever air flow is cut off and shall close when flow of air is resumed. It shall produce an air temperature of up to 135°F (57°C) at a 72°F (22°C) ambient room temperature at the hands (4 inches [102 mm] below air outlet).

C. Hand dryer Control assembly is activated by an infrared optical sensor located next to the air outlet. The dryer shall operate as long as hands are under the air outlet. There is a 35-second lockout feature if hands are not removed.

Underwriters' Laboratories, Inc. Listed

The entire dryer shall be listed under the re-examination service of Underwriters' Laboratories, Inc.

Dryers are available to meet requirements of:

Limited Warranty

The hand dryer shall be guaranteed to be free from defects for a period of five (5) years. Warranty shall include factory performed labor as well as the repair or exchange of defective parts, at manufacturer's option.

XLERATOR® Series - XL-W, XL-BW, XL-GR, XL-C, XL-SB, XL-SI

Model No.	Cover Finish	Mounting	Time Cycle	Dryer Type
XL-W, BW	White	Surface	Automatic	Hand Dryer
XL-GR	Graphite	Surface	Automatic	Hand Dryer
XL-C	Chrome	Surface	Automatic	Hand Dryer
XL-SB	Stainless	~~Surface~~	Automatic	Hand Dryer
XL-SI	Special Image	Surface	Automatic	Hand Dryer

USE RECESS KIT

Suggested Mounting Heights from Floor to Bottom of Dryer				
Men	Women	Teenagers	Children	Handicapped
45” (114 cm.)	43” (109 cm.)	41” (104 cm.)	35” (89 cm.)	37” (94cm.)

Units are Available as Specified In:		
110/120V	12.5 Amp.	60 Hz
208V	7 Amp.	60 Hz
220/240V	6.5 Amp.	50 or 60 HZ
277V	5.5 Amp.	60 Hz
50 Hz units are available for export		

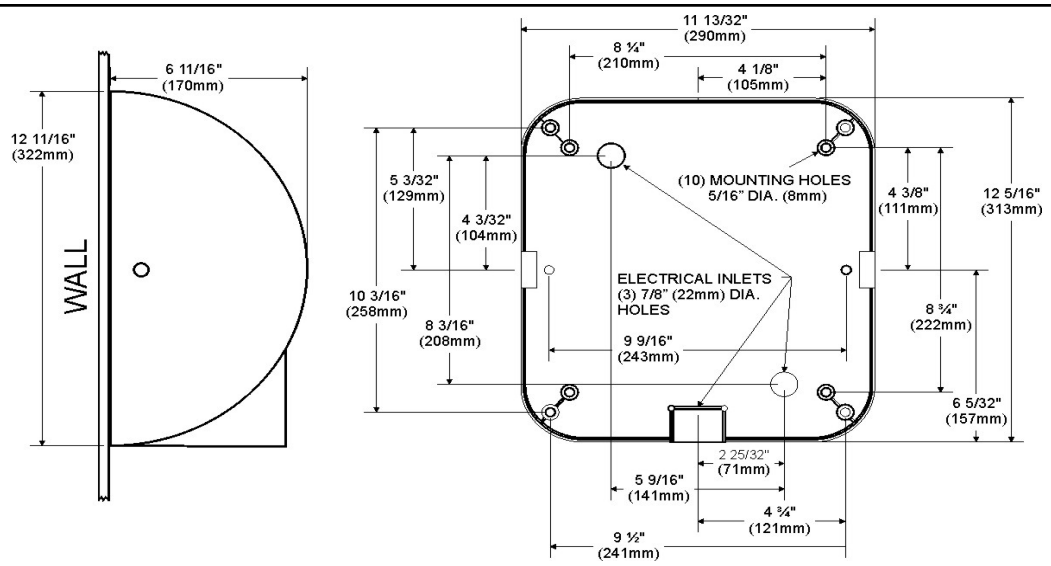
Dimensions / Weight

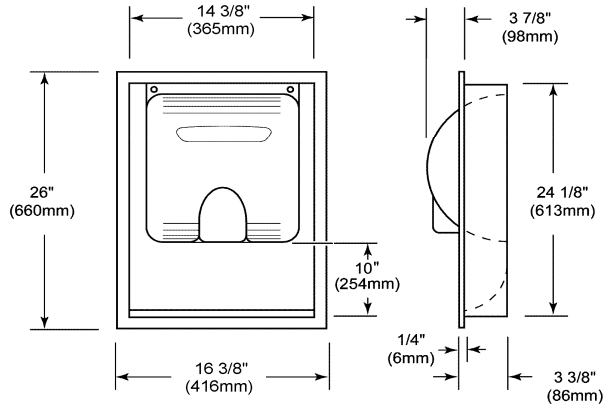
Dimensions:

11 3/4 lg. x 12 11/16" high x 6 11/16" deep (298 mm x 322 mm x 170 mm)

Shipping Weight:

Cast Cover	Stainless Cover	BMC Cover
17 lbs. (7.3 kg)	15 lbs. (6.8 kg)	13 lbs. (5.9 kg)





Recess Kit (#40502) ~~Optional~~ (Meets ADA Requirements)

Dimensions: 16 3/8” wide x 26” high x 3 3/8” deep (416 mm W x 660 mm H x 86 mm D)

Weight: 12 lbs. (5.4 kgs.)

Note: Base of recessed wall box should be 10” (254 mm) below suggested mounting height for dryer (see chart).

Excel Dryer, Inc.
357 Chestnut Street - P. O. Box 365
East Longmeadow, MA 01028 (USA)
Tel - 413.525.4531 Fax - 413.525.2853
Email: admin@exceldryer.com Web: www.exceldryer.com

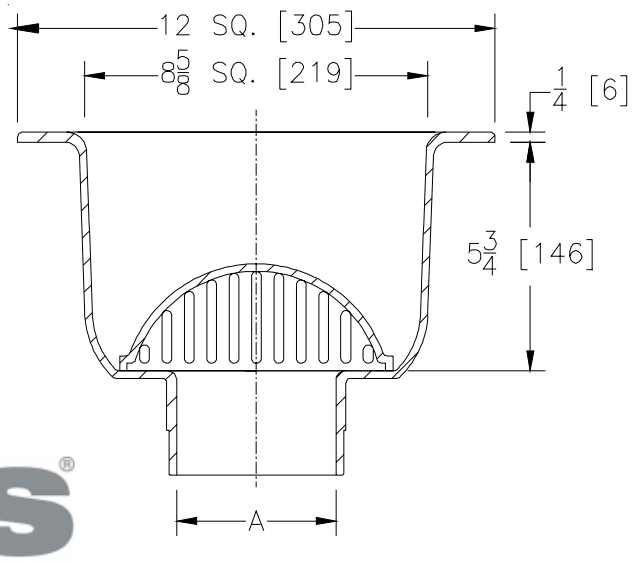
FD2375 12x12 [305x305] A.R.E. Floor Sink 6 [152] Sump Depth

FD2375-NH2

TAG : _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice





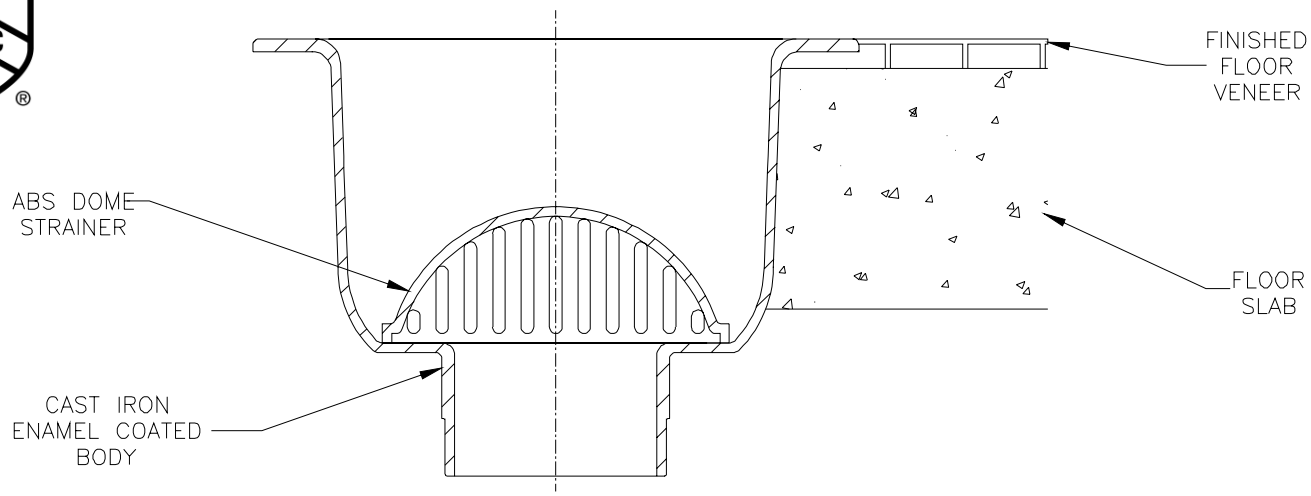
Product	'A' Connections
__FD2375-NH2	2 [51] No-Hub
__FD2375-NH3	3 [76] No-Hub
__FD2375-NH4	4 [102] No-Hub

FD2375 12x12 [305 x 305] A.R.E. Floor Sink 6 [152] Sump Depth
Recommended for sanitary installations. It consists of a cast iron body with a white acid-resisting porcelain enamel interior coating, and an ABS anti-splash dome strainer.

OPTIONS:

____ **-F** Full Grate
____ **-H** 1/2 Grate
____ **-T** 3/4 Grate
____ **-Y** Sediment Bucket

Typical Installation



ZURN LIGHT COMMERCIAL PLUMBING PRODUCTS ♦ 2640 South Work Street ♦ Falconer, NY 14733
Phone: 1-800/906-5060 ♦ Fax: 716/665-3126 ♦ World Wide Web: www.zurn.com

Rev. A **Date**: 5/12/05 **C.N. No.** 93364
Dwg. No. 63768 **Product No**. FD2375

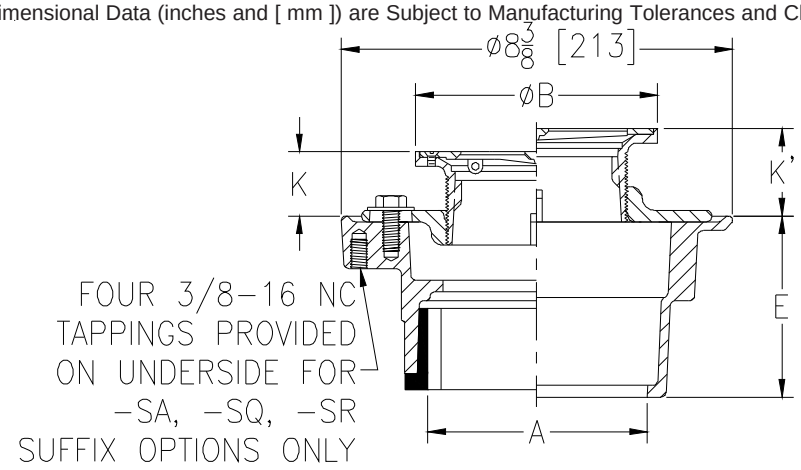
Z415C

BODY ASSEMBLY W/ "TYPE C" STRAINER

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Dimensions In Inches						Approx. Wt. Lbs. [kg]	Strainer Open Area Sq. In. [cm²]
A - Pipe Size	B Strainer Dia.	K		K'			
		Min.	Max.	Min.	Max.		
2-3 [51-76]	5 [127]	1 [25]	1-1/2 [38]	1-3/32 [28]	2-1/4 [57]	11 [5]	8 [52]
2-3-4 [51-76-102]	6 [152]	1 [25]	1-25/32 [45]	1-13/32 [36]	2-17/32 [64]	13 [6]	9 [58]
2-3-4 [51-76-102]	7 [178]	1 [25]	2-1/8 [54]	1-23/32 [44]	2-7/8 [73]	14 [6]	13 [84]
3-4 [76-102]	8 [203]	1-5/32 [29]	2-1/8 [54]	1-3/4 [44]	2-7/8 [73]	16 [7]	18 [116]
6 [152]	8 [203]	1-5/32 [29]	2-1/8 [54]	1-3/4 [44]	2-7/8 [73]	18 [8]	18 [116]

ENGINEERING SPECIFICATION: ZURN ZN415C

Floor and shower drain, Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots and "TYPE C" polished, hinged nickel bronze, light-duty strainer.

OPTIONS (Check/specify appropriate options)

PIPE SIZE	(Specify size/type)	**OUTLET**	**'E' BODY HT. DIM.**
2-3-4 [51-76-102]	____ IC	Inside Caulk	3-7/8 [98]
2-3-4 [51-76-102]	____ IG	Inside Gasket	3-7/8 [98]
2 [51]	____ IP	Threaded	2-3/8 [60]
3 [76]	____ IP	Threaded	2-5/8 [67]
4 [102]	____ IP	Threaded	2-7/8 [73]
6 [152]	____ IP	Threaded	2-3/4 [70]
2-3-4 [51-76-102]	____ NH	No-Hub	3-7/8 [98]
2-3-4 [51-76-102]	____ NL	Neo-Loc	3-3/4 [95]

PREFIXES

____ ZB D.C.C.I. Body Assembly w/ Polished Bronze Top
____ ZN D.C.C.I. Body Assembly w/ Polished Nickel Bronze Top*

SUFFIXES

____ -AR Acid Resisting Epoxy Coated Cast Iron
____ -CP Chrome-Plated Bronze Top
____ -G Galvanized Cast Iron
____ -P Trap Primer Connection (Specify 1/2 [13] or 3/4 [19])
____ -PC Protective Cover
____ -SA Stabilizer Assembly (See Z1035)
____ -SQ Stabilizer Q-Deck (See Z1035-Q)
____ -SR Stabilizer Ring
____ -TC Neo-loc Test Cap Gasket (2 - 4 [51 - 102] NL Bottom Outlet Only)
____ -U 1 - 3 [25 - 76] High Extension Adapter
____ -V Backwater Valve
____ -VP Vandal-Proof Secured Top
____ -Y Sediment Bucket
____ -18 Leveling Ring (See Z400-18)
____ -90 90° Threaded Side Outlet Body Assembly (2 [51], 3 [76] Only)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. L
Date: 05/22/14
C.N. No. 131012
Prod. | Dwg. No. Z415C

T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133-ADF12-B

Item No. 50

This Space for Architect/Engineer Approval

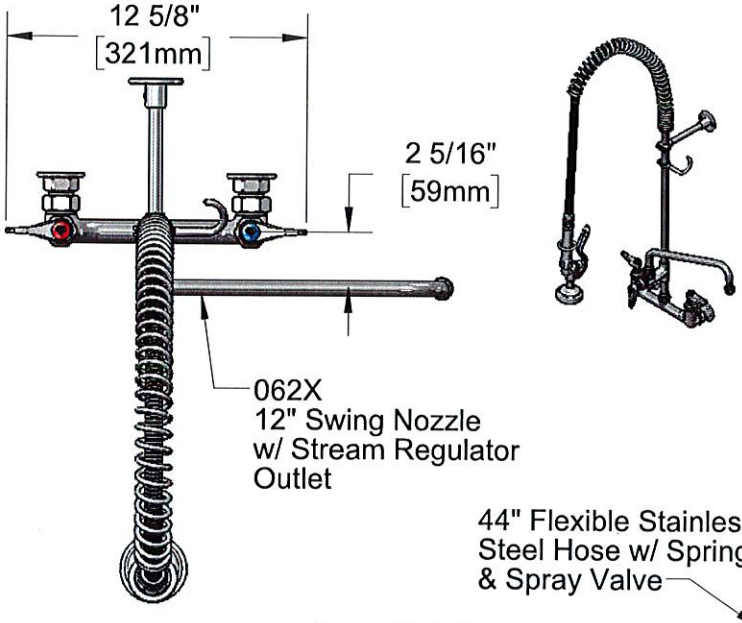
Job Name_____ Date_____

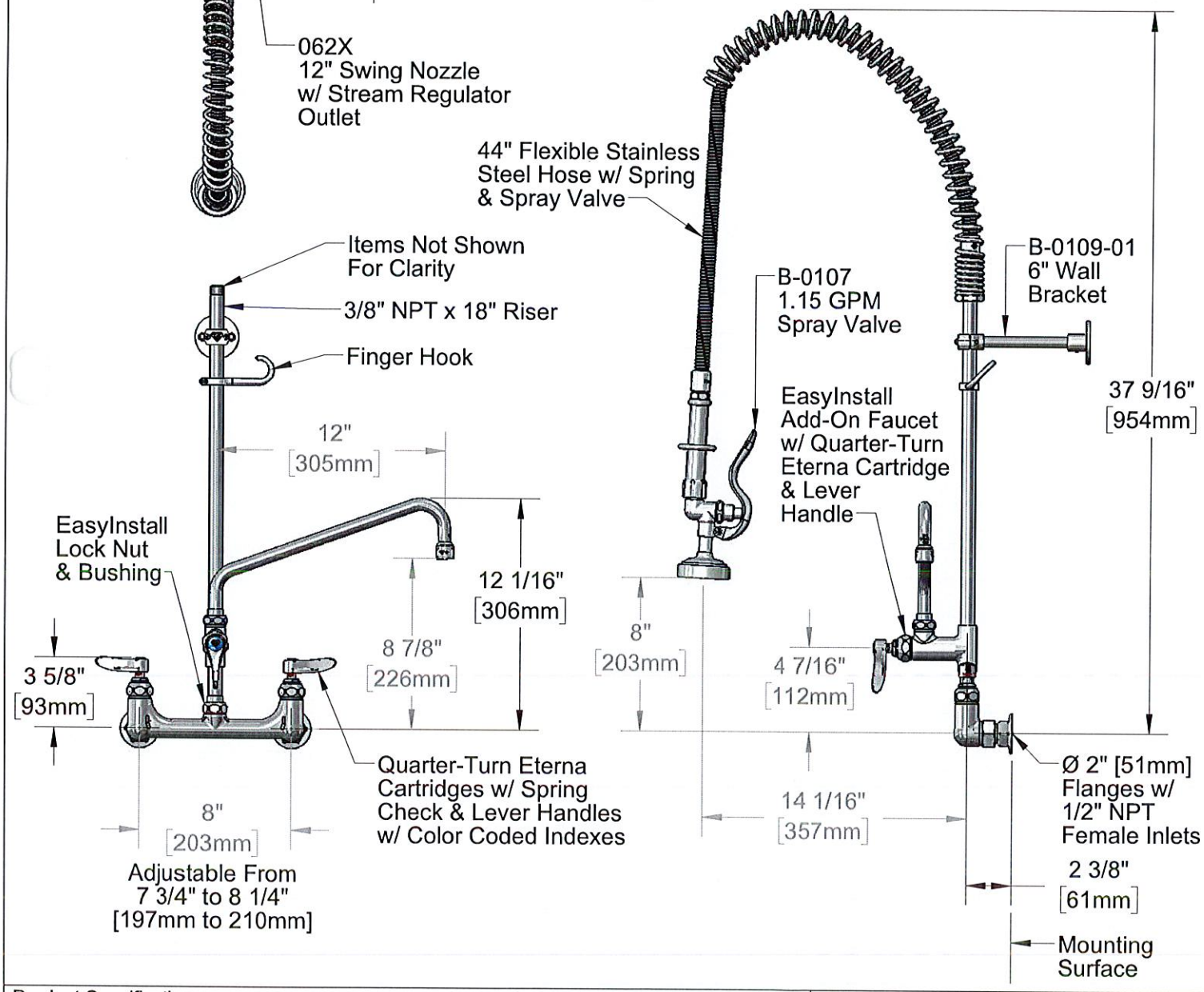
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Product Specifications:

-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn erna Cartridges w/ Spring Checks, Lever Handles, Add-On Faucet, 12" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
AMG	JRM	JHB	10/15/18	1:8	1 of 2

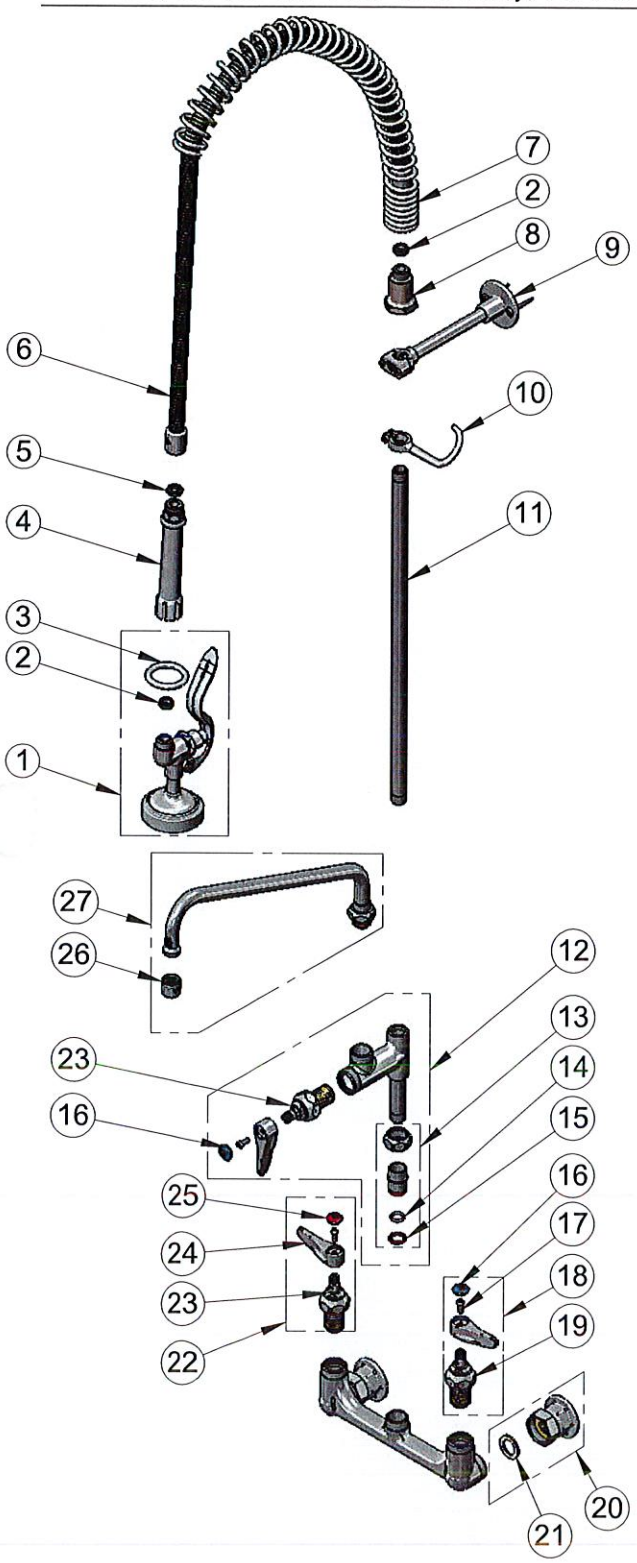
T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

elers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133-ADF12-B

Item No. 150



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107	1.15 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Flexible Stainless Steel Hose, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	B-0109-01	6" Wall Bracket
10	004R	Finger Hook
11	000369-40	3/8" NPT x 18" Riser
12	B-0155-LNEZ	Add-On Faucet w/ Quarter-Turn Eterna Cartridge, RTC & Lever Handle (Less Nozzle)
13	EZ-K	EasyInstall Kit: Nut, Bushing, O-ring & Lock Washer
14	001065-45	O-Ring
15	014200-45	Star Washer, Anti-Rotation
16	018506-19NS	Blue Button Index, Press-in
17	000925-45	Lab Handle Screw
18	002711-40NS	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check, Handle, Index & Screw
19	012442-40NS	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check
20	00AA	1/2" NPT Female Eccentric Flange
21	001019-45	Coupling Nut Washer
22	002712-40NS	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check, Handle, Index & Screw
23	012443-40NS	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check
24	001638-45NS	Lever Handle (New Style)
25	001193-19NS	Red Button Index, Press-in
26	B-PT	Full Flow Stream Regulator, 55/64-27
27	062X	12" Swing Nozzle w/ Stream Regulator Outlet

Product Specifications:
-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn rna Cartridges w/ Spring Checks, Lever Handles, Add-On Faucet, 12" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
AMG	JRM	JHB	10/15/18	NTS	2 of 2

ELKAY®
SPECIFICATIONS

Elkay Outdoor EZH2O Bottle Filling Station Tri-Level Pedestal Non-Filtered Non-Refrigerated
Model LK4430BF1L

PRODUCT SPECIFICATIONS

Elkay Outdoor EZH2O® Bottle Filling Station Tri-Level Pedestal, Non-Filtered Non-Refrigerated. Features shall include 316 Stainless, Laminar Flow, Heavy Duty Vandal Resistant. Furnished with Vandal Resistant bubbler. Mechanical Front Bubbler Button activation. Product shall be Floor Mount/Freestanding, for Outdoor applications, serving 3 station(s). Unit shall be lead-free design which is certified to NSF/ANSI 61 & 372 (lead free) and meets Federal and State low-lead requirements.

Special Features:	316 Stainless, Laminar Flow, Heavy Duty Vandal Resistant
Finish:	Beige (BGE), Black (BK), Blue (BLU), Brown (BRN), Evergreen (EVG), Gray (GRY), Orange (ORN), Powder Coat (12 Color Options) , Purple (PUR), Red (RED), Terracotta (TER), White (WHT), Yellow (YLW)
Power:	No Electrical Required
Bubbler Style:	Vandal Resistant
Activation by:	Mechanical Front Bubbler Button
Mounting Type:	Floor Mount/Freestanding
Chilling Capacity:	Non-refrigerated
Dimensions (L x W x H):	14" x 48" x 52-1/8"
Approx. Shipping Weight:	280 lbs.
Installation Location:	Outdoor
No. of Stations Served:	3

Special Note: Bottle Filler Stations 1 (Low), Bubbler Stations 2 (Upper-Mid), Choose from 12 color options

- Mechanically-Activated bubbler continues to supply water in event of service disruptions.
- Laminar flow provides clean fill with minimal splash.
- Base material constructed from marine-grade 316 stainless steel provides the ultimate corrosion protection from even the most corrosive elements.





AMERICAN PRIDE. A LIFETIME TRADITION.
Like your family, the Elkay family has values and traditions that endure. For almost a century, Elkay has been a family-owned and operated company, providing thousands of jobs that support our families and communities.

Included with Product: **Outdoor Bottle Filler**

Ships in one box.

PRODUCT COMPLIANCE

ADA & ICC A117.1

ASME A112.19.3/CSA B45.4

Buy American Act

GreenSpec®

NSF/ANSI 61 & 372 (lead free)

Complies with ADA & ICC A117.1 accessibility requirements when installed according to the requirements outlined in these standards. Installation may require additional components and/or construction features to be fully compliant. Consult the local Authority Having Jurisdiction if necessary.

Installation Instructions (PDF)

Warranty pertains to drinking water applications only. Non-drinking water applications are not covered under warranty.

Warranty (PDF)

PART:_____QTY: _____

PROJECT:_____

CONTACT:_____

DATE:_____

NOTES:_____

APPROVAL:_____

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

© 2021

Elkay Outdoor EZH2O Bottle Filling Station Tri-Level Pedestal Non-Filtered Non-Refrigerated
Model LK4430BF1L

OPTIONAL ACCESSORIES

LK4471LHB - Locking Hose Bib
97890C - Accessory - Direct Bury Adaptor

MOUNTING INSTRUCTIONS and PLUMBING CONNECTIONS

Provide solid, well-drained surface to mount pedestal fountain (concrete pad recommended) with adequate support (300 lb. load minimum). (6) 3/8" minimum fasteners (not included) should be attached firmly to mounting surface in order to secure unit. (Refer to rough-in diagram)

Locate and install plumbing through ground as required.

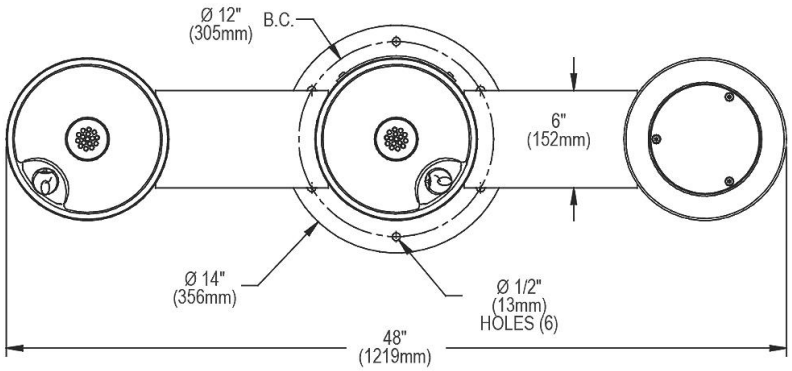
NOTE: Unit is not furnished with service valve.

Position pedestal over plumbing and secure base to fasteners. Remove access panels and connect supply and water lines. Turn on water supply and check for leaks. Reassemble access panels to pedestal.

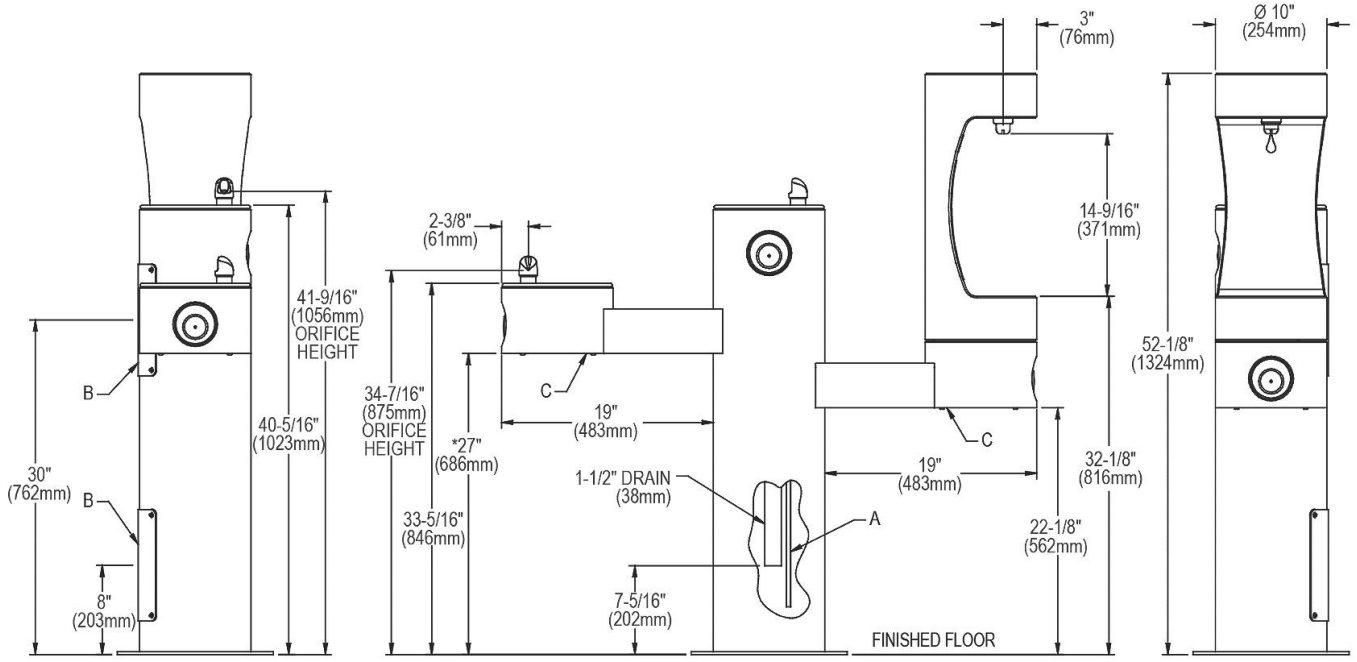
Trap and service stop not included.

OPERATING PRESSURES:
Supply water 20 – 105 psi maximum

TOP VIEW



FRONT VIEW **SIDE VIEW** **BACK VIEW**



A = 3/8" O.D. Unplated copper tube connect. Shut off valve by others.
B = Access panel(8" x 10").
C = Removable bottom cover.

* ADA Requirement

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

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Appendix E

Geotechnical Report

MOORE TWINING ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING AND GEOLOGIC/SEISMIC HAZARD INVESTIGATION PROPOSED 2-STORY MODULAR CLASSROOM BUILDING GAULT ELEMENTARY SCHOOL 1320 SEABRIGHT AVENUE SANTA CRUZ, CALIFORNIA

Project Number: E95810.01

For:

Santa Cruz City Schools
133 Mission Street, Suite 100
Santa Cruz, California 94518

February 12, 2021

www.mooretwining.com
PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.

February 12, 2021 E95810.01

Santa Cruz City Schools
133 Mission Street, Suite 100
Santa Cruz, California 94518

Attention: Mr. Trevor Miller, Director of Facilities

Subject: Geotechnical Engineering and Geologic/Seismic Hazard Investigation
Proposed 2-Story Modular Classroom Building
Gault Elementary School - 1320 Seabright Avenue
Santa Cruz, California

Dear Mr. Miller:

We are pleased to submit this geotechnical engineering and geologic/seismic hazard investigation report prepared for the proposed two-story classroom building at the existing Gault Elementary School in Santa Cruz, California. The contents of this report include the purpose of the investigation, scope of services, background information, investigative procedures, our findings, evaluations, conclusions, and recommendations.

It is recommended that Moore Twining Associates, Inc. (Moore Twining) be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine if they are consistent with our recommendations. This service is not a part of this current contractual agreement, however, the client should provide these documents for our review prior to their issuance for construction bidding purposes.

We recommend that Moore Twining Associates, Inc. (Moore Twining) be retained to review those portions of the plans and specifications that pertain to earthwork, and foundations to determine if they are consistent with our recommendations. This service is not a part of this current contractual agreement, however, the client should provide these documents for our review prior to their issuance for construction bidding purposes.

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

We appreciate the opportunity to be of service to Santa Cruz City Schools. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience at (800) 268-7021.

Sincerely,
MOORE TWINING ASSOCIATES, INC.

Zubair Anwar, RCE
Project Engineer



EXECUTIVE SUMMARY

Moore Twining Associates, Inc. conducted this geotechnical engineering and geologic/seismic hazard investigation for the proposed new classroom building at the existing Gault Elementary School in Santa Cruz, California.

Based on our review of the site plan, it is our understanding that the proposed 2-story classroom building will be of modular construction and will occupy about 4,800 square feet in plan area. The proposed classroom building is planned the northeast portion of the school campus. The proposed building area was occupied by three (3) portable classroom building at the time of this investigation which will be demolished as a part of the site development.

On November 23, 2020, three (3) borings were drilled for the field exploration in the area of the proposed new classroom building. Two (2) borings (B-1 and B-2) were drilled with a CME-75 drill rig to depths of 9 and 8.1 feet below site grades (BSG) where auger refusal was encountered in moderately weathered hard rock. Boring B-3 was drilled in an area not accessible to the drill rig using hand auger equipment to a depth of about 5 feet BSG.

The soils encountered (below the existing pavements) during the field investigation included fill soils consisting of silty sands at boring location B-2 and B-3 to depths of 3½ and 4½ feet BSG, respectively. The native near surface soils encountered below the pavements and fill soils consisted of sandy lean clay and clayey sand to depths of about 5 to 7½ feet BSG. The native soils were underlain by weather rock materials classified as siltstone to the maximum depth explored of about 9 feet BSG.

From a geotechnical and geologic standpoint, the site is suitable for the proposed construction with regard to support of the proposed building addition and improvements, provided the recommendations contained in the report are followed.

As part of the site preparation, in the areas of the proposed improvements, the existing surface and subsurface structures (including foundations, utilities, trees, etc.) will need to be removed and the excavations backfilled with engineered fill. This report includes recommendations for over-excavation of near surface soils to support new foundations on moisture conditioned and compacted subgrade soils in order to reduce the potential for excessive differential settlement.

During our November 23, 2020 field exploration, groundwater was encountered only at boring location B-1 at a depth of 6.05 feet BSG. Groundwater was not encountered in any of the other borings. Due to the presence of shallow rock conditions, the shallow groundwater is anticipated to be in a localized variable perched condition above the relatively less permeable rock and within fractures of the rock throughout the seasons.

Based on our analysis and shallow depth to rock of about 7½ feet BSG, the potential for liquefaction to occur at the site is considered low. The results of the analysis indicate total and differential seismic settlement of ½ inch total and ¼ inch differential in 40 feet.

The results of soil sample analyses indicate that the near-surface soils exhibit a “highly corrosive” corrosion potential to buried metal objects. Chemical analyses indicated a “negligible” potential for sulfate attack on concrete placed in contact with the near surface soils.

This executive summary should not be used for design or construction and should be reviewed in conjunction with the attached report.

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GEOTECHNICAL ENGINEERING AND
GEOLOGIC/SEISMIC HAZARD INVESTIGATION
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

Project Number: E95810.01

1.0 INTRODUCTION

This report presents the results of a geotechnical engineering and geologic/seismic hazard investigation report prepared for the proposed two-story classroom building to be located at the existing Gault Elementary School. Moore Twining Associates, Inc. (Moore Twining) was authorized by Santa Cruz City Schools to conduct this investigation.

The contents of this report include the purpose of the investigation and the scope of services provided. The site history, previous studies, existing site features, and anticipated construction are discussed. In addition, a description of the investigative procedures used and the subsequent findings obtained are presented. Finally, the report provides an evaluation of the findings, an evaluation of geologic and seismic hazards, general conclusions, and related recommendations. The report appendices contain the drawings (Appendix A); the logs of borings (Appendix B); the results of laboratory tests (Appendix C), and liquefaction and seismic settlement calculations (Appendix D).

2.0 PURPOSE AND SCOPE OF INVESTIGATION

2.1 Purpose: The purpose of this investigation was to conduct a field exploration, a laboratory testing program, evaluate the data collected during the field and laboratory portions of the investigation, and provide the following:

2.1.1 A description of general subsurface soil and groundwater conditions encountered;

2.1.2 Descriptions of potential geologic/seismic hazards in accordance with the requirements of the 2019 California Building Code and California Geological Survey – Note No. 48;

2.1.3 Soil profile type, site coefficients and adjusted Maximum Considered Earthquake spectral response acceleration parameters in accordance with the 2019 California Building Code;

2.1.4 Recommendations for earthwork construction, including site and subgrade preparation, and engineered fill;

2.1.5 Recommendations for temporary excavations, utility trench excavation and backfill, and excavation stability;

2.1.6 Geotechnical engineering parameters for use in design of foundations;

2.1.7 Estimates of static and seismic settlement for foundation design;

2.1.8 Recommendations for slab-on-grade floors and exterior concrete flatwork;

2.1.9 Evaluation of soil corrosion potential; and,

2.1.10 Final test boring logs and laboratory results.

This report is provided specifically for the proposed improvements described in the Anticipated Construction section of this report. This investigation did not include in-place density tests, an environmental investigation, or an environmental audit. In addition, this investigation did not include design or recommendations for pavement section recommendations. However, if any significant pavement improvements are planned, Moore Twining should be notified.

2.2 Scope: Our proposal referenced as MTP 20-0919, dated October 16, 2020, outlined the scope of our services. The actions undertaken during the investigation are summarized as follows:

2.2.1 The Schematic Site Plans for the proposed modular building project (Five sheets A1.1 through A1.5C), print dated October 14, 2020, prepared by Bartos Architecture, showing the existing and proposed building improvements, were reviewed.

2.2.2 A visual site reconnaissance and a subsurface exploration program including test borings were conducted.

2.2.3 Laboratory tests were conducted to determine selected physical and engineering properties of the subsurface soils.

2.2.4 Mr. Trevor Miller (Santa Cruz City Schools) and by Mr. Brian Anderson (Bartos Architecture) were consulted during the investigation.

2.2.5 The data obtained from the investigation were evaluated to develop an understanding of the subsurface soil conditions and the engineering properties of the subsurface soils.

2.2.6 This report was prepared to present the purpose and scope, background information, field exploration procedures, findings, evaluation, conclusions, and recommendations.

3.0 BACKGROUND INFORMATION

The site history and previous studies, site description, and the anticipated construction are summarized in the following subsections.

3.1 Site History and Previous Studies: Satellite images of the site from online sources, dating back to 1993, were reviewed. The 1993 satellite image appears to show that the proposed new building area was occupied by several structures that existed prior to the current classrooms. However, due to the poor image resolution of these older images the extent and number of structures (or if these were part of the school) was not clear. Several images of the site from 2002 through 2020 show that the area of the proposed classroom building was generally occupied by the portable classroom and related school improvements observed at the time of our field investigation.

No previous reports of geotechnical engineering investigations, compaction testing or environmental studies conducted for this site were provided for review during this investigation. If available, these reports should be provided for review and consideration for this project.

3.2 Site Description: Gault Elementary School is located at 1320 Seabright Avenue in Santa Cruz, California. The site is located at about 36.976608 degrees latitude and -122.008167 degrees longitude. A site location map is presented on Drawing No. 1 in Appendix A. The site plans depicting the majority of the school campus and the area of the proposed classroom building is included as Drawing No. 2 in Appendix A of this report. The campus is bound to the north by Effey Street, to the west by Seabright Avenue, to the south by Broadway, and to the east by Sumner Street.

The proposed classroom building is planned to be constructed in the northeast portion of the school campus. The proposed classroom building area was occupied by three (3) existing portable classrooms at the time of our field investigation. The area of the proposed classroom building is bordered to the north by a landscape strip with large/mature trees and a sidewalk fronting Effey Avenue beyond, to the east and southeast by two portable classroom buildings to be removed and a sidewalk fronting Sumner Avenue beyond, to the south by exiting flatwork and planter areas with mature trees and portable classroom buildings to remain beyond, and to the west by an access paved driveway and the main school building beyond.

The proposed building area was noted to be occupied three (3) existing portable classrooms to be removed, asphaltic pavements, PCC flatwork walkways and courtyard area. The courtyard area was noted to include planter with trees and concrete flatwork.

A private utility locator was used to identify potential underground utility conflicts in the areas of the pr1oposed boring locations. During this work, underground utilities, such as storm drain, communication and on-site storm drains were marked in the vicinity of proposed building improvement areas. Overhead electrical and communication utilities were noted traversing the central portion of the site. In addition, roof drains which appeared to be connected to an underground stormwater system appear to generally surround the existing building.

Observation of the exterior asphalt pavements and concrete sidewalks around the existing portable classroom structures did not exhibit notable distress indicative of excessive differential settlement. However the aged asphalt pavements did exhibit some cracking from tree root growth and material shrinkage.

According to the USGS 7½-Minute Series Topographic Map (Santa Crux, California), produced by the United States Geological Survey (USGS), dated 1987 (photo revised in 1994), the elevation of the site is about 70 feet above mean sea level (AMSL).

3.3 Anticipated Construction: Based on our review of the site plan, it is our understanding that the proposed 2-story classroom building will occupy about 4,800 square feet in plan area. The plans indicate the building will be of modular construction, so it is expected the structure will be a hybrid steel and wood framed building. It is assumed that the structure would be supported on permanent cast-in-place shallow foundations with a concrete slab-on-grade ground floor. Based on review of the site plan, an elevator and stairways are planned on the south side of the proposed building. The proposed elevator may include an elevator pit, it is anticipated that the elevator pit may extend to a depth of 5 feet below site grade.

Appurtenant construction is anticipated to include concrete walkways, underground utilities, and landscaping.

Foundation loading for the proposed new building was not provided at the time of preparation of this report. However, for design purposes, a maximum column load of 100 kips and wall foundation load of 2 kips per linear foot were assumed for the proposed new classroom building.

Grading plans were not available at the time this report was prepared. However, given the existing surrounding improvements to match with, limited cuts and fills are anticipated to grade the proposed building pad at the subject site.

4.0 INVESTIGATIVE PROCEDURES

The field exploration and laboratory testing program conducted for this investigation are summarized in the following subsections.

4.1 Field Exploration: The field exploration consisted of a site reconnaissance, drilling test borings, soil sampling, and standard penetration tests.

4.1.1 Site Reconnaissance: The site reconnaissance consisted of walking the site and noting visible surface features. The reconnaissance was conducted by a Moore Twining staff geologist on November 23, 2020. The features noted are described in the "Background Information" section of this report.

4.1.2 Drilling Test Borings: The depths of the borings were selected based on the type of construction, the depth of influence of the anticipated foundation loads and the subsurface soil conditions. The locations of the borings were determined by Moore Twining based on the locations of the proposed improvements.

Three (3) borings were drilled for the field exploration. On November 23, 2020, two (2) borings (B-1 and B-2) were drilled in walkway areas with a CME-75 drill rig to depths of 9 and 8.1 feet below site grades (BSG). The borings were terminated before the intended depths (15 and 50 feet BSG) due to auger refusal on moderately weathered hard rock materials. The CME-75 drill rig was equipped with 6⅝-inch outside diameter (O.D.) hollow-stem augers. The approximate locations of the borings are depicted on Drawing No. 2 in Appendix A of this report. Some of the boring locations had to be adjusted in the field due to existing utilities and site constrains.

For supplemental investigation of the center section of the proposed building which was not accessible to our truck mounted drill rig, boring B-3 was drilled in a planter area using hand auger equipment to a depth of about 5 feet below the elevation of the .

The borings were logged by, and drilled under the direction of, a Moore Twining staff geologist. The field soil classification was in accordance with the Unified Soil Classification System and consisted of particle size, color, and other distinguishing features of the soil.

The presence and elevation of free water, if any, in the borings were noted and recorded during drilling and immediately following completion of the test borings.

Test boring locations were determined by pacing with reference to the existing site features and are considered approximate. The approximate locations of the borings are included on Drawing No. 2 in Appendix A. The boreholes were loosely backfilled with material excavated during the drilling operations and the borings drilled in the walkways areas were topped with asphalt cold patch. Due to the loose nature of the test boring backfill, some settlement of the backfill should be anticipated.

4.1.3 Soil Sampling: During drilling of the hollow stem auger borings, standard penetration tests were conducted, and both disturbed and relatively undisturbed soil samples were obtained.

The standard penetration resistance, N-value, is defined as the number of blows required to drive a standard split barrel sampler into the soil. The standard split barrel sampler has a 2-inch O.D. and a 1⅜ inch inside diameter (I.D.). The sampler is driven by a 140-pound weight free falling 30 inches. The sampler is lowered to the bottom of the bore hole and set by driving it an initial 6 inches. It is then driven an additional 12 inches, or portion thereof, and the number of blows required to advance the sampler an additional 12 inches, or portion thereof, is recorded as the N-value.

Relatively undisturbed soil samples for laboratory tests were obtained by pushing or driving a California modified split barrel ring sampler into the soil. The soil was retained in brass rings, 2.5 inches O.D. and 1-inch in height. The lower 6-inch portion of the samples were placed in close-fitting, plastic, airtight containers which, in turn, were placed in cushioned boxes for transport to the laboratory. Soil samples obtained were taken to Moore Twining's laboratory for classification and testing. In addition, bulk samples of soil were obtained for laboratory testing.

4.2 Laboratory Testing: The laboratory testing was programmed to determine selected physical and engineering properties of the soils sampled and tested. The tests were conducted on disturbed and relatively undisturbed samples considered representative of the subsurface materials encountered.

The results of laboratory tests conducted on samples obtained from the test borings are summarized on the figures in Appendix C. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

5.0 FINDINGS AND RESULTS

The findings and results of the field exploration and laboratory testing are summarized in the following subsections.

5.1 Subsurface Profile: The borings were drilled through the existing asphalt concrete walkway areas. The asphaltic concrete pavement thicknesses were measured to be 3.4 and 5.6 inches of AC pavement underlain by 8.8 and 7.0 inches of aggregate base.

Below the aggregate base, fill soils consisting of silty sands were encountered in borings B-2 and B-3 to depths of 3½ and 4½ feet BSG, respectively. Plastic debris was noted in the fill soils at boring location B-3 at a depth of ½ foot BSG.

Below the fill, the native soils encountered consisted of sandy lean clay and clayey sand to depths of about 5 to 7½ feet BSG. These soils are interpreted to be weathered bedrock of the Purisima Formation. The native near surface soils were underlain by siltstone (Purisima Formation) to the maximum depth explored of about 9 feet BSG. At 8 to 9 feet the rock becomes less friable and fractured and could not be penetrated with hollow stem auger drill methods. The rock appears to be consistent with descriptions of the Purisima Formation. The regional geologic map (Drawing No. 3 in Appendix A) indicates that in the area of the site the Purisima Formation is overlain by a relatively thin mantle of Pleistocene terrace deposits (see Section 6.1 of this report) consisting of sands and gravels. Our investigation of the site did not identify these terrace deposits underlying the fill soils on the site.

The foregoing is a general summary of the soil conditions encountered in the test borings drilled for this investigation. Detailed descriptions of the soils encountered at each test boring are presented on the logs of borings in Appendix B. The stratification lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual. A general soil profile is shown on the cross section on Drawing No. 7 in Appendix A of this report.

5.2 Soil Engineering Properties: The following is a description of the soil engineering properties as determined from our field exploration and laboratory testing.

FILL SOILS - Silty Sand [SM]: The fill silty sand soils encountered were described as medium dense, as determined by standard penetration test (SPT), N-value, of 12 blows per foot. The moisture contents of the silty sand fill samples tested ranged from about 10 to 13 percent. An Atterberg limits test indicated the silty sands to be non plastic.

NATIVE - Clayey Sand [SC] (Weathered Purisima Formation): The native clayey sands encountered were described as very loose to very dense, as determined by standard penetration test (SPT), N-values, ranging from of 8 to 48 blows per foot and a California modified sampler corrected for SPT value of 4 blows per foot. The moisture contents of the clayey sand samples tested ranged from about 14 to 25 percent. The moisture contents of the clayey sand samples tested ranged from about 14 to 25 percent. Three (3) relatively undisturbed samples indicated dry densities of 107.1, 108.3, and 112.9 pounds per cubic foot. A consolidation test conducted on a sample collected from boring B-1 at a depth of 2 to 3½ feet BSG indicated about 3.4 percent consolidation under a load of 16 kips per square foot. Upon inundation, the sample did not exhibit any swell or collapse potential**.** An expansion index test conducted on a near surface clayey sand sample indicated an expansion index value of 3. The result of a direct shear test conducted on a sample collected from a depth of 2 to 3½ feet BSG indicated internal angle of friction of 33 degrees with corresponding cohesion value of 10 pounds per square foot.

NATIVE - Sandy Lean Clay [SC] (Weathered Purisima Formation): The native sandy lean clays encountered were described as stiff, as determined by standard penetration test (SPT), N-value, 11 blows per foot. A native sandy lean clay sample tested indicted moisture content of about 19 percent. These soils are

ROCK - Siltstone [Purisima Formation]: The siltstone encountered indicated N-values, determined by standard penetration test (SPT), greater than 50 blows per foot. If considered as a soil, the N-values would identify the material as hard and very dense.

Chemical Tests: The results of chemical tests performed on a near surface soil sample collected from depth of 1 to 5feet BSG from boring B-1 indicated a pH value of 6.5, minimum resistivityvalue of 1,201 ohm-centimeter, less than percent 0.00060 by weight chloride concentration, and less than 0.00060 percent by weight sulfate concentration, respectively.

Loss-on-Ignition (LOI): Two (2) loss-on-ignition tests conducted on samples collected from boring B-1 at depths of 2 to 3½ feet BSG and 3½ to 5 feet BSG indicated LOI values of 0.7 percent and 1.5 percent, respectively.

5.3 Groundwater Conditions: During our November 23, 2020 field exploration, groundwater was encountered only at boring location B-1 at a depth of 6.05 feet BSG (after augers were removed). Groundwater was not encountered in any of the other borings.

Due to the presence of shallow rock (Purisima Formation), the shallow groundwater is anticipated to be in a localized variable perched condition above the relatively less permeable rock and within fractures of the rock throughout the seasons. Based on the shallow depth to rock, the site is not anticipated to be underlain by an unconfined water aquifer. Therefore, a static groundwater depth is not anticipated to occur below the site area.

It should be recognized, that water table elevations fluctuate with time, since they are dependent upon seasonal precipitation, irrigation, land use, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered both during the construction phase and the design life of the project. The evaluation of such factors was beyond the scope of this investigation and report.

6.0 GEOLOGIC AND SEISMIC HAZARDS EVALUATION

6.1 Geomorphic and Geologic Setting: The Santa Cruz area is located in the central portion of the Coast Ranges geomorphic province of California. The Pacific Ocean is located about 1 mile southeast of the site. The province is characterized by northwest trending mountain ranges (elevations of 2,000 to 4,000 and occasionally 6,000 feet above sea level), and valleys. The valleys and ranges are subparallel with the San Andreas Fault, a right lateral strike slip fault and the predominant structural feature in the province extending more than 600 miles from Point Arena to the Gulf of California.

The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary strata. The coastline portion of the Coast Ranges have generally been uplifted, terraced and wave cut. West of the San Andreas Fault the Mesozoic and Cenozoic sedimentary strata are underlain by the Salinian Block, a granitic core.

Regional geologic and site geologic maps are included in Appendix A as Drawing Nos. 3 and 6, respectively, and a geologic (soil profile) cross section through the proposed building footprint is included as Drawing No. 7 in Appendix A of this report.

According to the Geologic Map of Santa Cruz County, compiled by Earl E Brabb (1997), the site is underlain by Pleistocene age “Lowest emergent coastal terrace deposits.” These deposits are described as sands and gravels. The referenced map indicates that the Pliocene and upper Miocene Purisima Formation underlies the coastal terrace deposits. This formation is described as: “Very thick bedded yellowish-gray tuffaceous and diatomaceous siltstone containing thick interbeds of bluish -gray, semi-friable, fine grained andesitic sandstone.” The description of the siltstone portion of the Purisima Formation is consistent with the rock material encountered below the site .

6.2 **Tectonics and Seismicity**: Active and potentially active fault zones are located in Coast Ranges and offshore in the site region. An "active fault" is defined, for the purpose of this evaluation, as a fault that has had surface displacement within the Holocene Epoch (about the last 11,700 years). Potentially active faults also contribute to the seismicity of the site. A widely accepted definition of "potentially active" is a fault that does not show evidence of displacement during the Holocene, but shows evidence of displacement occurring less than 1.6 million years ago (after the beginning of the Pleistocene Epoch). Since the Quaternary Period includes the Holocene and Pleistocene Epochs, Quaternary Faults are those that have documented latest fault displacement within the Holocene or Pleistocene Epochs, undifferentiated. Faults showing evidence of displacement older than 1.6 million years are usually classified as "Pre-Quaternary" and "inactive." Pre-Quaternary faults do not impact the site seismicity.

The site is located in the Salinean Block which is bounded by the active San Andreas Fault Zone to the northeast and the active San Gregorio Fault Zone to the southwest. The Fault Activity Map of California indicates that the nearest active faults to the site is the Monterey Bay fault zone and San Gregorio fault zone, indicated to be about 7½ miles southwest and 10½ miles northeast of the site, respectively. The map also indicates the active San Andreas fault zone and active Zayante fault are located about 10½ and 3.8 miles northeast and east of the site, respectively. The Late Quaternary, potentially active, Ben Lomond fault is located about 1 mile west of the site.

Based on the results of deaggregation of the 2475 year return period event (2 percent probability of exceedance in 50 years), using the United State Geological Survey deaggregation website (https://earthquake.usgs.gov/hazards/interactive/) Dynamic Conterminous U.S. 2014 Edition; the San Andreas fault zone is the predominant contributing source of seismicity for the site area. According to the deaggegation results, the San Gregorio fault zone contributes a lower percentage of the total seismicity of the site area. The Monterey Bay fault zone and numerous gridded point sources account for the majority of the remaining seismicity of the site area. Attributes of the primary faults and fault zones contributing to the site seismicity are provided in the following Table No. 1.

Table No. 1
List of Quaternary Faults Contributing to the Seismicity at the Site

Fault (Rupture Segment)	Predominant Moment Magnitude(s)	Distance to Site (Miles)
San Andreas Fault Zone (Multiple Segments)	7.07-8.01	10.4
San Gregorio Fault Zone (Combined)	7.46	11.5
Monterey Bay Fault Zone (including Tularcitos fault)	7.25	7.3

The site location relative to known nearby fault systems within 100 miles (160 kilometers) is depicted on Drawing No. 4 in Appendix A of this report.

7.0 EVALUATIONS

The data and methodology used to develop conclusions and recommendations for project design and preparation of construction specifications are summarized in the following subsections. The evaluation was based upon the subsurface soil conditions determined from the field exploration and laboratory testing program and our understanding of the proposed construction. The conclusions obtained from the results of our evaluations are described in the Conclusions section of this report.

7.1 Geologic Hazards: The potential geologic hazards of flooding, landslides, and volcanic activity are described in the following subsections.

7.1.1 Flooding: Based on the Flood Insurance Rate Maps distributed by the Federal Emergency Management Agency, the site is located in Zone X. According to Community Panel number 06087C0332E, revised on May 16, 2012, Zone X denotes the site as being in an area of minimal flood hazard.

Documents, such as General Plan Safety Element, directly describing the potential for dam inundation to impact the site area, were not located during our research. According to the document titled: "Dams within Jurisdiction of the State of California," prepared by the Department of Water Resources, 2017, six (6) jurisdictional dams are identified in Santa Cruz County. None of the dams are located near the site. Based on our review of the location of these dams and the associated drainages below the dams, the potential for inundation of the site as a result of dam failure is considered very low.

7.1.2 Landslides: Due to the relatively flat nature of the site, landslide hazard is not anticipated to be a factor for the project. In addition, based on our review of the City of Santa Cruz Local Hazard Mitigation Plan 2012 update, Figure 21 - Potential Slide Threats to Santa Cruz, the subject site is not mapped in a landslide hazard area.

7.1.3 Volcanic Activity: California includes six regions with a history of late Pleistocene volcanic eruptions that are subject to hazards from future eruptions (Miller, 1989). Of these six regions, the Clear Lake Area is the closest region, located about 137 miles north of the site. Based on review of Plate 1 (Miller, 1989), the subject site is not located within any designated volcanic hazard zones (such as flowage, pyroclastic flows, debris flows, or ash fall hazards).

Based on the distance of volcanic hazards from the site, the prospect for volcanic hazards to impact the site during the design life of the facility is considered low.

7.1.4 Conditional Geologic Hazards: Conditional geologic hazards, as identified in section 31 of California Geological Survey Note 48 are discussed in the following subsections.

7.1.4.1 Hazardous Materials: Hazardous materials such as methane gas, hydrogen-sulfide gas and tar seeps are not known to be present in the project area and are not considered to be a concern at the subject site.

7.1.4.2 Radon Gas: Naturally occurring radon gas is known to occur in some areas of California. Radon gas can accumulate in buildings and breathing air with elevated radon concentrations results in an increased risk of developing lung cancer. Radon gas forms from radioactive decay of small amounts of the elements uranium and thorium, naturally present in rocks and soils. Rock types, such as black shales, marine phosphatic rocks, and certain igneous rocks, are associated with relatively higher levels of radon gas than other rock types. These rock types are not known to be present near the ground surface at the project site.

Based on our review of a database maintained by the California Department of Public Health Services (CDPH) on the California Geologic Survey website, the California Indoor Radon Levels Sorted By Zip Code, last updated February 2016, indicates that 3 of the 268 radon tests conducted within the same zip code as the school site reported levels of radon gas exceeding 4 picocuries per liter. The U.S. EPA recommends that individuals avoid long-term exposure to radon concentrations above 4 picocuries per liter.

Considering the geologic conditions of the site area, the referenced data reported by the DHS, and assuming that the building addition will be properly ventilated, it is our opinion that potential hazards associated with radon gas are low.

7.1.4.3 Naturally Occurring Asbestos: Asbestos occurs in soil and rock naturally in certain geologic settings in California. It has been documented that inhalation of asbestos fibers may cause negative health effects. Most commonly, asbestos is associated with serpentinite and partially serpentized ultramafic rocks. Ultramafic rocks are scattered throughout much of the Coast Range region. Review of the referenced Open-File Report 2000-19, titled *"A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos,"* prepared by State of California Department of Conservation, Division of Mines and Geology, dated August, 2000, indicates the closest occurrence of ultramafic rocks is about 13 miles northeast of the site.

Ultramafic rocks were not encountered and are not common to the geologic environment the underlies the site. Based on the cited literature and our site observations, it is our opinion that the potential to encounter surface or near surface naturally occurring asbestos containing rock at the site is low.

7.1.4.4 Hydrocollapse: The near surface native clayey sand soils encountered at the subject site exhibited negligible hydrocollapse potential. Based on the data obtained from this investigation, including laboratory testing and the densities of relatively undisturbed samples, collapsible soils are not anticipated to be a concern for the project.

7.1.4.5 Regional Subsidence: Documents, such as General Plan Safety Element, directly describing the potential for regional subsidence to impact the site area were not located during our research. Based on our understanding of site geologic conditions, and the relatively shallow depth to bedrock, the potential for impacts to the site results from regional subsidence is considered very low.

7.2 Seismic Hazards: The potential for fault ground rupture, seismic groundshaking and seismic coefficients/earthquake spectral response acceleration design values, seiche, tsunamis, and liquefaction and seismic settlement are described in the following subsections.

7.2.1 Active Faulting and Surface Fault Rupture: Earthquakes are caused by the sudden displacement of earth along faults with a consequent release of stored strain energy. The fault slippage can often extend to the ground surface where it manifests in abrupt relative ground displacement across a rupture surface. Damage resulting directly from fault rupture ground displacement occurs only where structures are located astride a rupture surface with relative displacement.

The project site is not located in an Alquist-Priolo Earthquake Fault Zone or a known local earthquake fault rupture hazard zone. The locations of active faults were evaluated using the 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6, prepared by Jennings and Bryant. A map depicting the major active faults in the vicinity of the site is included on Drawing No. 4 in Appendix A of this report.

The Fault Activity Map of California indicates the active faults with surface rupture nearest to the site are Monterey Bay Fault Zone and San Andreas Fault Zone located about 7½ miles southwest and about 10½ miles northeast of the site, respectively. Considering the distance to the nearest known active faults with surface rupture, the potential for surface fault rupture due to a known active fault is considered low.

7.2.2 Groundshaking: For any given earthquake, the rock in the immediate vicinity will respond with a certain maximum acceleration and with a predominant period that depends on the nature of the rock and the source mechanism. Away from the focus of the earthquake, the ground motions begin to attenuate. The way in which the earthquake wave is altered depends to a great degree on source characteristics and to a lesser degree on the travel path.

A summary of our review of historic seismic activity relative to the site is included below.

7.2.2.1 Historic Seismic Activity: The general site region has experienced recurring seismic activity. Based on historical earthquake data obtained from the U.S. Geological Survey's earthquake database system, approximately 466 historical earthquakes with magnitude 4.0 or greater have been recorded from 1900 through February 11, 2020, within about 100 miles of the site. A map showing the location of the project site with relation to the approximate historical earthquake epicenter locations and magnitude category is presented on Drawing No. 5 in Appendix A of this report.

The nearest earthquake event (estimated magnitude of 4.0 and estimated peak ground acceleration at the subject site of 0.158g) found during the search occurred on November 12, 1937, with the epicenter approximately 1.7 miles north of the site. The largest magnitude earthquake identified in the 100 mile radius search was the 8.25 magnitude San Francisco Earthquake which occurred on April 18, 1906 approximately 56½ miles north of the site. The maximum historic peak horizontal ground acceleration of 0.131g was estimated for the subject site and occurred as a result of the San Francisco Earthquake . This analysis was performed using a computer program titled EQSEARCH (1989) with updated earthquake database through the year 2005, by Mr. Thomas Blake with Computer Services & Software, and earthquake data from 2006 to February 11, 2020 obtained from the USGS on-line United States Geological Survey, Search Earthquake Catalog, (https://earthquake.usgs.gov/earthquakes/search/).

7.2.2.2 Design Seismic Ground Motion Parameters and Site Class:
Seismic coefficients and spectral response acceleration values were developed for design of the building and adjacent canopy as required by the 2019 California Building Code (CBC). The CBC methodology for determining design ground motion values is based on U.S Geological Survey seismic hazard maps, which incorporate both probabilistic and deterministic seismic ground motion.

It is our understanding that the 2019 CBC will be used for structural design, and that seismic site coefficients are needed for design. Based on the 2019 CBC, a Site Class D represents the on-site soil conditions which have a estimated weighted average standard penetration resistance, N-value, of greater than 15 and less than 50 blows per foot in the upper 100 feet below site grade.

The recommended seismic coefficient and earthquake spectral response acceleration values for the project site are included in the Foundation Recommendations section of this report. A Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M) of 0.771g was determined for the site using the Ground Motion Parameter Calculator provided by the Structural Engineer's Associates of California (https://seismicmaps.org).

A table providing the recommended seismic coefficients and earthquake spectral response acceleration values for the project site is included in the “Shallow Foundations” recommendations section of this report.

7.2.3 Liquefaction and Seismic Settlement: Liquefaction and seismic settlement are conditions that can occur under seismic shaking from earthquake events. Liquefaction describes a phenomenon in which a saturated, cohesionless soil loses strength during an earthquake as a result of induced shearing strains. Lateral and vertical movements of the soil mass, combined with loss of bearing usually results. Fine, well sorted, loose sand, shallow groundwater conditions, higher intensity earthquakes, and particularly long duration of ground shaking are the requisite conditions for liquefaction.

Based on our review of the City of Santa Cruz Local Hazard Mitigation Plan 2012 update, Figure 6 - Areas in Santa Cruz Potentially Vulnerable to Liquefaction, the subject site is not mapped in a liquefaction hazard zone.

The near surface soils encountered generally consisted of fill soils underlain by native clayey sands extending to depths of about 5 to 7½ feet BSG, which were underlain by native sandy lean clay and Purisima Formation siltstone bedrock to the maximum depth explored of about 9 feet BSG.

During our November 23, 2020 field exploration, groundwater was encountered only at boring location B-1 at a depth of 6.05 feet BSG (after augers were removed). Due to the presence of shallow rock (Purisima Formation), the shallow groundwater is anticipated to be in a localized variable perched condition above the relatively less permeable rock and within fractures of the rock throughout the seasons. Based on the shallow depth to rock, the site is not anticipated to be underlain by an unconfined water aquifer. Therefore, a static groundwater depth is not anticipated to occur below the site area. However, a groundwater depth of 5 feet below site grade was used for liquefaction analysis.

Seismic settlement analysis was conducted using the computer program LIQUEFYPRO by Civiltech. The results of hazard deaggregation analysis (United States Geological Survey deaggregation website https://earthquake.usgs.gov/hazards/interactive/) indicates a magnitude 8.27 earthquake event is the predominant earthquake magnitude contributing to the design seismic ground motion. As indicated in Section 7.2.2.2 of this report, a Maximum Considered Earthquake (geometric mean) peak horizontal ground acceleration of 0.771g was also used for the analysis.

The SPT N-values from boring B-1 were relied upon in the analysis. Soil parameters, such as wet unit weight, N-value, and fines content were input for the soil layers encountered throughout the depths explored (see test boring logs, Appendix B).

Based on our analysis and shallow depth to rock of about 7½ feet BSG, the potential for liquefaction to occur at the site is considered low. The results of the analysis indicate total and differential seismic settlement of ½ inch total and ¼ inch differential in 40 feet. Tabular results of the seismic settlement analyses (spreadsheet) are included in Appendix D.

7.2.4 **Seiches and Tsunamis**: A seiche is a wave generated by the periodic oscillation of a body of water whose period is a function of the resonant characteristics of the containing basin as controlled by its physical dimensions. These periods generally range from a few minutes to an hour or more. The site is not located near large contained bodies of water with characteristics of a basin, so seiches are not considered a significant hazard at the site.

Tsunamis are waves generated in oceans from seismic activity. Based on our review of information provided on the Geographic Information Services (GIS) Department of Santa Cruz County, site is not located in a potential tsunami hazard zone and the nearest mapped zone is about ½ mile east and below the elevation of the campus.

7.3 **Soil Engineering**: The following sections describe potential geotechnical engineering impacts of the project.

7.3.1 **Existing Improvements**: At the time of our field investigation, the proposed classroom building area was occupied by three (3) existing portable classrooms and related site asphalt pavements, landscapes with large/mature trees, and concrete sidewalks.

Numerous existing underground utilities were noted in the building addition area, including water, gas, electric and communications. Removal of the pavements, fill soils, and associated surface and subsurface improvements will be critical to providing adequate and uniform support of the planned foundations and slabs-on-grade. Also the underground utilities to be abandoned should be excavated and entirely removed and not crushed or buried in place. The resulting excavations should be cleaned of all loose, organic or disturbed soils, the exposed native soils should be scarified to a depth of 8 inches then compacted as engineered fill. The excavations should be backfilled with compacted engineered fill.

Some trees are also located in a landscape area adjacent to the building which will need to be removed for the new construction. As part of preparation of the site, the trees, all root structures, organics and loose soils will need to be removed to prepare the building pad area.

As part of site preparation, the existing surface vegetation, organics, trees and all tree roots in excess of ¼ inch in diameter will need to be removed prior to use of the soils as engineered fill. All excavations resulting from removal of trees and root structures should be cleared of all roots and organics prior to compaction of the disturbed soils and backfill of the excavations with engineered fill.

Fill soils consisting of silty sand soils were encountered in a boring to depths of about 4½ feet BSG. Fills soils were not encountered in the boring drilled in the general vicinity of proposed building addition. However, if undocumented fill soils are encountered within the proposed building addition, the fill soils will need to be over excavated from proposed building addition area. Excavations resulting from over-excavation of fill soils should be backfilled with engineered fill in accordance with the recommendations of this report.

7.3.2 **Static Settlements and Bearing Capacity of Shallow Foundations:** The potential for excessive total and differential static settlement of foundations and slabs-on-grade was evaluated for the proposed structures. The increases in effective stress to underlying soils which can occur from new foundations and structures, placement of fill, withdrawal of groundwater, etc. can cause vertical deformation of the soils, which can result in damage to the overlying structures and improvements. The differential component of the settlement is often the most damaging. In addition, the allowable bearing pressures of the soils supporting the foundations should be evaluated for shear/punching type failure of the soils resulting from the imposed foundation loads.

As part of the site preparation, over-excavation is recommended in this report in the area of the proposed building addition to remove loose near surface soils and provide a uniform bearing surface for the new foundations. In addition, over-excavation and placement of engineered fill to support the proposed foundations is recommended to limit static settlements of proposed foundations to 1 inch total and ½ inch differential in 40 feet. The static settlements are based upon a net allowable soil bearing pressure of 2,000 pounds per square foot, for dead-plus-live loads for the proposed building addition foundation.

The net allowable soil bearing pressure is the additional contact pressure at the base of the foundations caused by the structure. The weight of the soil backfill and weight of the footing may be neglected in design. The net allowable soil bearing pressure presented was selected to satisfy both the static settlement criteria and Terzaghi bearing capacity equations for spread foundations. A factor of safety of 3.0 was used to determine the allowable bearing capacity based on Terzaghi equations. The analyses were conducted based on the column and wall loads for the structures noted in the Background Information section of this report. If maximum loads other than those indicated are anticipated, these loads should be provided to Moore Twining to evaluate the anticipated settlements.

7.3.3 Expansive Soils: One of the potential geotechnical hazards evaluated at this site is the expansion potential of the near surface soils. Over time, expansive soils will experience cyclic drying and wetting as the dry and wet seasons pass. Expansive soils experience volumetric changes (shrink/swell) as the moisture content of the clayey soils fluctuate. These shrink/swell cycles can impact foundations and lightly loaded slabs-on-grade when not designed for the anticipated expansive soil pressures. Expansive soils cause more damage to structures, particularly light buildings and pavements, than any other natural hazard, including earthquakes and floods (Jones and Holtz, 1973). Expansion potential may not manifest itself until months or years after construction. The potential for damage to slabs-on-grade and foundations supported on expansive soils can be reduced by placing non-expansive fill underlying foundations and slabs-on-grade.

In evaluation of the potential for expansive soils at the site, expansion index testing was performed on a representative sample of the near surface clayey sand soils which are anticipated to be within the zone of influence of the planned improvements. The expansion index testing was performed in accordance with ASTM D4829 and the results are included in Appendix C of this report. The result of laboratory testing indicated that the near surface clayey sand soils have a low expansion based on expansion index value of 3.

7.3.4 Wet, Unstable Soils: The near surface soils encountered and tested as part of this investigation ranged from 10 to 25 percent in moisture and are considered overly moist to obtain compaction. In addition, due to the high moisture contents, stabilization of the bottom of excavations for new building additions and excavations for underground utility trenches, pavements, etc. Therefore, contractors should anticipate special stabilization measures (i.e., placement of geotextile fabric and rock, chemical treatment, etc.) will be needed due to these conditions. In

addition, due to the overly moist soil conditions, aeration, or importing drier soils should be anticipated to achieve soil moisture contents suitable for compaction as engineered fill.

7.3.5 Soil Corrosion: The risk of corrosion of construction materials relates to the potential for soil-induced chemical reaction. Corrosion is a naturally occurring process whereby the surface of a metallic structure is oxidized or reduced to a corrosion product such as iron oxide (i.e., rust). The metallic surface is attacked through the migration of ions and loses its original strength by the thinning of the member.

Soils make up a complex environment for potential metallic corrosion. The corrosion potential of a soil depends on numerous factors including soil resistivity, texture, acidity, field moisture and chemical concentrations. In order to evaluate the potential for corrosion of metallic objects in contact with the onsite soils, chemical testing of soil samples was performed by Moore Twining as part of this report. The test results are included in Appendix C of this report. Conclusions regarding the corrosion potential of the soils tested are included in the Conclusions section of this report based on the National Association of Corrosion Engineers (NACE) corrosion severity ratings listed in Table No. 2, below.

Table No. 2

Soil Resistivity (ohm cm)	Corrosion Potential Rating
>20,000	Essentially non-corrosive
10,000 - 20,000	Mildly corrosive
5,000 - 10,000	Moderately corrosive
3,000 - 5,000	Corrosive
1,000 - 3,000	Highly corrosive
<1,000	Extremely corrosive

The results of soil sample analyses indicate that the near-surface soils exhibit a “highly corrosive” corrosion potential to buried metal objects. Appropriate corrosion protection should be provided for buried improvements based on the “highly corrosive” corrosion potential of the soils tested. If piping or concrete are placed in contact with imported soils, these soils should be analyzed to evaluate the corrosion potential of these soils.

The soil corrosion data should be provided to the manufacturers or suppliers of materials that will be in contact with soils (pipes or ferrous metal objects, etc.) to provide assistance in selecting the protection and materials for the proposed products or materials. If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional

consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to provide design parameters. Moore Twining does not provide corrosion engineering services.

7.3.6 Sulfate Attack of Concrete: Degradation of concrete in contact with soils due to sulfate attack involves complex physical and chemical processes. When sulfate attack occurs, these processes can reduce the durability of concrete by altering the chemical and microstructural nature of the cement paste. Sulfate attack is dependent on a variety of conditions including concrete quality, exposure to sulfates in soil/groundwater and environmental factors. The standard practice for geotechnical engineers in evaluation of the soils anticipated to be in contact with concrete is to perform testing to determine the sulfates present in the soils. The test results are then compared with the provisions of ACI 318, section 4.3 to provide guidelines for concrete exposed to sulfate-containing solutions. Common methods used to resist the potential for degradation of concrete due to sulfate attack from soils include, but are not limited to the use of sulfate-resisting cements, air-entrainment and reduced water to cement ratios.

8.0 CONCLUSIONS

Based on the data collected during the field exploration and laboratory testing programs, our geotechnical experience in the vicinity of the project site, and our understanding of the anticipated construction, the following general conclusions are presented.

8.1 The site is considered geotechnically and geologically suitable for support of the proposed improvements, provided the recommendations contained in this report are followed. It should be noted that the recommended design consultation and construction monitoring by Moore Twining are integral to this conclusion.

8.2 Fill soils consisting of silty sands were encountered in boring B-2 and B-3 to a depth of 3½ and 4 ½ feet BSG, respectively. The native near surface soils encountered below the pavements and fill soils consisted of sandy lean clay and clayey sand ands to depths of about 5 to 7½ feet BSG. The native near surface soils were underlain by siltstone rock to the maximum depth explored of about 9 feet BSG.

8.3 During our November 23, 2020 field exploration, groundwater was encountered only at boring location B-1 at a depth of 6.05 feet BSG. Groundwater was not encountered in any of the other borings. Due to the presence of shallow rock conditions, the shallow groundwater is anticipated to be in a localized variable perched condition above the relatively less permeable rock and within fractures of the rock throughout the seasons.

8.4 Due to the depth of groundwater, the cohesive clayey nature of most of the soils encountered, and the relatively shallow depth to rock indicate the classroom site is not susceptible to liquefaction. Refer to the discussion in Section 7.2.3 of this report for analysis details. Therefore, potential for liquefaction to occur at the site is considered low. In addition, due to limited thickness of the near surface soils, significant seismic settlement is not anticipated. However, for the purpose of design,

it is recommended to consider a potential seismic settlement of ½ inch total and ¼ inch differential in 40 feet.

8.5 The near surface clayey sand soils encountered are considered to have very low expansive potential.

8.6 As part of the site preparation, the existing surface and subsurface improvements (including foundations, utilities, trees, etc.) and associated fill soils will need to be removed and the excavations backfilled with engineered fill. In order to reduce the potential for excessive differential foundation settlement, this report includes recommendations for over-excavation of the near surface soils for support new foundations on moisture conditioned engineered fill in order to limit static settlements to 1 inch total and ½ inch differential in 40 feet. The static settlements for the building addition are based upon a net allowable soil bearing pressure of 2,000 pounds per square foot, for dead-plus-live loads.

8.7 The results of soil sample analyses indicate that the near-surface soils exhibit a "highly corrosive" corrosion potential to buried metal objects. Chemical analyses indicated a "negligible" potential for sulfate attack on concrete placed in contact with the near surface soils.

9.0 RECOMMENDATIONS

Based on the evaluation of the field and laboratory data and our geotechnical experience in the vicinity of the project, we present the following recommendations for use in the project design and construction. However, this report should be considered in its entirety. When applying the recommendations for design, the background information, procedures used, findings, evaluation, and conclusions should be considered. The recommended design consultation and observation of clearing, demolition activities and earthwork operations by Moore Twining are integral to the proper application of the recommendations.

Where the requirements of a governing agency or utility agency differ from the recommendations of this report, the more stringent recommendations should be applied to the project.

9.1 General

9.1.1 At the time this report was prepared and completed, structural load information had not been provided. So the foundations loads for the proposed structure were assumed based on the reported structure type (See anticipated construction). Moore Twining should be provided with the actual foundation loads and foundation plans for review, when available.

Additional or alternative recommendations may be warranted based on review of the foundation plans.

9.1.2 Moore Twining should be retained to review the final grading and foundation plans before the plans are released for bidding purposes so that any relevant recommendations can be presented. If the proposed foundation loading or the planned construction is different from that described in the Anticipated Construction section of this report, the recommendations in this report may not be appropriate. Moore Twining should be notified and requested to provide supplemental recommendations for the proposed construction if changes are planned.

9.1.3 A preconstruction meeting including, as a minimum, the owner, architect, general Contractor, earthwork, foundation subcontractors, and Moore Twining should be scheduled by the general Contractor at least one week prior to the start of clearing and grubbing. The purpose of the meeting should be to discuss critical project issues, concerns and scheduling.

9.1.4 Contractor(s) bidding on this project should determine if the data are sufficient for accurate bid purposes. If the data are not sufficient, the Contractor should conduct, or retain a qualified geotechnical engineer to conduct, supplemental studies and collect more data as required to prepare accurate bids.

9.1.5 All wells encountered (if any) should be abandoned per state and local requirements. The contractor should obtain an abandonment permit from the local environmental health department, and issue certificates of destruction to the owner upon completion.

9.1.6 Contractors should also be aware that wet soils are anticipated that will likely be significantly above the optimum moisture content required for proper compaction and could require soil drying or chemical treatment for stabilization to achieve the required relative compaction. Methods such as aeration, mixing wet soils with drier soils, chemical (i.e., cement) treatment of the soil, or over-excavation of an additional depth of 12 inches and placement of a bridge lift of aggregate base and a geotextile stabilization fabric such as Mirafi 600X, may be required to achieve a stable soil condition. The actual method employed to stabilize the bottom of the excavation or pavement subgrade should be selected at the time of construction. All stabilization of wet soils should be conducted in accordance with the project specifications.

9.1.7 A demolition plan should be prepared to identify existing improvements such existing storm drain facilities, underground utilities, buildings, flatwork,

pavements and trees, that are to be demolished and/or removed as part of the project.

9.2 Site Grading and Drainage

9.2.1 It is critical to develop and maintain site grades which will drain surface and roof runoff away from foundations and floor slabs - both during and after construction. Adjacent exterior finished grades should be sloped a minimum of five (5) percent for a distance of at least ten (10) feet away from the structure, or as necessary to preclude ponding of water adjacent to foundations, whichever is more stringent. Hardscapes may be sloped at a minimum of two (2) percent.

9.2.2 Surface grades should be designed so that surface water drains positively away from the building foundations. Surface water must not be allowed to pond adjacent to the building foundations. To reduce the potential for negative drainage, it is recommended to provide rain gutters and direct all water from roof drains into closed conduits that are connected to an acceptable discharge area away from the building foundations, upon an impervious surface that will direct water away into a storm drain, or directly into the site storm drain system.

9.2.3 It is recommended that landscaped, planted areas, etc. not be placed directly adjacent to the building foundations. Trees should be setback from proposed structures at least 10 feet or a distance equal to the anticipated drip line radius of the mature tree. For example, if a tree has an anticipated drip-line diameter of 30 feet, the tree should be planted at least 15 feet away (radius) from proposed or existing buildings.

9.2.4 Landscape and planter areas should be irrigated using low flow irrigation (such as drip, bubblers or mist type emitters). The use of plants with minimal water requirements are recommended.

9.2.5 In the event subsurface storm water infiltration or treatment systems, bioswales or similar designs are planned, the proposed locations and details of these features should be provided to Moore Twining for review and comment. If these types of features are required, sufficient setbacks to existing improvements should be maintained, and/or specific measures such as deepened curbs, cutoffs, liners, etc. should be incorporated in the designs

to reduce the potential for excessive settlement of improvements due to moisture and freewater migration from storm water systems.

9.3 Site Preparation

9.3.1 All topsoil, vegetation, organics, and debris should be removed from all areas of the planned improvements. The general depth of stripping should be sufficiently deep to remove all root systems and soils with organic contents of more than 3 percent by dry weight. The surface organic cover should not be disced into the soils. The actual depth of stripping should be reviewed by Moore Twining at the time of construction. Stripping should extend laterally a minimum of 5 feet outside the limits of the new improvements (i.e., proposed building, slabs-on-grade, etc.). These materials will not be suitable for use as engineered fill; however, stripped topsoil may be stockpiled and reused in landscape areas at the discretion of the owner.

9.3.2 Excavation of tree roots should be conducted as necessary to remove all root systems greater than about ¼ inch in diameter from the areas of proposed improvements. Soils containing organic matter such as root clumps, roots exceeding ¼ inch in diameter, with organic contents above 3 percent should be completely removed and not used as engineered fill. After removal of the roots and organics, the bottom of the excavation should be scarified to a minimum depth of 8 inches and compacted as engineered fill prior to backfilling operations. Areas of depressions should be excavated and backfilled with engineered fill under the observation of Moore Twining.

9.3.3 As part of site preparation, the existing surface and subsurface improvements and all soils disturbed as a result of the demolition and removal of existing improvements should be removed. Existing improvements to be removed should include existing pavements, underground utilities (including storm drains), subsurface structures and all associated bedding and backfill soils. The resulting excavations should be cleaned of all backfill and organic material, the exposed undisturbed native soils should then be scarified to a depth of 8-inches, moisture conditioned, then compacted as engineered fill, and the excavation backfilled with engineered fill.

9.3.4 Excavations adjacent to existing slabs and foundations could undermine foundation support and damage existing adjacent improvements which are to remain. The existing portable structures should be protected appropriately. The contractor should determine the requirements for shoring, underpinning, etc. based on the recommendations of this report and the requirements of the plans and specifications. In no case should the existing portable classroom foundations to remain be undermined. Thus, shoring or underpinning of the existing foundations directly adjacent to excavations should be conducted

where excavations must extend below a zone defined by a 1.5 horizontal to 1 vertical line that extends downward from the top of the existing foundations and slabs to remain. As an alternative, it may be possible to conduct the excavations adjacent to the existing structure using alternating slot cuts.

9.3.5 **Proposed Building** After removal of existing surface and subsurface improvements, new classroom building area should be prepared by excavation to the depth required to remove loose soils associated with demolition and expose undisturbed soils, to meet the following criteria whichever is deeper:
- to a minium depth of 3½ feet below existing site grade,
- to the depth required to remove fill soils (encountered to a depth of 4½ feet BSG in boring B-3),
- to the depth required to remove existing improvements (such as utilities, if encountered), or
- to 12 inches below the bottom of the new foundations.

9.3.6 **Proposed Elevator Pit:** After removal of existing surface and subsurface improvements, the elevator pit foundation should be prepared by excavation to the depth required to remove loose soils associated with demolition and expose undisturbed soils, any fill soils (fill soils encountered to a depth of 4½ feet BSG in boring B-3), to the depth required to remove existing improvements (such as utilities, if encountered), or to 12 inches below the bottom of the elevator pit foundation, whichever is deeper. If unstable soil conditions are experienced, the bottom of the over-excavation should be stabilized by placement of a geotextile fabric and aggregate base, crushed rock encapsulated in a geotextile fabric, or chemical treatment of soils. If aggregate base or crushed rock encapsulated in fabric is used for stabilization, deeper over-excavation should be conducted such that the rock/base section can be placed and stable conditions achieved at the minimum over-excavation depth specified above. The resulting excavation should then be backfilled to finished grades with engineered fill. After approval of the bottom of the excavation by Moore Twining, the bottom of the over-excavation should be compacted to a firm condition prior to placement of fill up to the bottom of the foundation.

9.3.7 After the over-excavation has been conducted and all disturbed soils have been removed as verified by a representative of Moore Twining, the exposed bottom of the excavation should be scarified to a minimum of 8 inches, moisture conditioned to between 1 and 4 percent above optimum moisture content and compacted as engineered fill. Once a stable, moisture conditioned and compacted subgrade is achieved, the excavation should be backfilled as an engineered fill.

9.3.8 Soils that will likely to be significantly above the optimum moisture content required for proper compaction are anticipated at the bottom of over-excavation, the bottom of the over-excavation should be stabilized by placement of a geotextile fabric and aggregate base, crushed rock encapsulated in a geotextile fabric, or chemical treatment of soils. If aggregate base or crushed rock encapsulated in fabric is used for stabilization, deeper over-excavation should be conducted such that the rock/base section can be placed and stable conditions achieved at the minimum over-excavation depth specified above.

9.3.9 The zone of over-excavation should extend to a relatively uniform depth throughout the entire building area and all areas of foundations, and to a distance of 5 feet beyond the edges of all foundations and/or 5 feet beyond perimeter stair or second floor walkway structures.

9.3.10 It is recommended that extra care be taken by the contractor to ensure that the horizontal and vertical extent of the over-excavation and compaction conform to the site preparation recommendations presented in this report. Moore Twining is not responsible for measuring and verifying the horizontal and vertical extent of over-excavation and compaction. The contractor should verify in writing based on survey data of the "as-built" excavation from a licensed surveyor that the horizontal and vertical over-excavation limits were completed in conformance with the recommendations of this report, the project plans, and the specifications (the most stringent applies). The verification should be performed by a licensed surveyor hired by the contractor. It is recommended the survey data be provided to Moore Twining for review and the data confirmed to meet project requirements prior to placement of fill in the excavated areas.

9.3.11 Structural loads for miscellaneous, lightly loaded (less than 1 kip per lineal foot) foundations such as for new screen walls and retaining walls less than 5 feet in height may be supported on subgrade soils prepared by over-excavation to the bottom of proposed footings, to a depth of at least 24 inches below preconstruction site grades, to at least 12 inches below subsurface structures to be removed (if any), and to the depth required to remove all undocumented fill soils, whichever is deeper. The zone of engineered fill should extend horizontally beyond the edge of foundations by a distance equal to the depth of fill below foundations. Upon approval of the over-excavation limits by Moore Twining, the soils at the bottom of the excavation should be scarified to a minimum depth of 8 inches, moisture conditioned and compacted as engineered fill. If unstable soil conditions are experienced, the bottom of the over-excavation should be stabilized by placement of a geotextile fabric and aggregate base, crushed rock encapsulated in a

geotextile fabric, or chemical treatment of soils. If aggregate base or crushed rock encapsulated in fabric is used for stabilization, deeper over-excavation should be conducted such that the rock/base section can be placed and stable conditions achieved at the minimum over-excavation depth specified above. The resulting excavation should then be backfilled to finished grades with engineered fill. The resulting excavation should be backfilled to finished grades with engineered fill.

9.3.12 All fill required to bring the site to final grades should be placed as engineered fill. In addition, all areas which are over-excavated should be compacted as engineered fill.

9.3.13 The moisture content and density of the compacted soils should be maintained until the placement of the aggregate base, vapor retarder and concrete slabs. If soft or unstable soils are encountered during excavation or compaction operations, our firm should be notified so the soils conditions can be examined and additional recommendations provided to address the pliant areas.

9.3.14 The Contractor should be responsible for the disposal of concrete, asphaltic concrete, soil, spoils, etc. that must be exported from the site. Individuals, facilities, agencies, etc. may require analytical testing and other assessments of these materials to determine if these materials are acceptable for the intended use by the receiving party. The Contractor is responsible to perform the tests, assessments, etc. necessary to determine the appropriate method of disposal. In addition, the Contractor is responsible for all costs to dispose of these materials in a legal manner.

9.4 Engineered Fill

9.4.1 The on-site near surface soils encountered are predominantly clayey sands. Interior slabs and exterior slabs on grade should be underlain by 4 inches of aggregate base over subgrade soils prepared in accordance with recommendations of this report. The existing near surface soils that are free of organics (less than 3 percent by weight), free of debris, and oversized materials greater than 3 inches in largest dimension will be suitable for use as fill material below the recommended aggregate base layer, provided they are properly moisture conditioned and compacted. If soils other than those considered in this report are encountered, Moore Twining should be notified to provide alternate recommendations.

9.4.2 The compactability of the native soils is dependent upon the moisture contents, subgrade conditions, degree of mixing, type of equipment, as well as other factors. The evaluation of such factors was beyond the scope of this

report; therefore, they should be evaluated by the Contractor during preparation of bids and construction of the project.

9.4.3 Imported fill soil should be non-contaminated, non-recycled, granular in nature and should contain enough fine-grained material (binder) to allow cutting "neat" footing trenches. Imported fill should meet the following acceptance criteria recommended

Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	85 - 100
Percent Passing No. 200 Sieve	15 - 40
Expansion Index (ASTM D4829)	Less than 15
Organics	< 3% by weight
Sulfates	< 0.05 % by weight
Min. Resistivity	> 3,000 ohms-cm

9.4.4 Prior to importing fill, the Contractor should submit test data that demonstrates that the proposed import soils comply with the recommended criteria for both geotechnical and environmental compliance. Also, prior to being transported to the site, the import material should be certified by the Contractor and the supplier (to the satisfaction of the Owner) that the soils do not contain any environmental contaminates regulated by local, state or federal agencies having jurisdiction. This certification should consist of, as a minimum, analytical data specific to the source of the import material in accordance with the Department of Toxic Substances Control, "Informational Advisory, Clean Imported Fill Material," dated October 2001. The list of constituents to be tested for the fill source should be submitted to the Owner for review and approval prior to the Contractor testing the fill.

9.4.5 On-site engineered fill soils should be placed in loose lifts approximately 8 inches thick or less, moisture-conditioned or air dried to between one (1) and four (4) percent above the optimum moisture content, and compacted to at least 92 percent of the maximum dry density as determined by ASTM D1557, with the exception of the final 12 inches of the subgrade soils below pavements, which should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.4.6 Imported engineered fill soils should be placed in loose lifts approximately 8 inches thick or less, moisture-conditioned or air dried to between optimum and 3 percent above the optimum moisture content, and compacted to at least 92 percent of the maximum dry density as determined by ASTM D1557, with the exception of the final 12 inches of the subgrade soils below pavements,

which should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.4.7 Underground utility trenches should be backfilled as engineered fill in accordance with Sections 9.4.5 and 9.4.6. Bedding and pipe zone backfill materials should be specified by the designer. Underground utility trenches should be a minimum of 24 inches wide to allow for compaction testing by traditional methods, unless the trenches are backfilled with controlled low strength material.

9.4.8 In-place density tests should be conducted in accordance with ASTM D6938 (nuclear density) at a frequency of at least:

Table No. 3

Area	Minimum Test Frequency
Building Pad Subgrade	1 test per 500 square feet per compacted lift, but not less than two (2) tests per building pad per lift
Exterior Walkways	1 test per 50 lineal feet
Utility Lines	1 test per 75 feet per compacted lift

9.4.9 Recycled materials (such as asphaltic concrete or Portland cement concrete) cannot be used in the proposed building pads.

9.4.10 Aggregate base should comply with State of California Department of Transportation requirements for Caltrans Class 2 aggregate base, with the exception that aggregate base below the buildings should not contain recycled materials. A recycled Class 2 aggregate base may be used for pavement areas outside the building. Aggregate base shall be compacted to a minimum relative compaction of 95 percent based on ASTM D 1557. Prior to importing the aggregate base material, the contractor should submit documentation demonstrating that the material meets all the quality requirements (i.e., recycled content, gradation, R-value, sand equivalent, durability, etc.) for the applicable aggregate base. Documentation should be

provided to the Owner, Architect and Moore Twining and reviewed and approved prior to delivery of the aggregate base to the site.

9.4.11 Open graded gravel and rock material such as ¾-inch crushed rock or ½-inch crushed rock should not be used as backfill including trench backfill. In the event gravel or rock is required by a regulatory agency for use as backfill (Contractor to obtain a letter from the agency stating the requirement for rock and/or gravel as backfill), all open graded materials shall be fully encased in a geotextile filter fabric, such as Mirafi 140N, to prevent migration of fine grained soils into the porous material. Gravel and rock cannot be used without the written approval of Moore Twining. If the contractor elects to use crushed rock (and if approved by Moore Twining), the contractor will be responsible for slurry cut off walls at the locations directed by Moore Twining. Crushed rock should be placed in thin (less than 8 inch) lifts and densified with a minimum of three (3) passes using a vibratory compactor.

9.5 Shallow Spread Foundations

9.5.1 Shallow spread foundations for the proposed building addition should be supported on engineered fill prepared as recommended in the Site Preparation section of this report. Shallow spread foundations for the proposed building addition meeting these recommendations may be designed for a maximum net allowable soil bearing pressure of 2,000 pounds per square foot for dead-plus-live loads. This value may be increased by one-third for short duration wind or seismic loads.

9.5.2 The bottom of new all perimeter and interior footings for the new building addition footings should have a minimum depth of 24 inches below the lowest adjacent grade. All footings for the new building should have a minimum width of 15 inches, regardless of load.

9.5.3 The foundations should be continuous around the perimeter of all structures to reduce moisture migration beneath the structure. Continuous perimeter foundations should be extended through doorways and/or openings that are not needed for support of loads.

9.5.4 The foundations should be designed and reinforced for the anticipated differential settlements and for temperature and shrinkage effects. A structural engineer experienced in foundation design should recommend the thickness, design details and concrete specifications for the foundations based on a total static settlement of 1 inch, a differential static settlement of ½ inch in 40 feet; a total swell of 1 inch and a differential swell of ½ inch in 40 feet; and a total static seismic settlement of ½ inch, a differential seismic settlement of ¼ inch in 40 feet.

9.5.5 The bottom surface area of concrete footings or concrete slabs in direct contact with engineered fill can be used to resist lateral loads. An allowable coefficient of friction of 0.30, can be used for design. In areas where slabs are underlain by a synthetic moisture barrier, an allowable coefficient of friction of 0.10, can be used for design.

9.5.6 The allowable passive resistance of the engineered fill may be assumed to be equal to the pressure developed by a fluid with a density of 275 pounds per cubic foot. The upper 12 inches of subgrade in landscape areas should be neglected in determining the total passive resistance.

9.5.7 Structural loads for miscellaneous lightly loaded (less than 1 kip per lineal foot) foundations should be prepared in accordance with the recommendations in the Site Preparation section of this report. Miscellaneous lightly loaded foundations extending a minimum depth of 18 inches below the lowest adjacent site grades may be designed for a maximum allowable soil bearing pressure of 1,500 pounds per square foot for dead-plus-live loads for footings. This value may be increased by one-third for short duration wind or seismic loads.

9.5.8 The following seismic factors were developed for the site using the Ground Motion Parameter Calculator provided by SEOAC and OSHPD (http://seismicmaps.org), and the site address (36.976608 degrees latitude and -122.008167 degrees longitude). The data provided in Table No. 3 are based upon the procedures of Sections 1613.2.1 through 1613.2.4 of the 2019 California Building Code, ASCE 7-16 Chapter 11 and Supplement No. 1. The data in Table No. 4 were not determined based upon a ground motion hazard analysis. The structural engineer should review the values in Table No. 4 and determine whether a ground motion hazard analysis is required for the project considering the seismic design category, structural details, and requirements of ASCE 7-16 (Section 11.4.8 and other applicable sections). If required, Moore Twining should be notified and requested to conduct the additional analysis, develop updated seismic factors for the project, and update the following values.

Table No. 4

Item	CBC Value
Site Class	D
Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M)	0.771

Item	CBC Value
Mapped Maximum Considered Earthquake (geometric mean) peak ground acceleration ASCE 7-10 (PGA)	0.701
Spectral Response At Short Period (0.2 Second), Ss	1.672
Spectral Response At 1-Second Period, S_1	0.641
Site Coefficient, Fa	1.0
Site Coefficient, Fv	See Note 1
Maximum considered earthquake spectral response acceleration for short period, SM_S	1.672
Maximum considered earthquake spectral response acceleration for 1 second, SM_1	See Note 1
Five percent damped design spectral response acceleration for short period, SD_S	1.115
Five percent damped design spectral response acceleration at 1-second period, SD_1	See Note 1
T_S (S_{D1}/S_{DS})	0.652

Note 1: Requires ground motion hazard analysis per ASCE Section 21.2 (ASCE 7-16, Section 11.4.8), unless the structural engineer determines that an Exception of Section 11.4.8 of ASCE 7-16 is applicable for the project design.
Ts value calculated using Long-Period Site Coefficient, Fv, from Table 11.4-2 of ASCE 7-16 Supplement 1.

9.5.9 Foundation excavations should be observed by Moore Twining prior to the placement of steel reinforcement and concrete to verify conformance with the intent of the recommendations of this report.

9.5.10 The moisture conditions of the subgrade soils for the building pad and foundation excavations should be maintained in accordance with the recommendations for engineered fill until placement of concrete for foundations or until aggregate base is placed for the building pad areas.

9.6 Interior Concrete Slabs-on-Grade

The following recommendations are intended for the interior floor slab of the building addition.

9.6.1 A structural engineer experienced in slab-on-grade design should recommend the thickness, design details and concrete specifications for the proposed slabs-on-grade for the total and differential settlements noted in this report.

9.6.2 The interior slabs-on-grade should be supported on a minimum of 4 inches of non-recycled Class 2 aggregate base over the depth of engineered fill recommended below foundations in the Site Preparation section of this report.

9.6.3 The moisture content of the engineered fill below the recommended imported granular fill should be verified to be within one (1) to four (4) percent above optimum moisture content prior to placing the granular fill, and also within 48 hours of placement of the vapor retarding membrane or the concrete for the slab-on-grade if a vapor retarding membrane is not used.

9.6.4 The recommendations provided herein are intended only for the design of interior concrete slabs-on-grade and their proposed uses, which do not include construction loading. The building contractor should assess the slab sections and determine its adequacy to support any proposed construction loads.

9.6.5 Where slabs on grade adjacent to the building are planned adjacent to landscape areas, these slabs should include a thickened edge or cutoff extending to the bottom of the aggregate base to reduce the potential for moisture to migrate through the base section towards the structures.

9.6.6 The slabs and underlying subgrade should be constructed in accordance with current American Concrete Institute (ACI) standards.

9.6.7 ACI recommends that the interior slab-on-grade be placed directly on a vapor retarder when the potential exists that excessive moisture could be trapped in materials above the vapor retarder prior to placement of the slab-on-grade. It is recommended that Stegowrap 15 or equivalent should be used where floor coverings, such as carpet and tile, are anticipated or where moisture could permeate into the interior and create problems. The layer of Stegowrap 15 should overlay a minimum of 4 inches of non-recycled compacted aggregate base. It should be noted that placing the PCC slab directly on the vapor barrier will increase the potential for cracking and curling; however, ACI recommends the placement of the vapor retarding membrane directly below the slab to reduce the amount vapor emission through the slab-on-grade. Based on discussions with Stego Industries, L.L.C. (telephone 949-493-5460), the Stegowrap can be placed directly on the AB and the concrete can be placed directly on the Stegowrap. It is recommended that a low shrinkage concrete mix be used for the slab on grade and that the slab be

moist cured for a minimum of 7 days to reduce the potential for excessive cracking from drying shrinkage. The underslab membrane should have a high puncture resistance (minimum of approximately 2,400 grams of puncture resistance), high abrasion resistance, rot resistant, and mildew resistant. It is recommended that the membrane be selected in accordance with the current ASTM C 755, Standard Practice For Selection of Vapor Retarder For Thermal Insulation and conform to the current ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Waters, or as Ground Cover. It is recommended that the vapor barrier selection and installation conform to the current ACI Manual of Concrete Practice, Guide for Concrete Floor and Slab Construction (302.1R), Addendum, Vapor Retarder Location and current ASTM E 1643, Standard Practice for Installation of Water Vapor Retarders Used In Contact with Earth or Granular Fill Under Concrete Slabs. In addition, it is recommended that the manufacturer of the floor covering and floor covering adhesive be consulted to determine if the manufacturers have additional recommendations regarding the design and construction of the slab-on-grade, testing of the slab-on-grade, slab preparation, application of the adhesive, installation of the floor covering and maintenance requirements. It should be noted that the recommendations presented in this report are not intended to achieve a specific vapor emission rate.

9.6.8 The membrane should be installed so that there are no holes or uncovered areas. All seams should be overlapped and sealed with the manufacturer approved tape, continuously at the laps so they are vapor tight. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc., should be sealed per manufacturer's recommendations.

9.6.9 Tears or punctures that may occur in the membrane should be repaired prior to placement of concrete per the manufacturer's recommendations. Once repaired, the membrane should be inspected by the Contractor and the owner to verify adequate compliance with manufacture's recommendations.

9.6.10 The manufacturer's requirements vary regarding the surface and cover material around the placed membrane. Vapor retarding membranes should be installed in accordance with the manufacturers' specifications.

9.6.11 The membrane is not required beneath exposed concrete floors provided that moisture intrusion into the strictures is permissible for the design life of the structure.

9.6.12 Additional measures to reduce moisture migration should be implemented if moisture sensitive floor coverings (such as wood or vinyl) are used. These include: 1) constructing a less pervious concrete floor slab by maintaining a

low water-cement ratio as recommended by ACI in the concrete for slabs-on-grade; 2) moist cure the slab for at least 7 days; 3) ensuring that all seams and utility protrusions are sealed with tape to create a "water tight" moisture retarding membrane; 4) placing concrete walkways or pavements adjacent to the structure; 5) locating lawns, planters and flower beds away from the structure; and 6) providing adequate drainage away from the structure sat a minimum two percent slope. In addition, water should not be allowed to pond adjacent to the structure.

9.6.13 It should be noted that the placement and compaction of the aggregate base, the vapor retarding membrane installation, protection, etc., and the placement, curing, etc. of concrete should be in accordance with the project geotechnical engineering report, applicable ACI requirements, the manufacturer's requirements, the project plans, the project specifications, whichever is most stringent.

9.6.14 The Contractor should test the moisture vapor transmission through the slab, the pH, internal relative humidity, etc., at a frequency and methods as specified by the flooring manufacturer or as required by the plans and specifications, whichever is most stringent. The results of vapor transmission tests, pH tests, internal relative humidity tests, ambient building conditions, etc. should be within floor manufacturer's and adhesive manufacturer's specifications at the time the floor is placed. It is recommended that the floor manufacturer and subcontractor review and approve the test data prior to floor covering installation.

9.6.15 To reduce the potential for damaging slabs during construction, the following recommendations are presented: 1) design for a differential slab movement of ½ inch relative to interior columns; 2) provide aggregate base below the slabs; and 3) the suitability of the loads from construction equipment which will operate on slabs or pavements should be evaluated by the contractor prior to loading the slab.

9.6.16 Backfill the zone above the top of footings at interior column locations, building perimeters, and below the bottom of slabs with an approved backfill and/or an aggregate base section as recommended herein for the area below interior slabs-on-grade. This procedure should provide more uniform support for the slabs which may reduce the potential for cracking.

9.7 Frictional Coefficient and Earth Pressures

9.7.1 The bottom surface area of concrete footings or concrete slabs in direct contact with engineered fill can be used to resist lateral loads. An allowable coefficient of friction of 0.30, can be used for design. In areas where slabs are underlain by a synthetic moisture barrier, an allowable coefficient of friction of 0.10 can be used for design.

9.7.2 The allowable passive resistance of the engineered fill may be assumed to be equal to the pressure developed by a fluid with a density of 275 pounds per cubic foot. The upper 12 inches of subgrade in landscape areas should be neglected in determining the total passive resistance.

9.7.3 The active and at-rest pressures for the recommended imported granular soils used as engineered fill may be assumed to be equal to the pressures developed by a fluid with a density of 45 and 66 pounds per cubic foot, respectively for level backfill conditions. These pressures do not include the surcharge effects of sloped backfill, construction equipment, loads imposed by nearby foundations and roadways and hydrostatic water pressure.

9.7.4 The at-rest pressure should be used in determining lateral earth pressures against walls which are not free to deflect. For walls which are free to deflect at least one percent of the wall height at the top, the active earth pressure may be used.

9.7.5 The above earth pressures assume that the backfill soils will be drained. Therefore, all retaining walls should incorporate the use of a drain, a filter fabric encased gravel section and a geo-composite system, to prevent hydrostatic pressures from acting on the walls. Clean-outs should be incorporated into the design.

9.8 Retaining Walls for Elevator Pit

9.8.1 Retaining walls should be backfilled with imported granular backfill with a maximum particle size of 3 inches, a minimum of 90 percent passing the No. 4 sieve, a maximum of 15 percent passing the No. 200 sieve and a minimum sand equivalent of 30. The zone of granular backfill should extend to a 1 horizontal to 1 vertical plane from the base of the wall.

9.8.2 Granular wall backfill should be compacted to at least 92 percent of the maximum dry density as determined by ASTM Test Method D1557.

9.8.3 Retaining walls may be subject to lateral loading from pressures exerted from the soils, groundwater, slabs-on-grade, and pavement traffic loads, adjacent

to the walls. In addition to earth pressures, lateral loads due to slabs-on-grade, footings, or traffic above the base of the walls should be included in design of the walls. The designer should take into consideration the allowable settlements for the improvements to be supported by retaining walls.

9.8.4 Retaining walls should be constructed with a drain system including, as a minimum, drain pipes surrounded by at least 1.0 cubic feet of ¾-inch open graded rock fully encapsulated by geotextile filter fabric (Mirafi 140N or equivalent). Drain pipes should be located near the wall to adequately reduce the potential for hydrostatic pressures behind the wall. Drainage should be directed to pipes which gravity drain to closed pipes of the storm drain or recommended subdrain system. Drain pipe outlet invert elevations should be sufficient (a bypass should be constructed if necessary) to preclude hydrostatic surcharge to the wall in the event the storm drain system do not function properly. Clean out and inspection points should be incorporated into the drain system. Drainage should be directed to the site storm drain system. The drainage system should be designed by the wall designer and detailed on the plans.

9.8.5 None of the data included in this report should be used for segmental wall or mechanically stabilized earth (MSE) wall design. A design level geotechnical investigation report should be conducted to provide design parameters for segmental retaining walls (if any). If the designer uses the data in this report for wall design, the designer assumes the sole risk for this data.

9.8.6 To reduce potential migration of water and moisture into the structure, waterproofing systems should be applied. The waterproofing systems should be designed by a qualified professional.

9.9 Exterior Concrete Slabs on Grade

The recommendations for exterior slabs provided below are not intended for use for slabs subjected to vehicular traffic, rather lightly loaded sidewalks, curbs, and planters, etc. Recommendations for concrete slabs subjected to vehicular traffic are not included in the scope of this report.

9.9.1 Exterior improvements that are planned directly adjacent to the building or that subject the subgrade soils to a sustained load greater than 125 pounds per square foot should be prepared in accordance with the recommendations presented in this report for interior floor slabs.

9.9.2 Subgrade soils for exterior slabs should be prepared as recommended in the "Site Preparation" section of this report. Upon completion of the over-excavation and compaction of the subgrade soils, exterior slabs should be

supported on 4 inches of non-recycled Class 2 aggregate base over the prepared subgrade soils.

9.9.3 The moisture content of the engineered fill below the recommended granular fill should be maintained at least one (1) to four (4) percent above optimum moisture content prior to placing the granular fill. The moisture content of the upper 12 inches of the subgrade soils should be tested and confirmed prior to placing the granular fill.

9.9.4 Where exterior slabs are planned adjacent to landscape areas, as a minimum, the exterior slabs should include a thickened edge or cutoff extending slightly below the bottom of the imported, granular soils.

9.9.5 If the subgrade is prepared, and then disturbed by equipment workers, weather or other sources, we recommend that the subgrade to receive slabs be tested to verify adequate compaction. If adequate compaction is not verified, the disturbed non-expansive subgrade should be over-excavated, scarified, and compacted as engineered fill. This condition should be verified prior to installation of plumbing, footing excavation, and construction of the slabs-on-grade.

9.9.6 Since exterior sidewalks, curbs, etc. are typically constructed at the end of the construction process, the moisture conditioning conducted during earthwork can revert to natural dry conditions. Placing concrete walks and finish work in areas where the subgrade soils below the granular fill have dried should be avoided. It is recommended that the general Contractor notify Moore Twining to conduct in-place moisture and density tests prior to placing aggregate base and concrete flatwork. Written test results indicating passing density and moisture tests (minimum moisture content of at least one percent above optimum moisture content) should be in the general Contractor's possession prior to placing concrete for exterior flatwork.

9.10 Temporary Excavations

9.10.1 It is the responsibility of the Contractor to provide safe working conditions with respect to excavation slope stability. The Contractor is responsible for site slope safety, and classification of materials for excavation purposes, and maintaining slopes in a safe manner during construction. The grades classification and height recommendations presented for temporary slopes are for consideration in preparing budget estimates and evaluating construction procedures.

9.10.2 Temporary excavations should be constructed in accordance with CAL OSHA requirements. As a minimum, temporary cut slopes should not be steeper than 1½ to 1, horizontal to vertical, and flatter if possible. If

excavations cannot meet these criteria, the temporary excavations should be shored.

9.10.3 Shoring systems, if used, should be designed by an engineer with experience in designing shoring systems and registered in the State of California. Shoring design should be based on the lateral earth pressures included in this report, temporary and permanent surcharge loads and hydrostatic pressures.

9.10.4 In no case should excavations extend below a 1.5H to 1V zone below existing utilities, top of foundations and/or floor slabs which are to remain after construction. Excavations which are required to be advanced below the 1.5H to 1V envelope should be shored to support the soils, foundations, and slabs.

9.10.5 Excavation stability should be monitored by the Contractor. Slope gradient estimates provided in this report do not relieve the Contractor of the responsibility for excavation safety. In the event that tension cracks or distress to the structure occurs, during or after excavation, the owners and Moore Twining should be notified immediately and the Contractor should take appropriate actions to prevent further damage or injury.

9.11 Corrosion Protection

9.11.1 Based on the National Association of Corrosion Engineers corrosion severity rating listed in Section 8.4 of this report and the analytical result of analysis of one (1) near surface soil sample, the near surface soils are "highly corrosive" to ferrous alloy pipes, as indicated by resistivity value of 1,600 ohms-cm and pH value of 6.5. Buried metal objects should be protected in accordance with the manufacturer's recommendations based o the "highly corrosive" corrosion potential of the soil. The evaluation was limited to the effects of soils to metal objects; corrosion due to other potential sources, such as stray currents and groundwater, was not evaluated.

9.11.2 Corrosion of concrete due to sulfate attack is not anticipated based on less than 0.00062 percent by dry weight concentration of sulfate for the near-surface soils. According to provisions of ACI 318, section 4.3, the sulfate concentrations fall in the negligible classification (0.00 to 0.10 percent by weight) for concrete. Therefore, no restrictions are required regarding the type, water-to-cement ratio, or strength of the concrete used for foundation and slabs due to the sulfate content. However, a low water to cement ratio is recommended for slabs on grade as recommended in the "Interior Slabs on Grade" section of this report.

9.11.3 These soil corrosion data should be provided to the manufacturers or suppliers of materials that will be in contact with soils (pipes or ferrous metal objects, etc.) to provide assistance in selecting the protection and materials

for the proposed products or materials. If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to design parameters. Moore Twining is not a corrosion engineer; thus, cannot provide recommendations for mitigation of corrosive soil conditions. It is recommended that a corrosion engineer be consulted for the site specific conditions.

10.0 DESIGN CONSULTATION

10.1 Moore Twining should be retained to review those portions of the contract drawings and specifications that pertain to earthwork operations, pavements and foundations prior to finalization to determine whether they are consistent with our recommendations. This service is not part of this current contractual agreement.

10.2 It is the client's responsibility to provide plans and specification documents for our review prior to their issuance for construction bidding purposes.

10.3 If Moore Twining is not retained for the plan review, we assume no liability for the misinterpretation of our conclusions and recommendations. This review is documented by a formal plan/specification review report provided by Moore Twining.

11.0 CONSTRUCTION MONITORING

11.1 It is recommended that Moore Twining be retained to conduct the necessary observation, field-testing services and provide results so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, the geotechnical engineer should provide a written summary of the observations, field testing and conclusions regarding the conformance of the completed work to the intent of the plans and specifications. This service is not, however, part of this current contractual agreement.

11.2 The construction monitoring is an integral part of this investigation. This phase of the work provides Moore Twining the opportunity to verify the subsurface conditions interpolated from the soil borings and make alternative recommendations if the conditions differ from those anticipated.

11.3 If the Moore Twining is not afforded the opportunity to provide engineering observation and field testing services during construction activities related to earthwork, foundations, pavements and trenches; then, Moore Twining will not be responsible for compliance of any aspect of the construction with our

recommendations or performance of the structures or improvements if the recommendations of this report are not followed. We recommend that if a firm other than Moore Twining is selected to conduct these services that they review this report and state that they understand the conclusions and recommendations of this report and they agree to conduct sufficient observations and testing to ensure the construction complies with this report's recommendations. Moore Twining should be notified, in writing, if another firm is selected to conduct observations and field-testing services prior to construction.

12.0 NOTIFICATION AND LIMITATIONS

12.1 The conclusions and recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of the field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations.

12.2 The nature and extent of subsurface variations between borings may not become evident until construction.

12.3 If variations or undesirable conditions are encountered during construction, Moore Twining should be notified promptly so that these conditions can be reviewed and the recommendations reconsidered where necessary. It should be noted that unexpected conditions frequently require additional expenditures for proper construction of the project.

12.4 If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work (more than 12 months) at the site, or if conditions have changed due to natural cause or construction operations at or adjacent to the site, the conclusions and recommendations contained in this report should be considered invalid unless the changes are reviewed and our conclusions and recommendations modified or approved in writing.

12.5 Changed site conditions, or relocation of proposed structures, may require additional field and laboratory investigations to determine if our conclusions and recommendations are applicable considering the changed conditions or time lapse.

12.6 The conclusions and recommendations contained in this report are valid only for the project discussed in Section 3.3, Anticipated Construction. The use of the information and recommendations contained in this report for structures on this site not discussed herein or for structures on other sites not discussed in Section 3.2, Site Description is not recommended. The entity or entities that use or cause to use this report or any portion thereof for another structure or site not covered by this report shall hold Moore Twining, its officers and employees harmless from any and all claims and provide Moore Twining's defense in the event of a claim.

12.7 This report is issued with the understanding that it is the responsibility of the client to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, designers, contractors, subcontractors, and other parties having interest in the project so that the steps necessary to carry out these recommendations in the design, construction and maintenance of the project are taken by the appropriate party.

12.8 This report presents the results of a geotechnical engineering investigation only and should not be construed as an environmental audit or study.

12.9 Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally-accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

12.10 This investigation report should not be used in the preparation of a Storm Water Pollution Prevention Plan (SWPPP). Use of this report or any data included in the report in preparation of an SWPPP would be at the owner's sole risk.

12.11 Reliance on this report by a third party (i.e., that is not a party to our written agreement) is at the party's sole risk. If the project and/or site are purchased by another party, the purchaser must obtain written authorization and sign an agreement with Moore Twining in order to rely upon the information provided in this report for design or construction of the project.

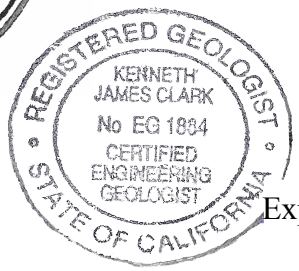
We appreciate the opportunity to be of service to Santa Cruz City Schools. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Respectfully Submitted,

MOORE TWINING ASSOCIATES, INC.
Geotechnical Engineering Division



Zubair Anwar, RCE
Project Engineer



Exp. 5-31-21

Kenneth J. Clark, CEG
Engineering Supervisor



Scott W. Krauter, RGE
Assistant Manager

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United States Geological Survey, Search Earthquake Catalog , (https://earthquake.usgs.gov/earthquakes/search/)

APPENDIX A

DRAWINGS

Drawing No. 1 - Site Location Map
Drawing No. 2 - Test Boring Locations With Proposed Improvements
Drawing No. 3 - Regional Geologic Map
Drawing No. 4 - Map of Faults Relative to Site
Drawing No. 5 - Historical Earthquake Epicenter Map
Drawing No. 6 - Site Geologic Map
Drawing No. 7 - Soil Profile Cross Section A-A’



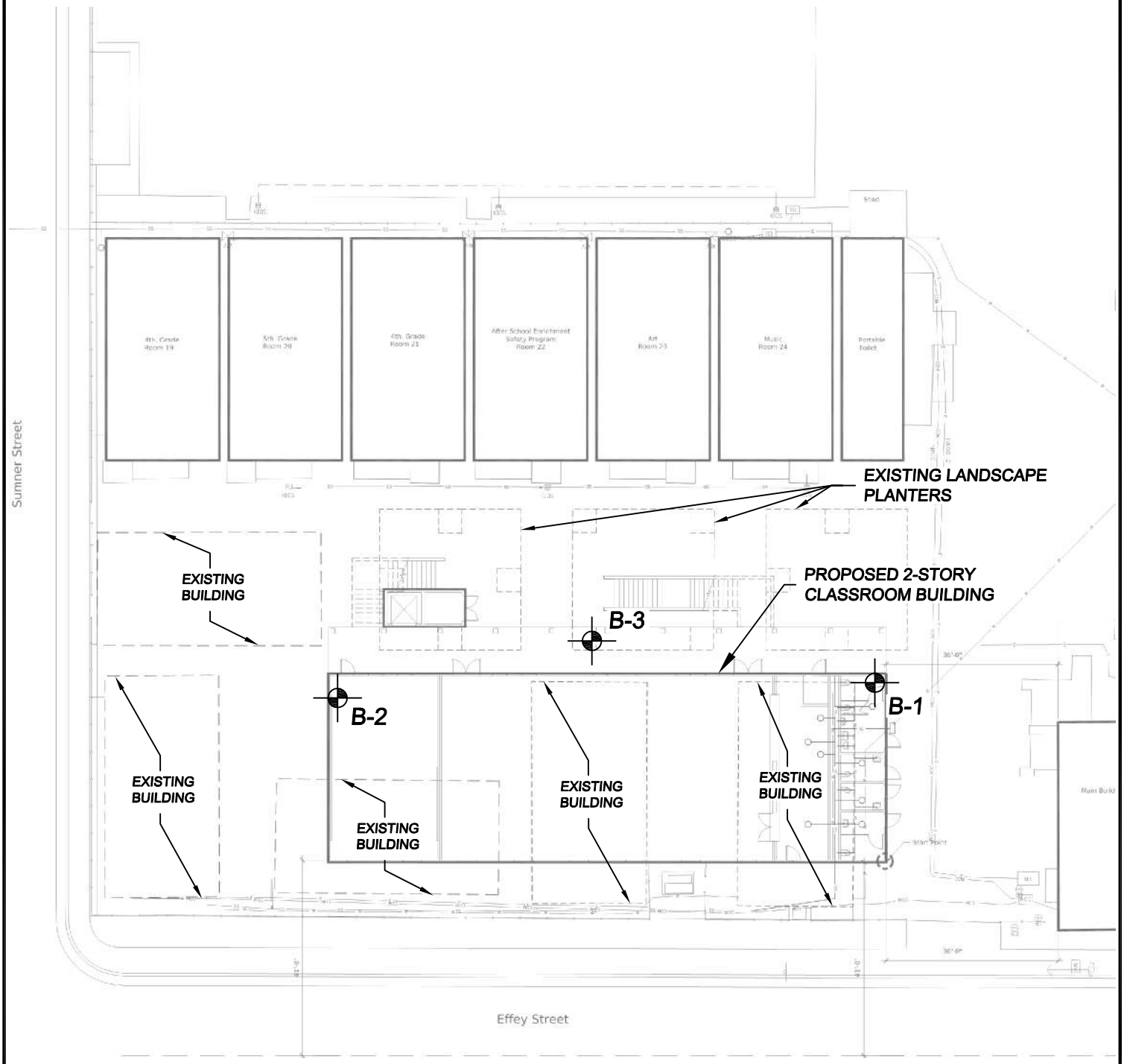
SOURCE: U.S.G.S. TOPOGRAPHIC MAP, 7 ½ MINUTE SERIES
SANTA CRUZ, CALIFORNIA QUADRANGLE 1987, PHOTOREVISED 1994

0 2000
APPROXIMATE SCALE IN FEET

SITE LOCATION MAP
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

FILE NO.:	DATE:
95810-01-01	01/07/2021
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 1

MOORE TWINING ASSOCIATES, INC.



REFERENCE: ENLARGED SITE PLAN A1.5C, BA 17-005.5 PREPARED BY BARTOS ARCHITECTURE

APPROXIMATE TEST BORING LOCATION DRILLED BY MOORE TWINING ON NOVEMBER 23,2020

N

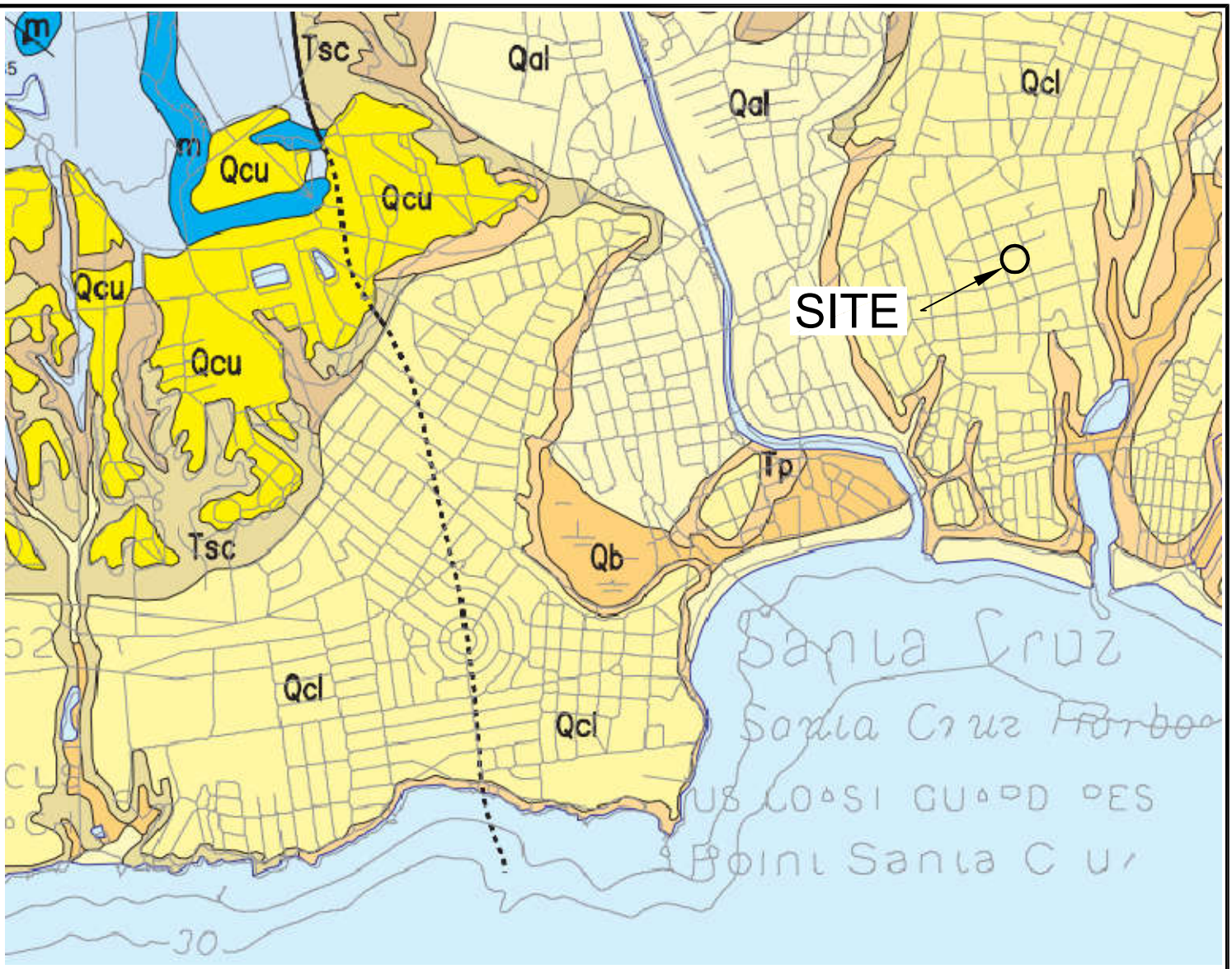
0 30

APPROXIMATE SCALE IN FEET

SITE PLAN AND TEST BORING LOCATION MAP
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 2

MOORE TWINING ASSOCIATES, INC.



Qcl **Lowest emergent coastal terrace deposits (Pleistocene)**—Semiconsolidated, generally well-sorted sand with a few thin, relatively continuous layers of gravel. Deposited in nearshore high-energy marine environment. Grades upward into eolian deposits of Manresa Beach in southern part of county. Thickness variable; maximum approximately 40 ft. Unit thins to north where it ranges from 5 to 20 ft thick. Weathered zone ranges from 5 to 20 ft thick. As mapped, locally includes many small areas of fluvial and colluvial silt, sand, and gravel, especially at or near old wave-cut cliffs

Tp **Purisima Formation (Pliocene and upper Miocene)**—Very thick bedded yellowish-gray tuffaceous and diatomaceous siltstone containing thick interbeds of bluish-gray, semifriable, fine-grained andesitic sandstone. As shown, includes Santa Cruz Mudstone east of Scotts Valley and north of Santa Cruz. Thickness approximately 3,000 ft in the Corralitos Canyon area

Qb **Basin deposits (Holocene)**—For description, see column West of Soquel Creek

N

0 0.5

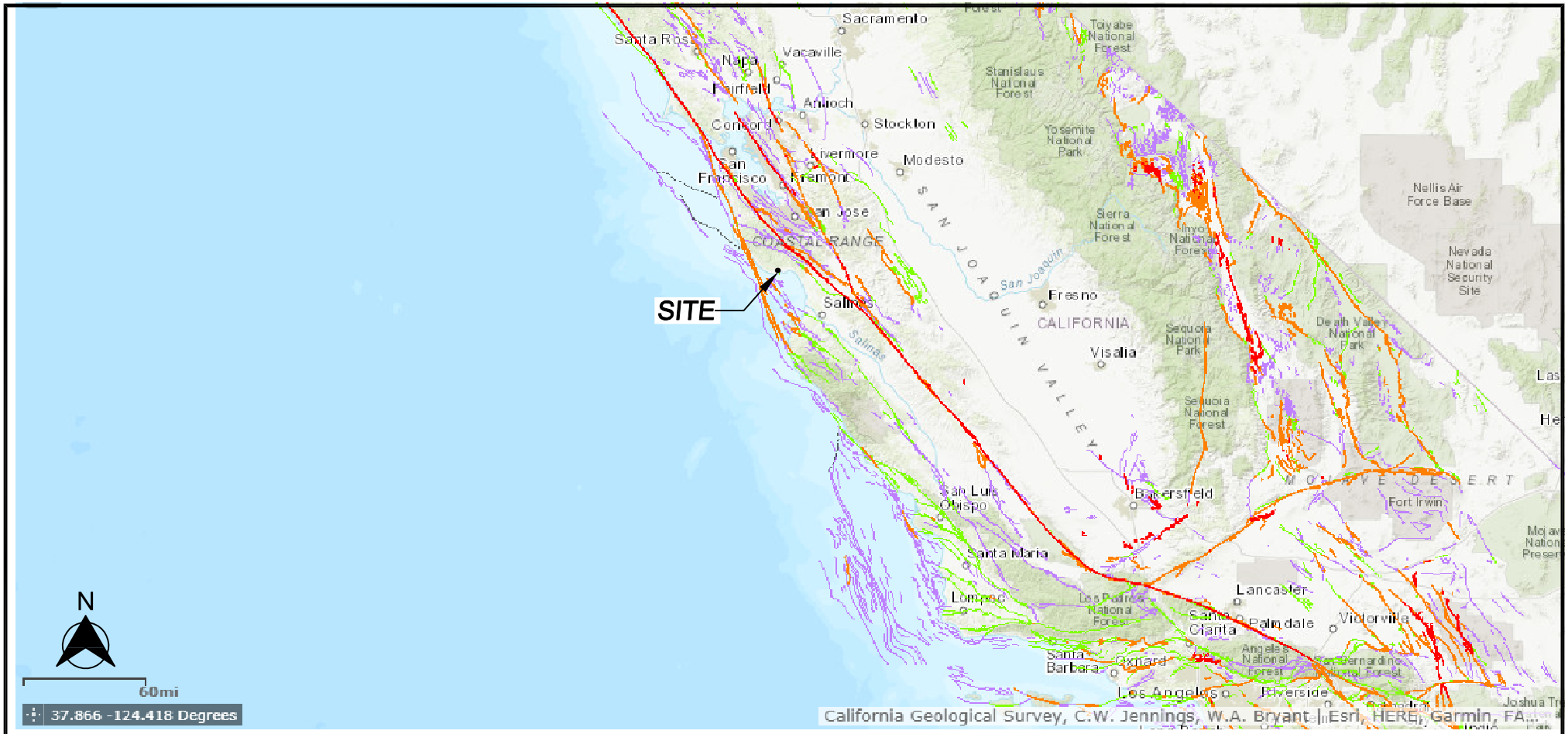
APPROXIMATE SCALE IN MILES

SOURCE: GEOLOGIC MAP OF SANTA CRUZ COUNTY, CALIFORNIA
COMPILED BY EARL E. BRABB, 1997

REGIONAL GEOLOGIC MAP
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 3

MOORE TWINING ASSOCIATES, INC.



LEGEND

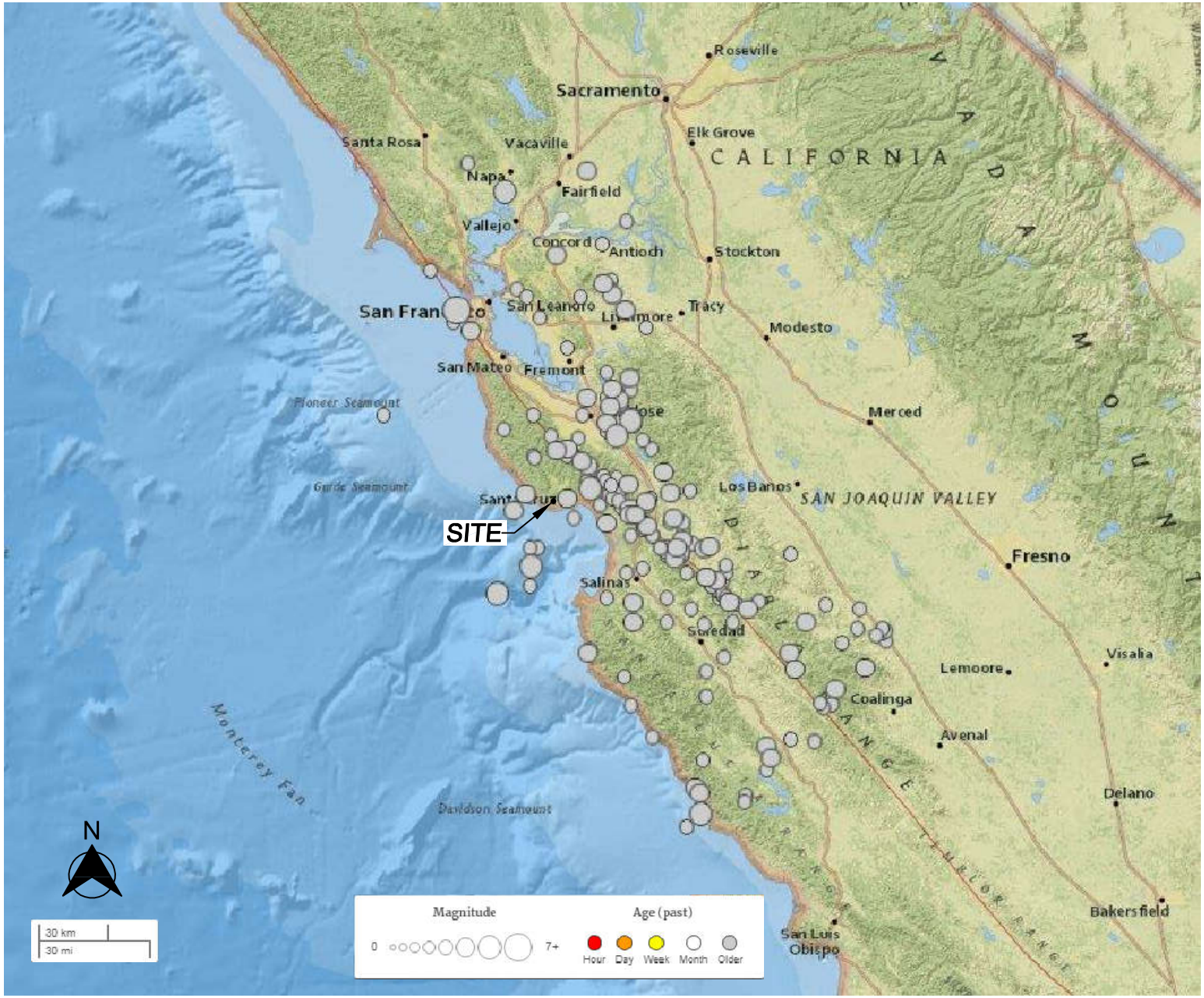
- ***Fault along which historic (last 200 years) displacement has occurred***
- ***Holocene fault displacement (during past 11,700 years) without historic record***
- ***Late Quaternary fault displacement (during past 700,000 years)***
- ***Quaternary fault (age undifferentiated)***

REFERENCE: JENNINGS, CW., AND BRYANT, W.A., 2010 FAULT ACTIVITY MAP OF CALIFORNIA: CALIFORNIA GEOLOGICAL SURVEY, GEOLOGIC DATA MAP NO. 6

MAP OF ACTIVE AND POTENTIALLY ACTIVE FAULTS RELATIVE TO SITE
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

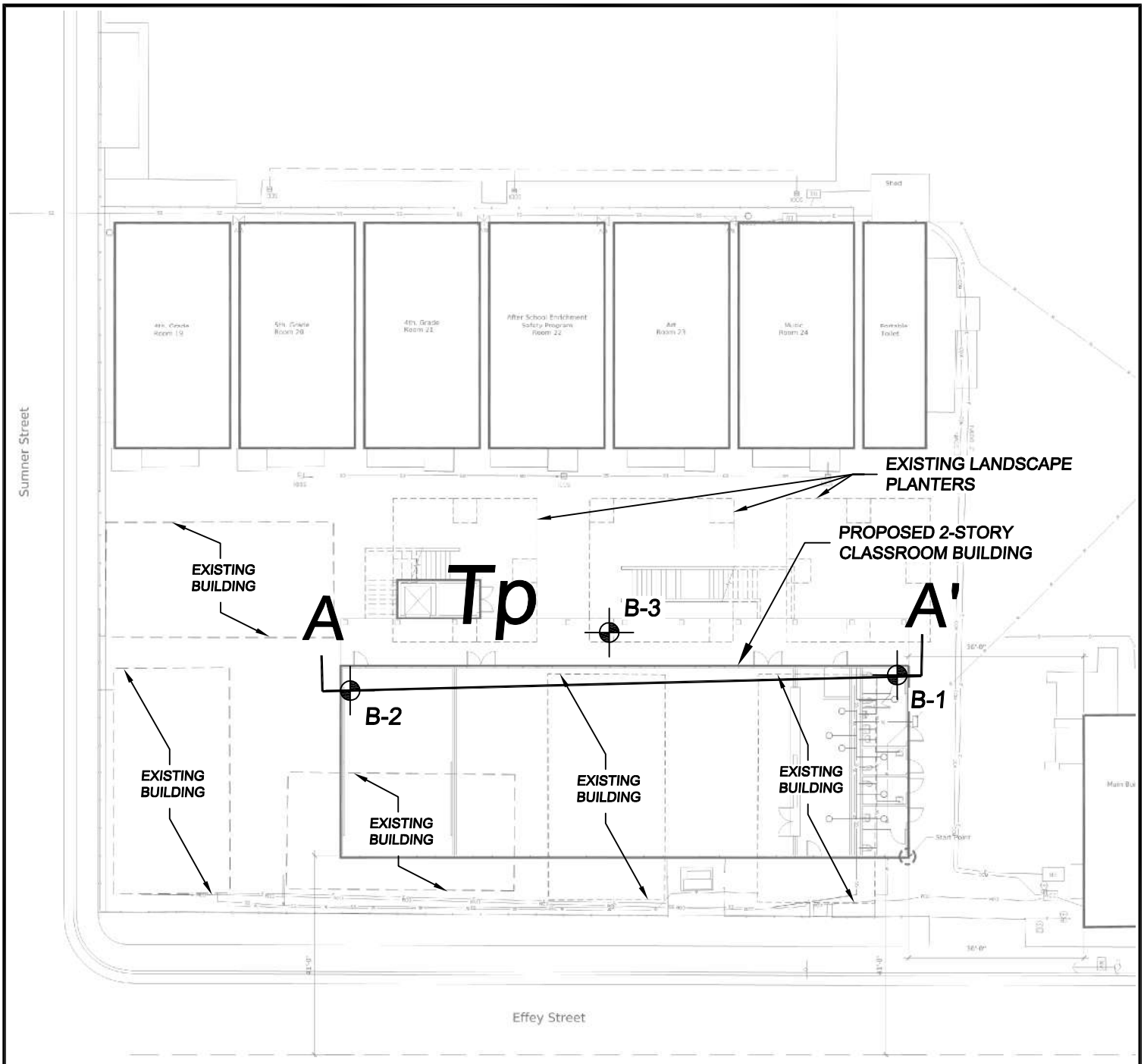
FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 4

MOORE TWINING ASSOCIATES, INC.



HISTORICAL EARTHQUAKE EPICENTER MAP PROPOSED 2-STORY MODULAR CLASSROOM BUILDING GAULT ELEMENTARY SCHOOL 1320 SEABRIGHT AVENUE SANTA CRUZ, CALIFORNIA	FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
	DRAWN BY: RM	APPROVED BY:
	PROJECT NO. E95810.01	DRAWING NO. 5

MOORE TWINING ASSOCIATES, INC.
Since 1898



APPROXIMATE TEST BORING LOCATION DRILLED BY MOORE TWINING ON NOVEMBER 23,2020

A A' CROSS SECTION

Tp: PURISIMA FORMATION (SILTSTONE / GRANITE)

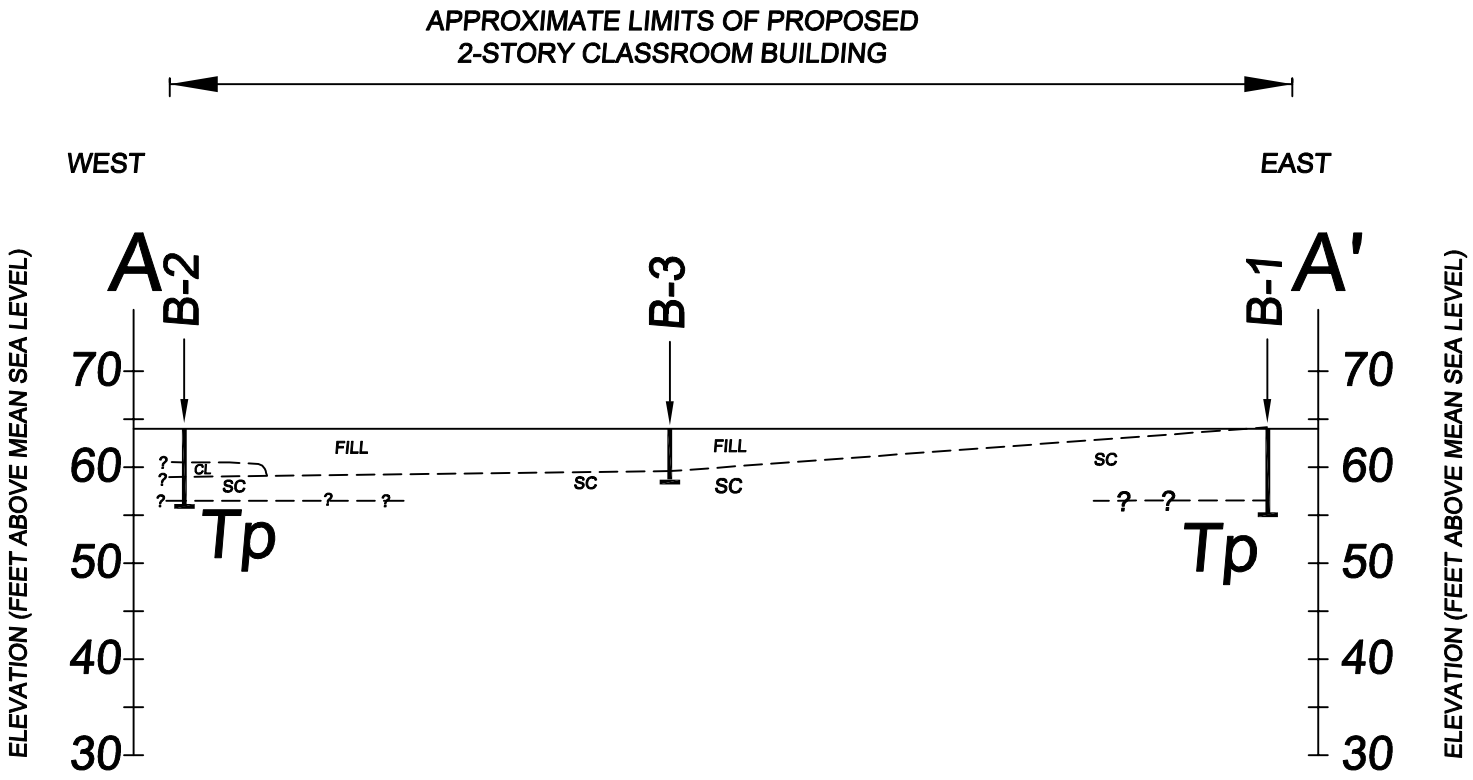
0 30

APPROXIMATE SCALE IN FEET

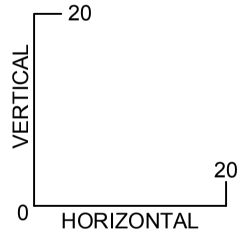
SITE GEOLOGIC MAP
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 6

MOORE TWINING ASSOCIATES, INC.



Tp: PURISIMA FORMATION (SILTSTONE)
SC: CLAYEY SAND
FILL: SILTY SAND
CL: SANDY LEAN CLAY



APPROXIMATE SCALE
IN FEET

GEOLOGIC SOIL PROFILE CROSS SECTION A-A'
PROPOSED 2-STORY MODULAR CLASSROOM BUILDING
GAULT ELEMENTARY SCHOOL
1320 SEABRIGHT AVENUE
SANTA CRUZ, CALIFORNIA

FILE NO. 95810-01-02	DATE DRAWN: 02/10/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. E95810.01	DRAWING NO. 7

MOORE TWINING ASSOCIATES, INC.
Since 1898

APPENDIX B

LOGS OF BORINGS

This appendix contains the final logs of borings. These logs represent our interpretation of the contents of the field logs and the results of the field and laboratory tests.

The logs and related information depict subsurface conditions only at these locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these test boring locations. Also, the passage of time may result in changes in the soil conditions at these test boring locations.

In addition, an explanation of the abbreviations used in the preparation of the logs and a description of the Unified Soil Classification System are provided at the end of Appendix B.

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-1

Project: Proposed 2-Story Classroom at Gault Elementary School

Project Number: E95810.01

Drilled By: J.C.

Drill Type: CME 75

Auger Type: 6-5/8" Hollow Stem Augers

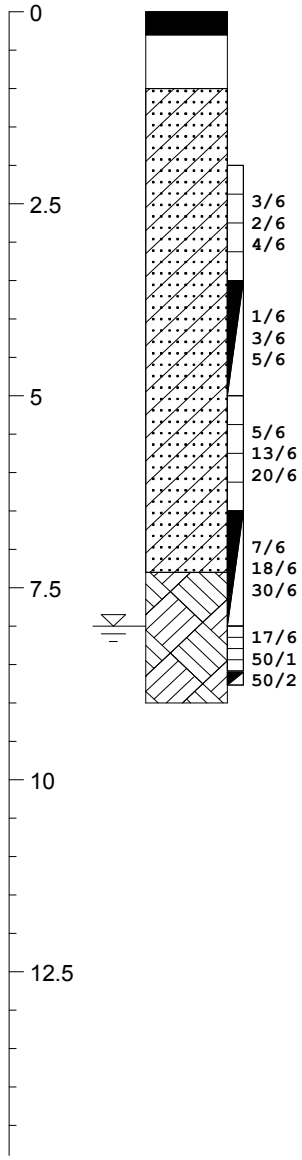
Hammer Type: 140 Lb Auto Trip Hammer

Logged By: J.C.

Date: November 23, 2020

Elevation: N/A

Depth to Groundwater First Encountered During Drilling: 8 feet



ELEVATION/ DEPTH (feet)	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC	ASPHALTIC CONCRETE = 3.4 INCHES THICK			
	AB				
	SC	AGGREGATE BASE = 8.8 INCHES THICK	EI=3		
		CLAYEY SAND; moist, fine to medium, black Very loose	AT2-3.5': DD=107.1 pcf Sand=64.9% -#200=35.1 LL=23 PI=8 ø=33° C=10 psf LOI=0.7%	6	13.8
		Loose		8	25.4
		Medium dense, very moist, brown	At 3.5-5': LOI=1.5% At 5-6.5': DD=108.3 pcf Sand=84.2% -#200=15.8%	33	18.3
		Dense	Resistance to drilling	48	
	ROCK	ROCK - SILTSTONE; highly weathered, brown, friable Wet	DD=101.4 pcf	>50	10.2
		Dark-gray		>50	
		Bottom of boring B-1 at 9 feet BSG			

Notes: *Groundwater encountered at 8 feet bsg during drilling. Groundwater was measured at 6.05 feet bsg after drilling with auger withdrawn.*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-2

Project: Proposed 2-Story Classroom at Gault Elementary School

Project Number: E95810.01

Drilled By: J.C.

Drill Type: CME 75

Auger Type: 6-5/8" Hollow Stem Augers

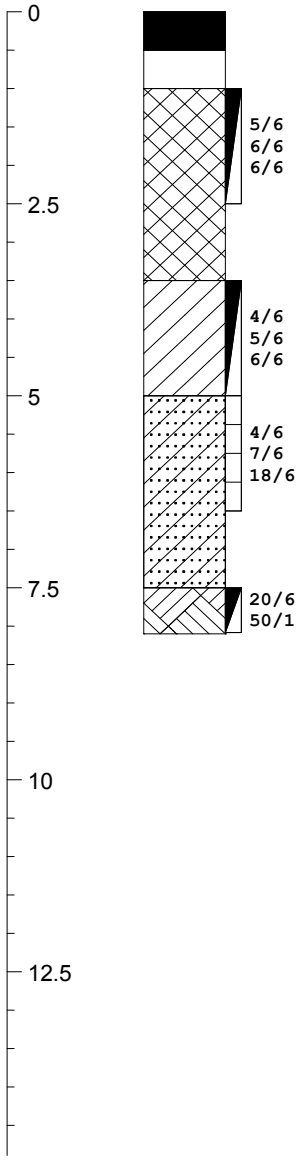
Hammer Type: 140 Lb Auto Trip Hammer

Logged By: J.C.

Date: November 23, 2020

Elevation: N/A

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	ASPHALTIC CONCRETE = 5.6 INCHES THICK			
		AB				
		FILL	AGGREGATE BASE = 7.0 INCHES THICK	Sand=64.1% -#200=35.9% LL=NV LL=NP	12	10.7
			SILTY SAND; medium dense, moist, fine to medium grained, black			
		CL	SANDY LEAN CLAY; stiff moist, low to medium plasticity, brown	Sand=48.5% -#200=51.5%	11	19.0
		SC	CLAYEY SAND; medium dense, moist, fine to medium, brown	DD=112.9 pcf Sand=58.1% -#200=41.9%	25	18.2
		ROCK	ROCK - SILTSTONE; moderately weathered, light-gray	Resistance to drilling on coarse gravel	>50	
			Bottom of boring B-2 at 8.1 feet BSG			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-3

Project: Proposed 2-Story Classroom at Gault Elementary School

Project Number: E95810.01

Drilled By: J.C.

Drill Type: N/A

Auger Type: 4" diameter hand auger

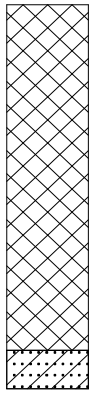
Hammer Type: N/A

Logged By: J.C.

Date: November 23, 2020

Elevation: N/A

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		FILL	FILL - SILTY SAND; moist, fine to medium grained, with rootlets Tarp fabric At 0.5 feet - Dark-brown, plastic, debris At 1.5 feet - Slight increase in moisture, trace fine gravel	Moderate resistance to hand augering		9.5 13.2 9.6
2.5						
5		SC	CLAYEY SAND; Very moist, fine to medium grained, dark-brown Bottom of boring B-3A at 5 feet BSG	Moderate resistance to hand augering		
7.5						
10						
12.5						

Notes:

Figure Number

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	ASPHALTIC CONCRETE
	Blank
	SC: Clayey sand
	Siltstone
	Fill
	CL: LEAN CLAY
Misc. Symbols	
	Water table during drilling

Notes:

1. Test borings were drilled on November 23, 2020, using a CME-75 drill rig equipped with 6 5/8 inch outside diameter hollow-stem augers and auger equipment.

2. Groundwater was encountered during drilling (see logs).

3. Boring locations were located by pace with reference to the existing site features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. The "N-value" reported for the California Modified Split Barrel Sampler is the uncorrected field blow count. This value should not be interpreted as an SPT equivalent N-value.

6. Results of tests conducted on samples recovered are reported on the logs. Abbreviations used are:

AMSL =	Above mean sea level
O.D. =	Outside diameter
DD =	Dry density (pcf)
-#200 =	Percent passing #200 sieve (%)
N/A =	Not applicable
N/E =	None encountered
pcf =	pounds per cubic foot
psf =	pounds per square foot
BSG =	below site grade
LL =	Liquid Limit
PI =	Plasticity Index
NP =	Non-Plastic
NV =	Non-Viscous
C =	Cohesion
ø =	Angle of Internal Friction
AC =	Asphlat Concrete
AB =	Aggregate Base

KEY TO SYMBOLS

Symbol Description

Soil Samplers



California Modified split barrel ring sampler



Standard penetration test

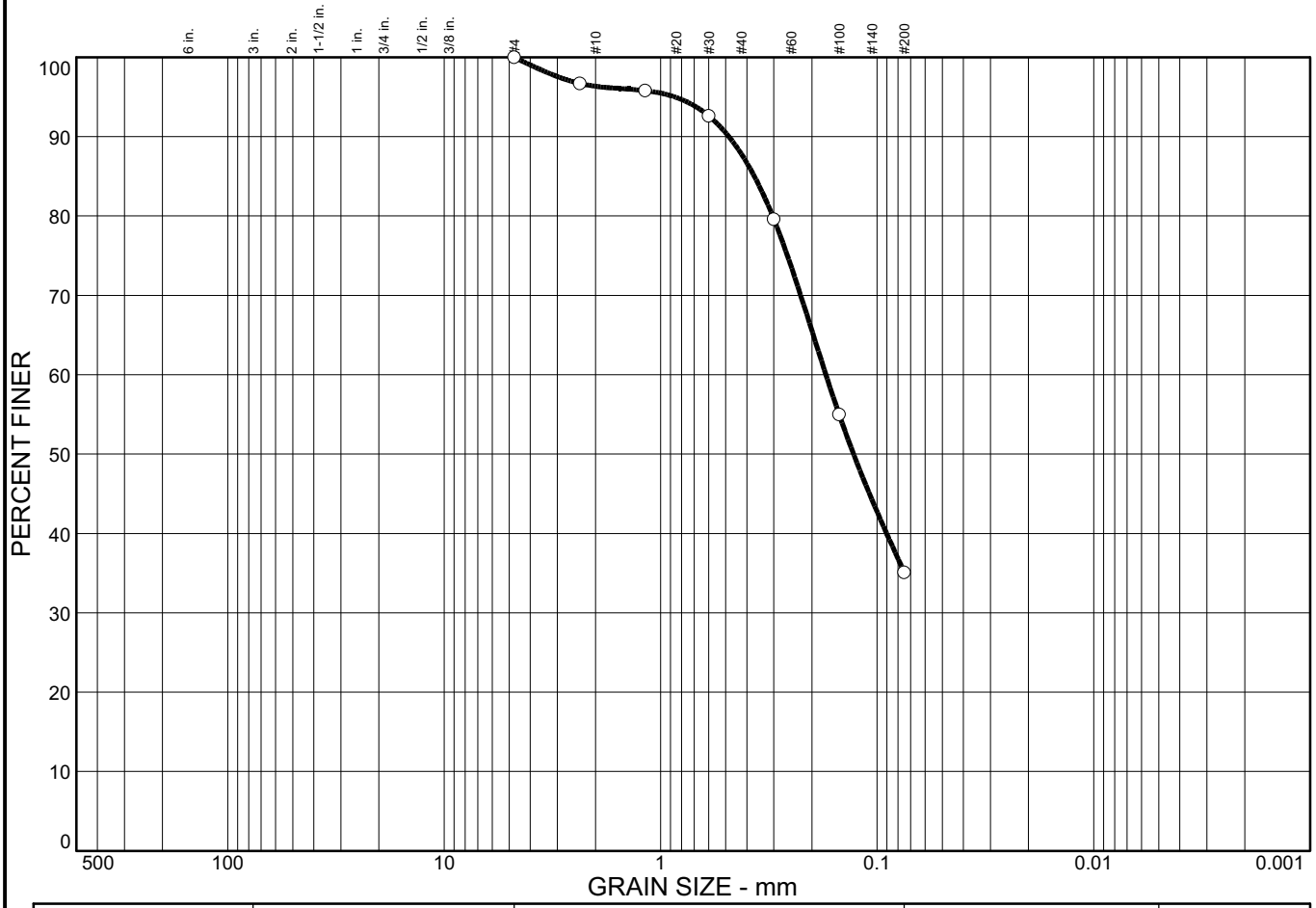
APPENDIX C

RESULTS OF LABORATORY TESTS

This appendix contains the individual results of the following tests. The results of the moisture content and dry density tests are included on the test boring logs in Appendix B. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

These Included:	To Determine:
Moisture Content (ASTM D2216)	Moisture contents representative of field conditions at the time the sample was taken.
Dry Density (ASTM D2937)	Dry unit weight of sample representative of in-situ or in-place undisturbed condition.
Grain-Size Distribution (ASTM D422)	Size and distribution of soil particles, i.e., clay, silt, sand, and gravel.
Atterberg Limits (ASTM D4318)	Determines the moisture content where the soil behaves as a viscous material (liquid limit) and the moisture content at which the soil reaches a plastic state
Expansion Index (ASTM D4829)	Swell potential of soil with increases in moisture content.
Consolidation (ASTM D2435)	The amount and rate at which a soil sample compresses when loaded, and the influence of saturation on its behavior.
Direct Shear (ASTM D3080)	Soil shearing strength under varying loads and/or moisture conditions.
Moisture-Density Relationship (ASTM D1557)	The optimum (best) moisture content for compacting soil and the maximum dry unit weight (density) for a given compactive effort.
Sulfate Content (ASTM D4327)	Percentage of water-soluble sulfate as (SO4) in soil samples. Used as an indication of the relative degree of sulfate attack on concrete and for selecting the cement type.
Chloride Content (ASTM D4327)	Percentage of soluble chloride in soil. Used to evaluate the potential attack on encased reinforcing steel.
Resistivity (ASTM G187)	The potential of the soil to corrode metal.
pH (ASTM D4972)	The acidity or alkalinity of subgrade material.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.9	35.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	96.7		
#16	95.8		
#30	92.6		
#50	79.6		
#100	55.0		
#200	35.1		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= 15 LL= 23 PI= 8

Coefficients

D_{85}= 0.369 D_{60}= 0.173 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample No.: B-1 **Source of Sample:** **Date:** 11/25/20
Location: **Elev./Depth:** 2-3.5'

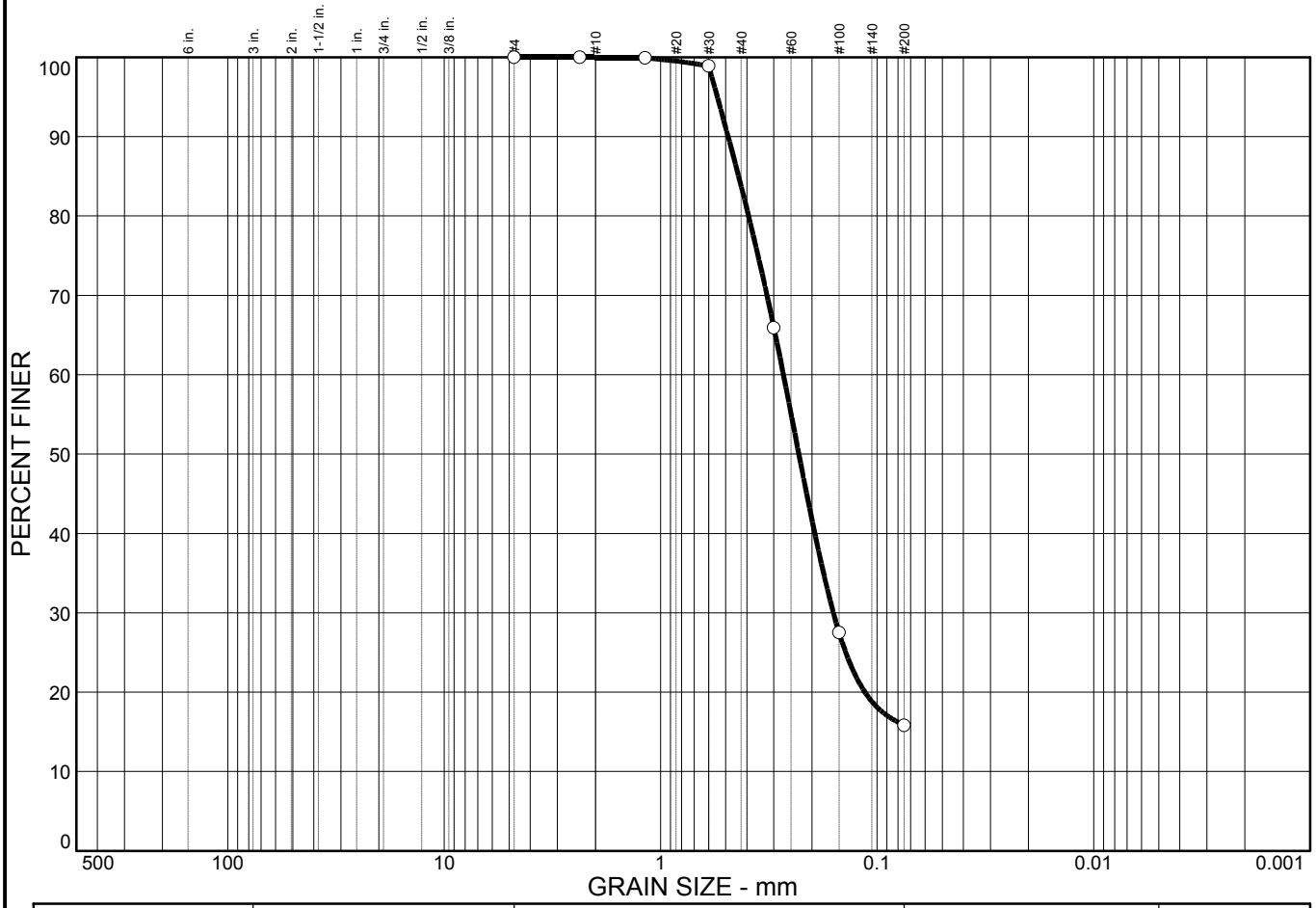
Moore Twining Associates, Inc.

Fresno, CA

Client: Santa Cruz City Schools
Project: Proposed Two-Story Building at Gault E.S.

Project No: E95810.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	84.2	15.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	99.9		
#30	98.9		
#50	65.9		
#100	27.5		
#200	15.8		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.437 D_{60}= 0.271 D_{50}= 0.230
D_{30}= 0.159 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: B-1 **Source of Sample:** **Date:** 11/25/20
Location: **Elev./Depth:** 5-6.5'

Moore Twining Associates, Inc.

Fresno, CA

Client: Santa Cruz City Schools
Project: Proposed Two-Story Building at Gault E.S.

Project No: E95810.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.1	35.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.8		
#16	96.7		
#30	94.2		
#50	83.6		
#100	61.9		
#200	35.9		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.319 D_{60}= 0.142 D_{50}= 0.109
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: B-2 **Source of Sample:** **Date:** 11/25/20
Location: **Elev./Depth:** 1-2.5'

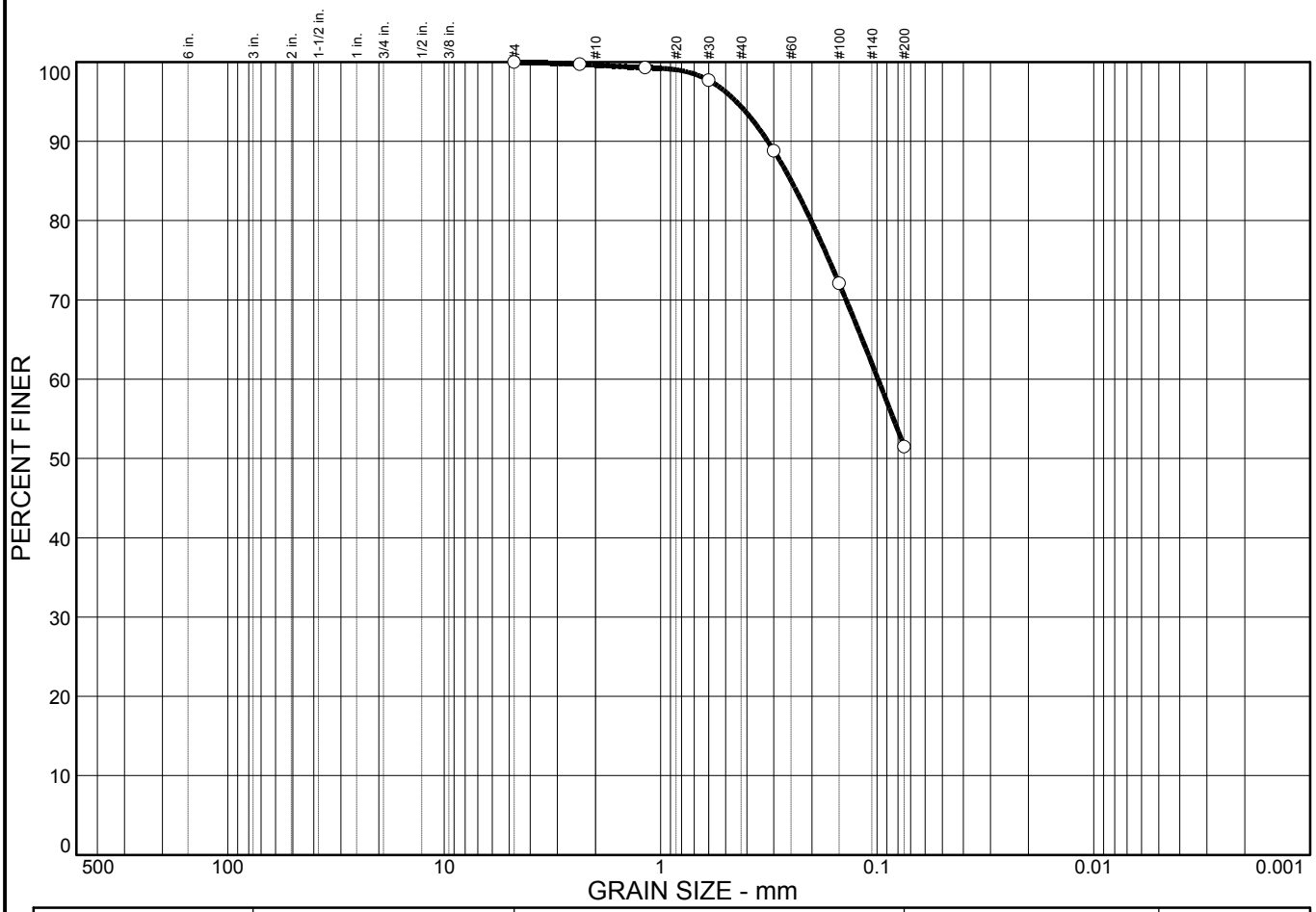
Moore Twining Associates, Inc.

Fresno, CA

Client: Santa Cruz City Schools
Project: Proposed Two-Story Building at Gault E.S.

Project No: E95810.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	48.5	51.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#16	99.3		
#30	97.7		
#50	88.8		
#100	72.1		
#200	51.5		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.250 D_{60}= 0.0991 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: B-2 **Source of Sample:** **Date:** 11/25/20
Location: **Elev./Depth:** 3.5-5'

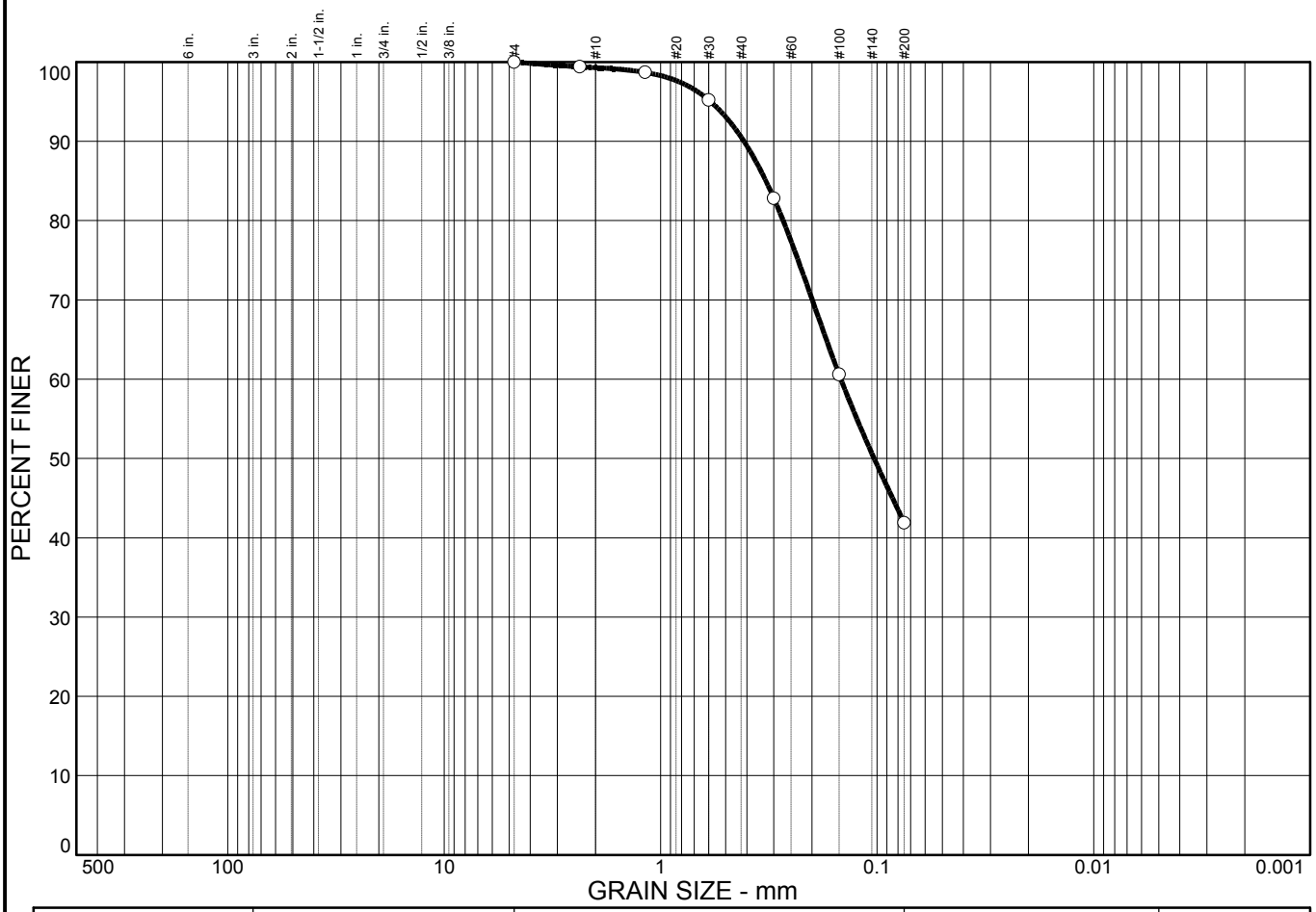
Moore Twining Associates, Inc.

Fresno, CA

Client: Santa Cruz City Schools
Project: Proposed Two-Story Building at Gault E.S.

Project No: E95810.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	58.1	41.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.4		
#16	98.7		
#30	95.2		
#50	82.8		
#100	60.6		
#200	41.9		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.327 D_{60}= 0.147 D_{50}= 0.103
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample No.: B-2 **Source of Sample:** **Date:** 11/25/20
Location: **Elev./Depth:** 5-6.5'

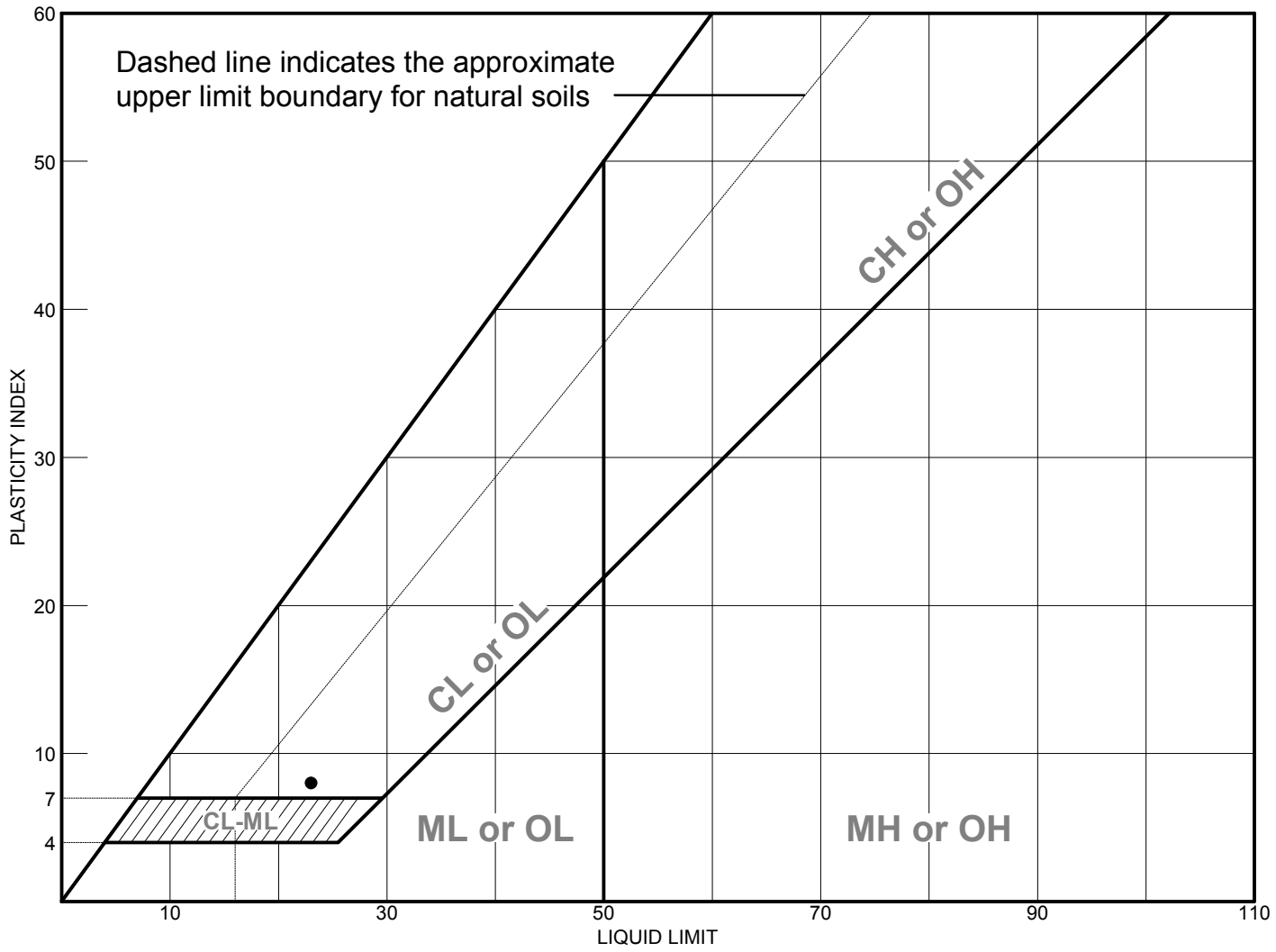
Moore Twining Associates, Inc.

Fresno, CA

Client: Santa Cruz City Schools
Project: Proposed Two-Story Building at Gault E.S.

Project No: E95810.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	23	15	8	87.9	35.1	SC

Project No. E95810.01 **Client:** Santa Cruz City Schools

Project: Proposed Two-Story Building at Gault E.S.

● **Source:** **Sample No.:** B-1 **Elev./Depth:** 2-3.5'

Remarks:

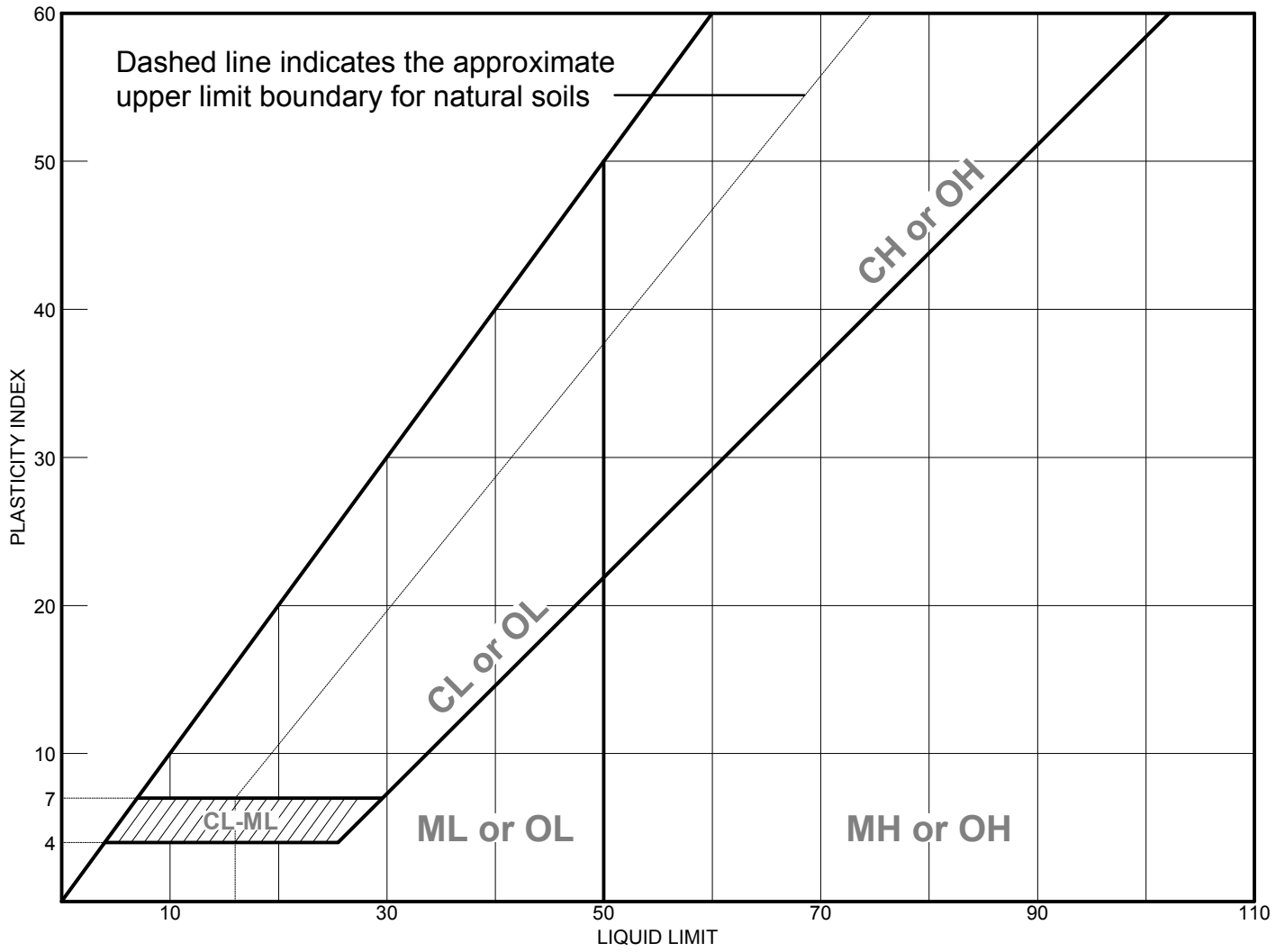
●

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Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	90.3	35.9	SM

Project No. E95810.01 **Client:** Santa Cruz City Schools

Project: Proposed Two-Story Building at Gault E.S.

● **Source:** **Sample No.:** B-2 **Elev./Depth:** 1-2.5'

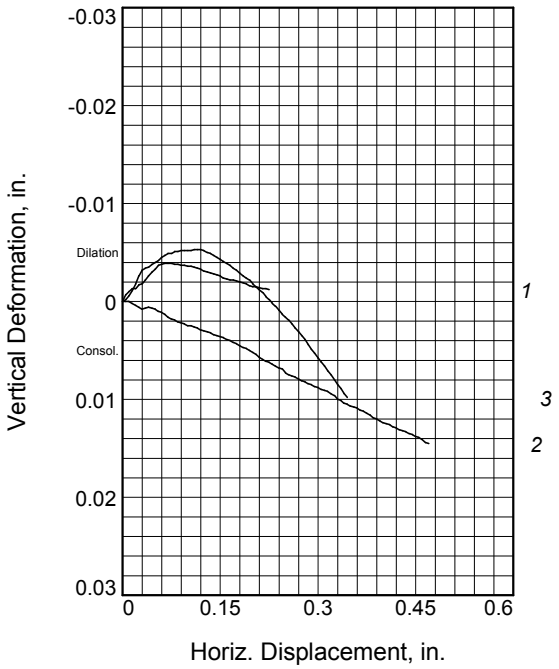
Remarks:

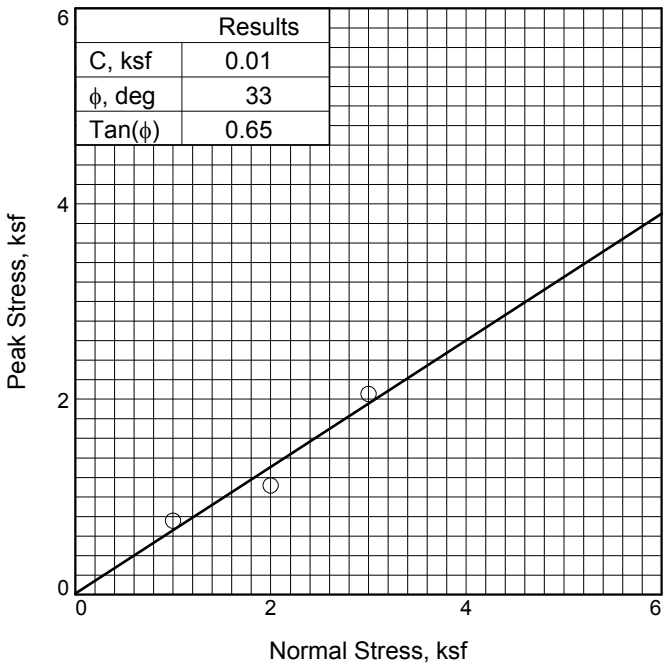
●

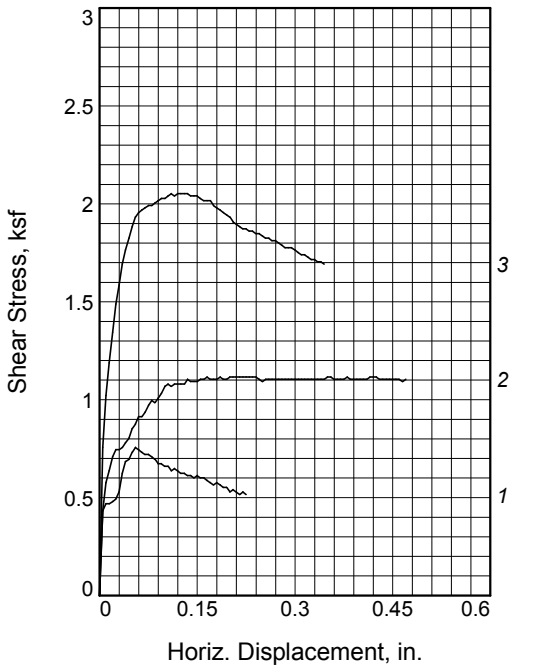
Moore Twining Associates, Inc.

Fresno, CA

Figure







Sample No.		1	2	3
Initial	Water Content, %	33.1	23.1	17.4
	Dry Density, pcf	86.0	97.2	106.0
	Saturation, %	95.1	87.2	82.2
	Void Ratio	0.9235	0.7016	0.5614
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	33.9	23.8	17.4
	Dry Density, pcf	87.1	100.7	112.5
	Saturation, %	99.9	97.9	98.2
	Void Ratio	0.9000	0.6428	0.4699
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.97	0.94
Normal Stress, ksf		1.00	2.00	3.00
Peak Stress, ksf		0.76	1.12	2.05
Displacement, in.		0.06	0.17	0.11
Ultimate Stress, ksf				
Displacement, in.				
Strain at peak, %		2.3	6.8	4.6

Sample Type:
Description: Clayey sand

LL= 23 **PL=** 15 **PI=** 8
Specific Gravity= 2.65
Remarks:

Figure _____

Client: Santa Cruz City Schools

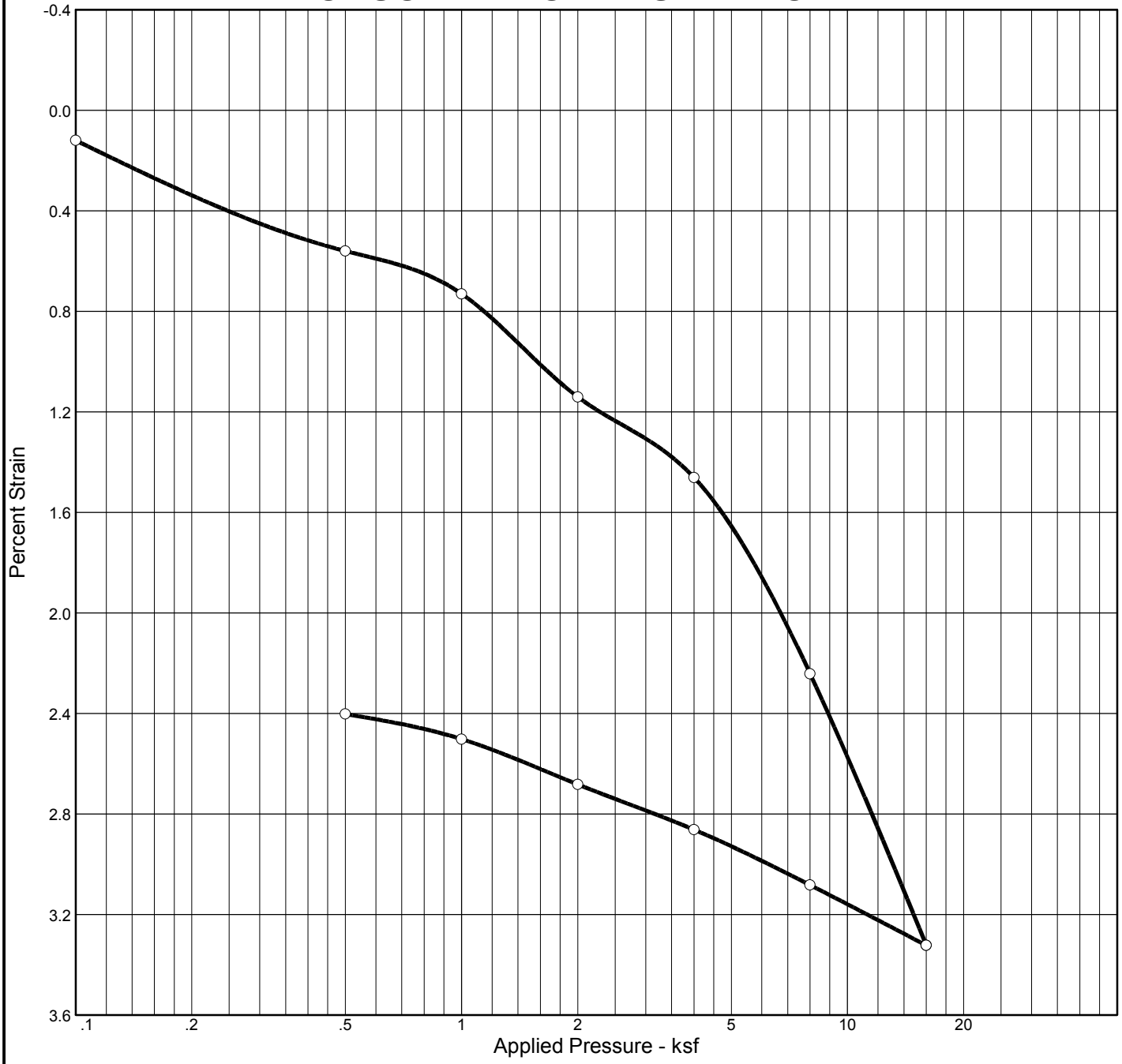
Project: Proposed Two-Story Building at Gault E.S.

Sample Number: B-1 **Depth:** 2-3.5'

Proj. No.: E95810.01 **Date Sampled:** 11/25/20

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
Sat.	Moist.											
77.8 %	13.8 %	112.5	23	8	2.65		5.26	0.05	0.01			0.471

MATERIAL DESCRIPTION	USCS	AASHTO
Clayey sand	SC	

Project No. E95810.01 **Client:** Santa Cruz City Schools

Project: Proposed Two-Story Building at Gault E.S.

Source: **Sample No.:** B-1 **Elev./Depth:** 2-3.5'

Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

MOORE TWINING ASSOCIATES, INC.

EXPANSION INDEX TEST, ASTM D4829

MTA PROJECT NAME:	Proposed Two-Story Building at Gault E.S.	REPORT DATE:	12/24/2020
		TEST DATE:	12/18/2020
MTA PROJECT NO.:	E95810.01		
SAMPLE I.D.:	B-1 @ 1-4'		
SAMPLED BY:	JC		
SAMPLE DATE:	11/25/2020	TESTED BY:	MA
MATERIALS DESCRIPTION:	Clayey sand		
% PASSING # 4 SIEVE	100		

Initial Moisture Determination:		Final Moisture Determination:	
Pan + Wet Soil Wt., gm	250.0	Wet Soil Wt., lbs	0.9755
Pan + Dry Soil Wt., gm	229.0	Dry Soil Wt., lbs	0.8225
Pan Wt., gm	0.0		
Initial % Moisture Content	9.2	Final % Moisture Content	18.6

Initial Expansion Data:		**Final Expansion Data:**	
Ring + Sample Wt., lbs	0.8979	Ring + Sample Wt., lbs	0.9755
Ring Wt., lbs	0.0000	Ring Wt., lbs	0.0000
Remolded Wt., lbs	0.8979	Remolded Wt., lbs	0.9755
Remolded Wet Density, pcf	123.5	Remolded Wet Density, pcf	133.8
Remolded Dry Density, pcf	113.1	Remolded Dry Density, pcf	112.8

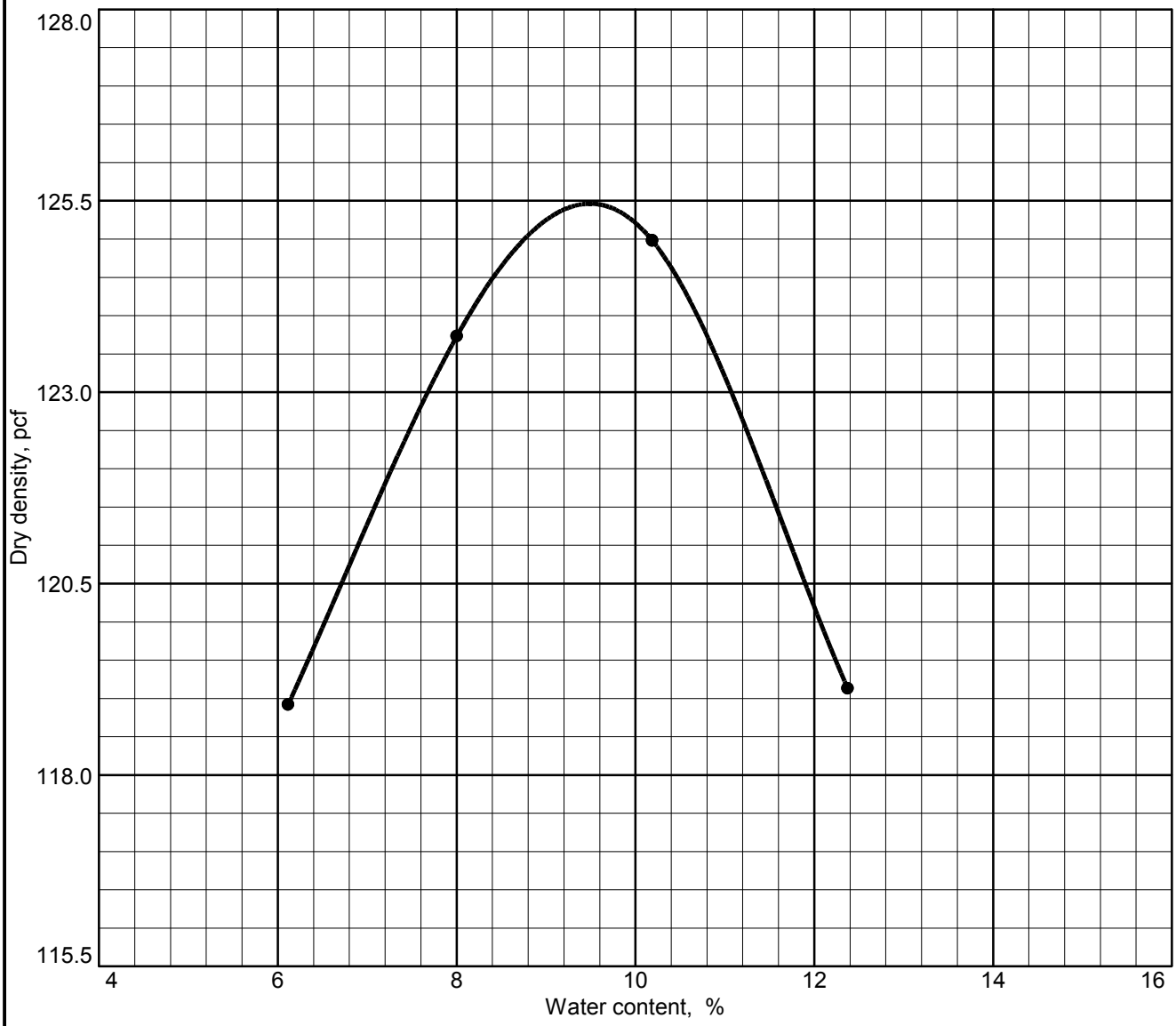
Expansion Data:		Initial Volume	Final Volume
		0.00727222	0.007293
Initial Gage Reading, in:	0.0500		
Final Gage Reading, in:	0.0529		
Expansion, in:	0.0029		
Expansion Index	3	**Comments:**	**Very Low Expansion Potential**

Classification of Expansive Soils. (Table No.1 From ASTM D4829)

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-4'								

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 125.5 pcf Optimum moisture = 9.5 %	Clayey sand

Project No. E95810.01 **Client:** Santa Cruz City Schools

Project: Proposed Two-Story Building at Gault E.S.

● **Source:** **Sample No.:** B-1 **Elev./Depth:** 1-4'

Remarks:

Moore Twining Associates, Inc.

Fresno, CA

Figure

MOORE TWINING ASSOCIATES, INC.

Project No:	Proposed Two-Story Building at Gault E.S.	Report Date:	12/24/2020
Project:	E95810.01		

Materials Testing Report
ASTM D2974

Sample Location:	B-1 @ 3.5-5'		
Sampled By:	JC	Tested By:	MA
Sample Date:	11/25/2020	Date Tested:	12/14/2020
Material Description:	Clayey sand		

Start Weight, gm:	124.0
Final Weight, gm:	123.10
Tare Weight, gm	62.0
Percent of Organic, %:	1.5

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Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.

Project No:	Proposed Two-Story Building at Gault E.S.	Report Date:	12/24/2020
Project:	E95810.01		

Materials Testing Report
ASTM D2974

Sample Location:	B-1 @ 2-3.5'		
Sampled By:	JC	Tested By:	MA
Sample Date:	11/25/2020	Date Tested:	12/14/2020
Material Description:	Clayey sand		

Start Weight, gm:	121.3
Final Weight, gm:	120.86
Tare Weight, gm	61.74
Percent of Organic, %:	0.7

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Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

December 23, 2020

Work Order #: **GL10001**

Ken Clark
MTA Geotechnical Division
2527 Fresno Street
Fresno, CA 93721

RE: Proposed Two-Story Building at Gault E.S.

Enclosed are the analytical results for samples received by our laboratory on **12/10/20** . For your reference, these analyses have been assigned laboratory work order number **GL10001**.

All analyses have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, Moore Twining Associates, Inc. (MTA) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

Sincerely,

Moore Twining Associates, Inc.



Susan Federico
Client Services Representative

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

MTA Geotechnical Division 2527 Fresno Street Fresno CA, 93721	**Project:** Proposed Two-Story Building at Gault E.S. **Project Number:** E92810.01 **Project Manager:** Ken Clark	**Reported:** 12/23/2020

Analytical Report for the Following Samples

Sample ID	Notes	Laboratory ID	Matrix	Date Sampled	Date Received
B1@1-4.0		GL10001-01	Soil	11/25/20 00:00	12/10/20 08:47

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

MTA Geotechnical Division	**Project:** Proposed Two-Story Building at Gault E.S.	**Reported:**
2527 Fresno Street	**Project Number:** E92810.01	12/23/2020
Fresno CA, 93721	**Project Manager:** Ken Clark	

B1@1-4.0

GL10001-01 (Soil) Sampled: 11/25/20 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		ND	6.0	mg/kg	3	B0L1610	12/16/20	12/17/20	Cal Test 422
Chloride		ND	0.00060	% by Weight	3	[CALC]	12/17/20	12/17/20	[CALC]
Sulfate as SO4		ND	0.00060	% by Weight	3	[CALC]	12/17/20	12/17/20	[CALC]
pH		**6.5**	0.10	pH Units	1	B0L1610	12/16/20	12/17/20	Cal Test 643
Sulfate as SO4		ND	6.0	mg/kg	3	B0L1610	12/16/20	12/17/20	Cal Test 417

Notes and Definitions

DUP1	A high RPD was observed between a sample and this sample's duplicate.
µg/L	micrograms per liter (parts per billion concentration units)
mg/L	milligrams per liter (parts per million concentration units)
mg/kg	milligrams per kilogram (parts per million concentration units)
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
	Analysis of pH, filtration, and residual chlorine is to take place immediately after sampling in the field. If the test was performed in the laboratory, the hold time was exceeded. **(for aqueous matrices only)**

MOORE TWINING

CHAIN OF CUSTODY / ANALYSIS REQUEST

2527 FRESNO STREET • FRESNO, CA 93721 • PHONE (559) 268-7021 • FAX: (559) 268-0740

ANALYTICAL CHEMISTRY DIVISION
CALIFORNIA ELAP CERTIFICATION # 1371

WORK ORDER #: 2 GL10001
PAGE 1 OF 2

REPORT TO:
ATTENTION: Ken Clark
COMPANY NAME:
ADDRESS:
PHONE:
EMAIL / FAX:

☐ **INVOICE TO:**
ATTENTION:
COMPANY NAME:
ADDRESS:
PHONE:
EMAIL / FAX:

☐ **REPORT COPY TO:**

REPORTING:
☑ STANDARD FORMAT ☐ PDF
☐ EDT (SWRCB) ☐ EXCEL
☐ GEOTRACKER/COELT (LUFT)
GLOBAL ID:
☐ COUNTY ENVIRONMENTAL HEALTH:
☐ STATE WATER RESOURCES CONTROL BOARD:
☐ OTHER:

SAMPLE INFORMATION
SAMPLED BY (PRINT):
SIGNATURE:
☐ PUBLIC SYSTEM ☑ ROUTINE
☐ PRIVATE WELL ☐ REPEAT
☐ OTHER ☐ REPLACEMENT

TURN AROUND TIME
☑ STANDARD
☐ RUSH, DUE ON:

SAMPLE TYPES
SOLID:
BS - BIOSOLID
CR - CERAMIC
SL - SOIL/SOLID
LIQUID:
DW - DRINKING WATER
GW - GROUND WATER
OL - OIL
SF - SURFACE WATER
ST - STORM WATER
WW - WASTEWATER

PROJECT INFORMATION
CONTRACT / P.O. NO.:
PROJECT: Proposed Two-Story Building at Gault E.S
PROJECT NUMBER: E95810.01
PROJECT MANAGER: Ken Clark

ANALYSIS REQUESTED

LAB USE

NOTES ON RECEIVED CONDITION:
☐ CUSTODY SEAL(S) BROKEN ☐ SAMPLES(S) DAMAGED
☐ ON ICE ☐ AMBIENT TEMP. ☐ INCORRECT PRESERVATION

	CLIENT SAMPLE ID	DATE	TIME	TYPE	Corrosion	STATION CODE
1	B1E 1-4.0	11/25/20	N/A	SL	✓	

COMMENTS / ADDITIONAL INSTRUCTIONS:

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Miguel Alcaraz	MTA/MAT	12-10-20	0847		MTA

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in MTA's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody and agrees to MTA's terms and conditions for laboratory services unless contractually bound otherwise. MTA's current terms and conditions can be obtained by contacting our accounting department at (559) 268-7021.

Moore Twining Associates

Sample Integrity — Page 2 of 2 — WO# GL10001 — MTA Bottles: (Yes) or No

COC Info

Was temperature within range? Chemistry ≤6°C Micro <10°C Temp_____°C	(Yes) No N/A	Did all bottle labels agree with COC?	(Yes) No N/A	Were there bubbles in VOA vials? (**Volatiles Only**)	Yes No (N/A)
If samples were taken today, is there evidence that chilling has begun? Recvd_____C°	(Yes) No N/A	Was a sufficient amount of sample received?	(Yes) No N/A	Was PM notified of discrepancies? PM: By/Time:	Yes No (N/A)
Did all bottles arrive unbroken and intact?	(Yes) No N/A	Were correct containers and preservatives received for the tests requested?	(Yes) No N/A		
Do samples have a hold time <72 hours?	Yes (No) N/A				

Bottles Received

125ml (A) 250ml (B) 1Liter (C) 40ml VOA (V)	1																		
Bacti $Na_2S_2O_3$																			
None (P)																			
Cr6 Buffer (P) Borate Carbonate Buffer																			
HNO_3 (P)																			
H_2SO_4 (P)																			
NaOH (P)																			
NaOH+ZnAc (P)																			
Dissolved Oxygen 300ml (P)																			
None (AG)																			
None (CG) 500ml																			
$Na_2S_2O_3$ 250ml (Brown P) 549																			
$Na_2S_2O_3$ (AG)																			
$Na_2S_2O_3$ (CG)																			
Thio/K Citrate																			
NH_4Cl (AG) 552																			
HCl (AG)																			
None (CG) 500ml																			
H_3PO_4 (AG)																			
Other:																			
Plastic Bag	1																		
Low Level Hg/Metals Double Bag																			
Client Own																			
Glass Jar: 125/ 250/ 500																			
Soil Tube: Brass/ Steel/ Plastic																			
5 g Encore																			
Ascorboc Acid (AG) Voa																			
1gallon Cubitainer																			
Voa w/Sodium Thio + MCAA																			

Comments

Filter or Split

	Container	Preservative	Date/Time/Initials
S P F			
S P F			
S P F			
S P F			
S P F			

Labeled by: ____ @_____ Labels checked by: ____ @ 0920

FL-SC-0003-06

MOORE TWINING ASSOCIATES, INC.

Project Name:	Proposed Two-Story Building at Gault E.S.	Report Date:	12/24/2020
		Sample Date:	11/25/2020
Project Number:	E95810.01		
		Sampled By:	JC
Subject:	Minimum Resistivity, ASTM G187	Tested By:	MA
Material Description:	Clayey sand	Test Date:	12/18/2020
Location:	B-1 @ 1-4'		

Laboratory Test Results, Minimum Resistivity - ASTM G187

Total Water Added, mls	Resistivity, Ohm-cm
75 mls	9,100
100 mls	7,400
125 mls	4,900
150 mls	2,900
175 mls	2,100
200 mls	1,800
225 mls	1,600
250 mls	1,900

Remarks: Min. Resistivity is 1,600 Ohm-cm

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

APPENDIX D

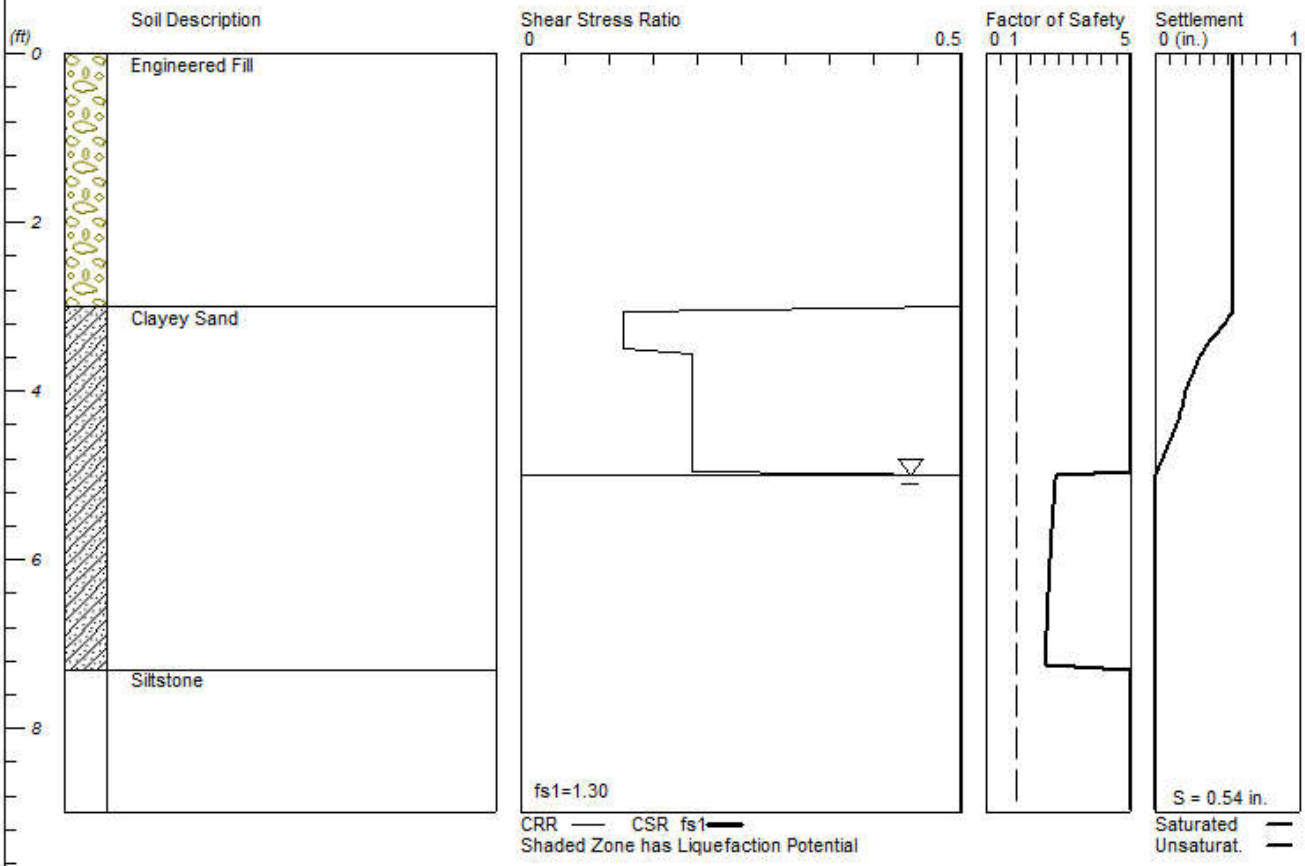
SEISMIC SETTLEMENT CALCULATIONS

LIQUEFACTION ANALYSIS

Gault ES - 2 Story Building

Hole No.=B-1 Water Depth=5 ft

Magnitude=8.27
Acceleration=0.771g



LiquefyPro CivilTech Software USA www.civiltech.com

****

LIQUEFACTION ANALYSIS CALCULATION DETAILS

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www.civiltechsoftware.com

****

Font: Courier New, Regular, Size 8 is recommended for this report.

Licensed to , 2/12/2021 12:29:39 PM

Input File Name: F:\ENG\Geotech\E95810.01 Gault School\B-1.liq

Title: Gault ES - 2 Story Building

Subtitle: E95810.01

Input Data:

Surface Elev.=

Hole No.=B-1

Depth of Hole=9.00 ft

Water Table during Earthquake= 5.00 ft

Water Table during In-Situ Testing= 6.05 ft

Max. Acceleration=0.77 g

Earthquake Magnitude=8.27

No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.2
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.3
   Plot one CSR curve (fs1=User)
10. Average two input data between two Depths: No

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	Gamma pcf	Fines %
0.00	4.00	125.00	NoLiq
3.00	4.00	125.00	35.10
3.50	8.00	125.00	35.10
5.00	21.00	125.00	15.80
6.50	48.00	125.00	15.80
7.30	50.00	125.00	NoLiq

Output Results:

Calculation segment, dz=0.050 ft

User defined Print Interval, dp=1.00 ft

Peak Ground Acceleration (PGA), a_max = 0.77g

CSR Calculation:

Depth ft	gamma pcf	sigma atm	gamma' pcf	sigma' atm	rd	mZ g	a(z) g	CSR	x fs1	=CSRfs
0.00	125.00	0.000	125.00	0.000	1.00	0.000	0.771	0.50	1.30	0.65
1.00	125.00	0.059	125.00	0.059	1.00	0.000	0.771	0.50	1.30	0.65
2.00	125.00	0.118	125.00	0.118	1.00	0.000	0.771	0.50	1.30	0.65
3.00	125.00	0.177	125.00	0.177	0.99	0.000	0.771	0.50	1.30	0.65
4.00	125.00	0.236	125.00	0.236	0.99	0.000	0.771	0.50	1.30	0.65
5.00	125.00	0.295	62.60	0.295	0.99	0.000	0.771	0.50	1.30	0.64
6.00	125.00	0.354	62.60	0.325	0.99	0.000	0.771	0.54	1.30	0.70
7.00	125.00	0.413	62.60	0.355	0.98	0.000	0.771	0.57	1.30	0.75
8.00	125.00	0.473	62.60	0.384	0.98	0.000	0.771	0.61	1.30	0.79
9.00	125.00	0.532	62.60	0.414	0.98	0.000	0.771	0.63	1.30	0.82

CSR is based on water table at 5.00 during earthquake

CRR Calculation from SPT or BPT data:

Depth ft	SPT	Cebs	Cr	sigma' atm	Cn	(N1)60	Fines %	d(N1)60	(N1)60f	CRR7.5
0.00	4.00	1.44	0.75	0.000	1.70	7.34	NoLiq	6.47	13.81	0.15
1.00	4.00	1.44	0.75	0.059	1.70	7.34	NoLiq	6.47	13.81	0.15
2.00	4.00	1.44	0.75	0.118	1.70	7.34	NoLiq	6.47	13.81	0.15
3.00	4.00	1.44	0.75	0.177	1.70	7.34	NoLiq	6.47	13.81	0.15
4.00	8.00	1.44	0.75	0.236	1.70	14.69	35.10	7.94	22.63	0.25
5.00	21.00	1.44	0.75	0.295	1.70	38.56	15.80	4.75	43.31	2.00
6.00	21.00	1.44	0.75	0.354	1.68	38.10	15.80	4.73	42.82	2.00
7.00	48.00	1.44	0.75	0.385	1.61	83.50	15.80	7.12	90.62	2.00
8.00	50.00	1.44	0.75	0.415	1.55	83.82	NoLiq	21.76	105.58	2.00
9.00	50.00	1.44	0.85	0.445	1.50	91.78	NoLiq	23.36	115.14	2.00

CRR is based on water table at 6.05 during In-Situ Testing

Factor of Safety, - Earthquake Magnitude= 8.27:

Depth ft	sigC' atm	CRR7.5	x Ksig	=CRRv	x MSF	=CRRm	CSRfs	F.S.=CRRm/CSRfs
0.00	0.00	0.15	1.00	0.15	0.78	2.00	0.65	5.00 ^
1.00	0.04	0.15	1.00	0.15	0.78	2.00	0.65	5.00 ^
2.00	0.08	0.15	1.00	0.15	0.78	2.00	0.65	5.00 ^
3.00	0.12	0.15	1.00	0.15	0.78	2.00	0.65	5.00 ^
4.00	0.15	0.25	1.00	0.25	0.78	0.19	0.65	5.00
5.00	0.19	2.00	1.00	2.00	0.78	1.56	0.64	2.42
6.00	0.23	2.00	1.00	2.00	0.78	1.56	0.70	2.22
7.00	0.25	2.00	1.00	2.00	0.78	1.56	0.75	2.08
8.00	0.27	2.00	1.00	2.00	0.78	2.00	0.79	5.00 ^
9.00	0.29	2.00	1.00	2.00	0.78	2.00	0.82	5.00 ^

* F.S.<1: Liquefaction Potential Zone. (If above water table: F.S.=5)
^ No-liquefiable Soils or above Water Table.
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

CPT convert to SPT for Settlement Analysis:
Fines Correction for Settlement Analysis:

Depth ft	Ic	qc/N60	qc1 atm	(N1)60	Fines %	d(N1)60	(N1)60s
0.00	-	-	-	13.81	NoLiq	0.00	13.81
1.00	-	-	-	13.81	NoLiq	0.00	13.81
2.00	-	-	-	13.81	NoLiq	0.00	13.81
3.00	-	-	-	13.81	NoLiq	0.00	13.81
4.00	-	-	-	22.63	35.10	0.00	22.63
5.00	-	-	-	43.31	15.80	0.00	43.31
6.00	-	-	-	42.82	15.80	0.00	42.82
7.00	-	-	-	90.62	15.80	0.00	90.62
8.00	-	-	-	100.00	NoLiq	0.00	100.00
9.00	-	-	-	100.00	NoLiq	0.00	100.00

(N1)60s has been fines corrected in liquefaction analysis, therefore d(N1)60=0.
Fines=NoLiq means the soils are not liquefiable.

Settlement of Saturated Sands:
Settlement Analysis Method: Ishihara / Yoshimine

Depth ft	CSRsf	/ MSF*	=CSRm	F.S.	Fines %	(N1)60s	Dr %	ec %	dsz in.	dsp in.	S in.
8.95	0.82	1.00	0.82	5.00	NoLiq	100.00	100.00	0.000	0.0E0	0.000	0.000
8.00	0.79	1.00	0.79	5.00	NoLiq	100.00	100.00	0.000	0.0E0	0.000	0.000
7.00	0.75	1.00	0.75	2.08	15.80	90.62	100.00	0.000	0.0E0	0.000	0.000
6.00	0.70	1.00	0.70	2.22	15.80	42.82	100.00	0.000	0.0E0	0.000	0.000

5.00	0.64	1.00	0.64	2.42	15.80	43.31	100.00	0.000	0.0E0	0.000	0.000

No Settlement of Saturated Sands

Settlement of Saturated Sands=0.000 in.
qc1 and (N1)60 is after fines correction in liquefaction analysis
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=1.00 ft
S is cumulated settlement at this depth

Settlement of Unsaturated Sands:

Depth	sigma'	sigC'	(N1)60s	CSRsf	Gmax	g*Ge/Gm	g_eff	ec7.5	Cec	ec	dsz	dsp	S
ft	atm	atm			atm			%		%	in.	in.	
4.95	0.29	0.19	22.63	0.64	550.86	3.4E-4	1.0000	0.8387	1.19	1.0018	1.20E-2	0.012	0.012
4.00	0.24	0.15	22.63	0.65	495.19	3.1E-4	0.5003	0.4197	1.19	0.5012	6.01E-3	0.199	0.211
3.00	0.18	0.12	13.81	0.65	363.86	3.2E-4	1.0000	1.5891	1.19	1.8980	0.00E0	0.329	0.541
2.00	0.12	0.08	13.81	0.65	297.10	2.6E-4	1.0000	1.5891	1.19	1.8980	0.00E0	0.000	0.541
1.00	0.06	0.04	13.81	0.65	210.09	1.8E-4	0.0443	0.0704	1.19	0.0840	0.00E0	0.000	0.541
0.00	0.00	0.00	13.81	0.65	2.73	2.4E-6	0.0010	0.0016	1.19	0.0019	0.00E0	0.000	0.541

Settlement of Unsaturated Sands=0.541 in.
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=1.00 ft
S is cumulated settlement at this depth

Total Settlement of Saturated and Unsaturated Sands=0.541 in.

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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1 atm (atmosphere) = 1.0581 tsf(1 tsf = 1 ton/ft2 = 2 kip/ft2)
1 atm (atmosphere) = 101.325 kPa(1 kPa = 1 kN/m2 = 0.001 Mpa)

SPT	Field data from Standard Penetration Test (SPT)
BPT	Field data from Becker Penetration Test (BPT)
qc	Field data from Cone Penetration Test (CPT) [atm (tsf)]
fs	Friction from CPT testing [atm (tsf)]
Rf	Ratio of fs/qc (%)
gamma	Total unit weight of soil
gamma'	Effective unit weight of soil
Fines	Fines content [%]
D50	Mean grain size
Dr	Relative Density
sigma	Total vertical stress [atm]
sigma'	Effective vertical stress [atm]
sigC'	Effective confining pressure [atm]
rd	Acceleration reduction coefficient by Seed
a_max.	Peak Ground Acceleration (PGA) in ground surface
mZ	Linear acceleration reduction coefficient X depth
a_min.	Minimum acceleration under linear reduction, mZ
CRRv	CRR after overburden stress correction, CRRv=CRR7.5 * Ksig
CRR7.5	Cyclic resistance ratio (M=7.5)
Ksig	Overburden stress correction factor for CRR7.5
CRRm	After magnitude scaling correction CRRm=CRRv * MSF
MSF	Magnitude scaling factor from M=7.5 to user input M
CSR	Cyclic stress ratio induced by earthquake
CSRfs	CSRfs=CSR*fs1 (Default fs1=1)
fs1	First CSR curve in graphic defined in #9 of Advanced page
fs2	2nd CSR curve in graphic defined in #9 of Advanced page

F.S.	Calculated factor of safety against liquefaction F.S.=CRRm/CSRsf
Cebs	Energy Ratio, Borehole Dia., and Sampling Method Corrections
Cr	Rod Length Corrections
Cn	Overburden Pressure Correction
(N1)60	SPT after corrections, (N1)60=SPT * Cr * Cn * Cebs
d(N1)60	Fines correction of SPT
(N1)60f	(N1)60 after fines corrections, (N1)60f=(N1)60 + d(N1)60
Cq	Overburden stress correction factor
qc1	CPT after Overburden stress correction
dqc1	Fines correction of CPT
qc1f	CPT after Fines and Overburden correction, qc1f=qc1 + dqc1
qc1n	CPT after normalization in Robertson's method
Kc	Fine correction factor in Robertson's Method
qc1f	CPT after Fines correction in Robertson's Method
Ic	Soil type index in Suzuki's and Robertson's Methods
(N1)60s	(N1)60 after settlement fines corrections
CSRm	After magnitude scaling correction for Settlement calculation CSRm=CSRsf / MSF*
CSRfs	Cyclic stress ratio induced by earthquake with user inputed fs
MSF*	Scaling factor from CSR, MSF*=1, based on Item 2 of Page C.
ec	Volumetric strain for saturated sands
dz	Calculation segment, dz=0.050 ft
dsz	Settlement in each segment, dz
dp	User defined print interval
dsp	Settlement in each print interval, dp
Gmax	Shear Modulus at low strain
g_eff	gamma_eff, Effective shear Strain
g*Ge/Gm	gamma_eff * G_eff/G_max, Strain-modulus ratio
ec7.5	Volumetric Strain for magnitude=7.5
Cec	Magnitude correction factor for any magnitude
ec	Volumetric strain for unsaturated sands, ec=Cec * ec7.5
NoLiq	No-Liquefy Soils

References:

1. NCEER Workshop on Evaluation of Liquefaction Resistance of Soils. Youd, T.L., and Idriss, I.M., eds., Technical Report NCEER 97-0022.

SP117. Southern California Earthquake Center. Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California. University of Southern California. March 1999.

2. RECENT ADVANCES IN SOIL LIQUEFACTION ENGINEERING AND SEISMIC SITE RESPONSE EVALUATION, Paper No. SPL-2, PROCEEDINGS: Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, San Diego, CA, March 2001.

3. RECENT ADVANCES IN SOIL LIQUEFACTION ENGINEERING: A UNIFIED AND CONSISTENT FRAMEWORK, Earthquake Engineering Research Center, Report No. EERC 2003-06 by R.B Seed and etc. April 2003.

Note: Print Interval you selected does not show complete results. To get complete results, you should select 'Segment' in Print Interval (Item 12, Page C).