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STATE OF CALIFORNIA
DEPT. OF GENERAL SERVICES

SEP - 1 2015

DIVISION OF THE STATE ARCHITECT
L.A. BASIN REGIONAL OFFICE

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APPL NO. 03/114383 DATE 06/07/2015

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SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Structural steel.
 - 2. Architecturally exposed structural steel.
- C. Related Sections:
 - 1. Section 01 42 00: Testing and Inspection.
 - 2. Section 03 30 00: Cast-In-Place Concrete.
 - 3. Section 04 82 00: Concrete Unit Masonry.
 - 4. ***Section 05 12 13: Architecturally Exposed Structural Steel (12.19.14)***
 - 5. Section 05 30 00: Metal Decking.
 - 6. Section 05 50 00: Metal Fabrications.
 - 7. Section 09 91 00: Paints and Coatings.
 - 8. ***Section 09 96 00: High Performance Coatings (12.19.14)***

1.2 REFERENCE STANDARDS, SPECIFICATIONS AND CODES

- A. CBC Chapter 22A.
- B. American Institute of Steel Construction (AISC):
 - 1. AISC – Steel Construction Manual, 13th Edition, including:
 - a. AISC 360 Specifications for Structural Steel Buildings.
 - b. AISC 303 Code of Standard Practice for Steel Buildings and Bridges.
 - c. RCSC – Specification for Structural Joints Using ASTM A325 or A490 Bolts.
 - 2. AISC 341 - Seismic Provisions for Structural Steel Buildings, March 9, 2005, including Supplement No. 1, November 16, 2005.

3. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 2. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 4. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 5. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
 7. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 Ksi Minimum Tensile Strength.
 8. ASTM A435 - Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.
 9. ASTM A490 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 11. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 12. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 13. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 14. ASTM A673 - Standard Specification for Sampling Procedure for Impact Testing of Structural Steel,
 15. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 16. ASTM A992 – Standard Specification for Structural Steel Shapes.
 17. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).

18. ASTM E23 - Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.
 19. ASTM E112 - Standard Test Methods for Determining Average Grain Size
 20. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-Ksi Yield Strength.
 21. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 22. ASTM F1852 – Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tension Strength.
- D. American Welding Society (AWS):
1. AWS D1.1 – Structural Welding Code - Steel.
 2. AWS D1.8 – Structural Welding Code – Seismic Supplement.
 2. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 3. AWS B2.1 – Specifications for Welding Procedures and Performance Qualification.
- E. SSPC – Steel Structures Painting Council:
1. SP-2 - Hand Tool Cleaning.

1.3 SYSTEM DESCRIPTION

A. Regulatory Requirements:

1. Structural steel shall conform to CBC requirements, except that steel manufactured by acid Bessemer process is not permitted for structural purposes.
2. Sheet and strip steel other than those listed in CBC, if provided for structural purpose, shall comply with DSA requirements.

B. Architectural Exposed Structural Steel (AESS)

1. ***Steel members exposed to view in the final condition to building users other than maintenance staff shall be fabricated and erected according to AISC Code of Standard Practice Section 10 with the following exceptions.***
 - a. ***Tolerances for as-fabricated straightness and as-erected plumbness, levelness and alignment shall be standard AISC tolerances. In other words, no special tolerances in these areas are required for AESS members. (12.19.14)***

1.4 SUBMITTALS

A. Shop Drawings:

1. Submit Shop Drawings, including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection. Fully detail minor connections and fastenings not shown or specified in the Contract Documents to meet required conditions using similar detailing as shown in the Contract Documents. Include a fully detailed, well controlled sequence and technique plan for shop and field welding that minimizes locked in stresses and distortion; submit sequence and technique plan for review by the Architect.
 - a. Include details of cuts, connections, camber, and holes in accordance with Figure 4.5 of AWS D1.1 or AISC 360 Section J1.8, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
 - b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed for Work specified in other sections.
 - c. Erection and Bracing Plan and Erection Procedure: Submit an erection and framing plan, including columns, beams, and girders, signed and sealed by a Structural or Civil Engineer registered in the State of California in accordance with Title 8 CCR, Section 1710, Erection of Structures. Maintain a copy at the Project site as required by the California Division of Industrial Safety.
 - d. Submit a list of steel items to be galvanized.
 - e. Include identification and details of AESS members, if applicable.

B. Product Data:

1. Submit copies of fabricator's specifications and installation instructions for the following products. Include laboratory test reports and other data required demonstrating compliance with these Specifications:
 - a. Structural steel, each type; including certified copies of mill reports covering chemical and physical properties.
 - b. Welding electrodes.
 - c. Welding gas.
 - d. Unfinished bolts and nuts.
 - e. Structural steel primer paint.

- f. High-strength bolts, including nuts and washers.
- C. Manufacturer's Mill Certificate:
 - 1. Submit, certifying that products meet or exceed specified requirements.
- D. Mill Test Reports:
 - 1. Submit manufacturer's certificates, indicating structural yield and tensile strength, destructive and non-destructive test analysis.
- E. Charpy-V-Notch (CVN) Impact Test: Submit certified copies of Charpy-V-Notch (CVN) Impact Test by the manufacturer for applicable steel members and components.
 - 1. Charpy-V-Notch (CVN) Impact Test for Base Metal: Moment frame columns, and girders subjected to Charpy-V-Notch impact test in accordance with AISC 341 Part I, Section 6.3, as modified by Supplement 1.
 - 2. Charpy-V-Notch test shall be performed by the manufacturer employing Test Frequency (P) in accordance with ASTM A673 and utilizing standard specimen sizes shown in Figure 6 of ASTM E23. The absorbed energy in a CVN impact test shall not be less than that specified in Material Part 2 of this section.
- F. Submit certified copies of tests by manufacturer for fine grain practice. Structural steel base material, as described above, shall be manufactured to be fully killed and fine grained having grain size number 5 or better as determined by ASTM E112.
- G. Welding Procedure Specifications (WPS): Submit weld procedures for all welding on project to Owner's testing laboratory for approval. After approval by testing laboratory, submit to Architect for record. Weld procedures shall be qualified as described in AWS D1.5, section 5.12 or 5.13, AISC 341 and AISC 358, as applicable. Weld procedures shall indicate joints details and tolerances, preheat and interpass temperature, post-heat treatment, single or multiple stringer passes, peening of stringer passes for groove welds except for the first and the last pass, electrode type and size, welding current, polarity and amperes and root treatment. The welding variables for each stringer pass shall be recorded and averaged, from these averages the weld heat input shall be calculated. Submit the manufacturer's product data sheet for all welding material used. Welding shall not proceed until WPS have been reviewed and approved by the Engineer of Record.
- H. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1. Shop welders shall be Project certified for FCAW in accordance with AWS D1.1.
- I. Test Reports: Submit reports of tests conducted on shop and field welded and bolted connections. Include data on type of test conducted and test results.

- J. Welding Material Certification: Provide certificate that welding material complies to specifications. Submit to Owner's testing laboratory.

1.5 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", (AISC 303) modified as follows:
 - a. Replace "Structural Design Drawings" with "Contract Documents" throughout the document.
 - b. Paragraph 3.2 is hereby modified in it's entirety as follows:

"Contract Documents including but not limited to architectural, mechanical, plumbing, electrical, civil and kitchen design drawings and specifications shall be used as supplement to the structural plans to define configurations and construction information."
 - c. Delete Paragraph 3.3.
 - d. In Paragraph 4.4, delete the following sentence:

"These drawings shall be returned to the Fabricator within 14 calendar days."
 - e. Delete Paragraph 4.4.1.(a) in it's entirety.
 - f. Paragraph 4.4.2 is hereby modified in it's entirety as follows:

"No review action, implicit or explicit, shall be interpreted to authorize changes in the Contract Documents."
2. AISC 360 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
3. AISC 341 – Seismic Provisions for Structural Steel Buildings
4. AISC 358 – Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications
5. Perform welding in accordance with AWS Standards, AWS D1.1, and California Building Code Section 2204A.1 and approved Weld Procedure Specifications (WPS).
6. Structural Joint Reference Specification - The Specifications for Structural Joints Using ASTM A325 or ASTM A490 Bolts established by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, hereinafter referred to as "Ref Spec".

- B. Shop fabrication shall be inspected in accordance with CBC.

- C. Erect mock-up panel of fabricated structural steel meeting Architecturally Exposed Structural Steel (AESS) tolerances for exposed areas. Approval by Architect is required. Mock-up to remain for comparison but may not be left as part of the work.
- D. Qualifications of Fabricator: Fabricate structural steel in shop of a licensed fabricator, AISC certified, in the same category of the scope of this project. City of Los Angeles certification in lieu of AISC certification is acceptable.
- E. Source Quality Control: Refer to Section 01420. Testing Laboratory shall perform conformance testing in accordance with CBC Section 2212A.1.
 - 1. Identified Structural Steel: Tests are waived for steel identified by heat number, accompanied by mill analyses and mill test reports, and properly tagged with an Identification Certificate so as to be readily identified for conformance with applicable ASTM. Comply with CBC Section, 2212A and/or 1704A.
 - 2. Unidentified Structural Steel: Steel not identified and certified as specified above shall be tested according to following requirements. Structural steel fabricator shall cut samples under direction of the Special Inspector and Testing Laboratory shall machine or otherwise prepare the specimens and perform testing of each 5 tons or fraction thereof for each size of unidentified steel except, in the case of random pieces or of steel having F_y greater than 36 Ksi, testing of each piece is required. Tests required are:
 - a. For pipe, one tension and elongation test and one flattening test for each size.
 - b. For all other steel, one tension and elongation test and one bend test for each size.
 - c. Contractor shall reimburse to Owner all costs paid by Owner for testing unidentified steel.
 - 3. Testing and Inspection of High Strength Bolts, Nuts, and Washers: According to CBC Section 2212A.2 and associated ASTM standards.
- F. Erection and Bracing Plan and Procedure: Refer to Section 1710, Title 8, CCR, and Building Code. Employ and pay a California registered civil engineer to prepare an erection and bracing plan and erection procedure for structural steel including columns, beams, and girders, who shall be solely responsible for its compliance. Follow the plan and procedure exactly. Keep a copy at the job site as required by California Division of Industrial Safety. File two copies of stamped erection and bracing plan and procedure for record purposes only, not for review or approval.
- G. Testing & Inspection shall comply with the following:
 - 1. CBC Section 2212A.1 Tests of Structural Steel. All steel used for structural purposes shall be identified as required by CBC Section 2203A. Manufacturer's mill analyses and test reports are acceptable for properly

identified steel, but the enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified for the structure.

2. EXCEPTION: No mechanical tests are required for unidentified steel when the minimum yield stress required by the design is less than or equal to 25 ksi (172 Mpa) and the steel is not part of the designated lateral-force-resisting system.
3. CBC Section 2212A.2 Tests of High-strength Bolts, Nuts and Washers. High-strength bolts, nuts and washers shall be sampled and tested by an approved independent testing laboratory for conformance with the requirements of Division III.
4. CBC Section 2212A.3 Tests of End-welded Studs. End-welded studs shall be sampled, tested and inspected per the requirements of the Structural Welding Code – Steel, published by the American Welding Society.
5. CBC Section 1704A.3.2.1 Inspection of Shop Fabrication. Inspection of shop fabrication shall be required for significant structural detailed connection and fabrication work as directed by the enforcement agency. This inspection shall be made by a qualified inspector approved by the enforcement agency. The inspector shall furnish the architect, structural engineer and the enforcement agency with a report that the materials and workmanship conform to the approved plans and specifications.
6. CBC Section 1704A.3.1.1 Inspection of Welding. Inspection of all shop and field welding operations, including the installation of automatic end-welded stud shear connectors shall be made by a qualified welding inspector approved by the enforcement agency. Such inspector shall be a person trained and thoroughly experienced in inspecting welding operations. The inspector's ability to distinguish between sound and unsound welding shall be reliably established. The minimum requirements for a qualified welding inspector shall be as those for an AWS certified welding inspector (CWI), as defined in the provisions of the ANSI/AWS QCI-1-96, Standard for AWS Certification of Welding Inspectors published by the American Welding Society. All welding inspectors shall be approved by the enforcement agency.
7. The ability of each welder to produce sound welds of all types required by the work shall be established by welder qualification satisfactory to the enforcement agency.
8. Welding inspection of structural welding shall conform to the requirements of AWS D1.1 Structural Welding Code – Steel, published by the American Welding Society, except as modified by this section.
9. Welding inspection of cold-formed steel members shall conform to the requirements of AWS D1.3.

10. The welding inspector shall make a systematic record of all welds. This record shall include in addition to other required records:
 - a. Identification marks of welders.
 - b. List of defective welds.
 - c. Manner of correction of defects.
11. The welding inspector shall check the material, equipment, details of construction and procedure, as well as the welds. The inspector shall also check the ability of the welder. The inspector shall verify that the installation procedure for automatic end-welded stud shear connectors is in accordance with the requirements of AWS D1.1, Structural Welding Code – Steel, published by the American Weld Society and the approved plans and specifications. The inspector shall furnish the architect, structural engineer and the enforcement agency with a verified report that the welding is proper and has been done in conformity with AWS D1.1, Structural Welding Code – Steel, published by the American Welding Society and the approved plans and specifications. The inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics or any other aid to visual inspection, which the inspector may deem necessary to be assured of the adequacy of the welding.
12. EXCEPTION: Plant welding inspection of open-web steel joists may be waived with the approval of the enforcement agency where welding inspection is provided at the jobsite.
13. CBC Section 1704A.3.3 Inspection of High Strength Bolt Installations. Inspection of high-strength bolt installations shall be made by an inspector specially approved for that purpose by the enforcement agency. The inspector shall check the materials, equipment, details of construction and installation procedure. The inspector shall furnish the architect, structural engineer and the enforcement agency with a report that the work has been completed in every material respect in compliance with the approved plans and specifications.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store structural steel above grade on platforms, skids or other supports.
- B. Protect steel from corrosion.
- C. Store welding electrodes in accordance with AWS D 12.1. Deliver electrodes to the site in unbroken packages bearing the manufacturer's name and label identifying the contents.
- D. Store other materials in a weather-tight and dry place until installed into the Work.

1.7 PROJECT SITE CONDITIONS

- A. Site Measurements: Take field measurements as required. Report any major discrepancy between Drawings and field dimensions.
- B. Protection of Floors: Use caution to protect floor slab and adjacent Work from damage. Do not overload floors. Use rubber tired equipment to handle and move steel. Do not place steel members directly on floor; use pads of timber or like material for cushioning.
- C. Temporary Flooring: Provide necessary temporary planking, scaffolding, and flooring for erection of structural steel or support of erection machinery. Conform use of temporary floors or steel decking to Code.
- D. Connection of Steel Decking Temporary Flooring: Temporarily weld steel decking to supports where used as a working platform. Distribute concentrated loadings from welding machines and other heavy machinery with planking or equal. Replace decking damaged by use as a working platform at no additional contract cost.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Stock Materials: Provide exact materials, sections, shapes, thickness, sizes, weights, and details of construction indicated on Drawings. Changes because of material stock or shop practices will be considered if net area of shape or section is not reduced thereby, if material and structural properties are at least equivalent, and if overall dimensions are not exceeded.
- B. All shapes, bars, plates, tubes and pipes shall be made of materials with at least 16% recycled content if produced from Basic Oxygen Furnace (BOF) or at least 67% recycled content if produced from Electric Arc Furnace (EAF).

2.2 MATERIALS

- A. Structural Steel: See structural drawings for detailed list of steel shape ASTM designation requirements.
- B. Threaded Fasteners: See structural drawings for ASTM designations.
- C. High-Strength Threaded Fasteners: See structural drawings for ASTM designations.
- D. Anchor Bolts: See structural drawings for ASTM designations.
- E. Primer: Use types acceptable to governing air quality management officials.
 - 1. For above-grade locations: Lead free metal primer, Tnemec 10-99 or Rust-Oleum X-60.
 - 2. For below grade applications: Coal-tar epoxy coating, two coats, 5 mils per coat. Perma Bar, as manufactured by Karlee Co., Burbank, CA, or equal. Touch-up on job site with Perma-Bar coal-tar epoxy, match finish coat thickness.

- F. Clevis & Turnbuckle materials to be C-1035 and shall have the capacity to resist loads equal to or greater than those specified in the Manual of Steel Construction – Allowable Stress Design, Ninth Edition Tables on 4-148 & 4-149. Supply Structural Engineer of Record evidence of conformance to the specified classifications and capacities.
- G. Galvanizing: ASTM A123.
- H. Welding Electrodes: Provide electrodes recommended by manufacturer for seismic connections.
 - 1. Comply with AISC 341.
- I. Shear stud connectors: ASTM A108, Grade 1015 forged steel, headed, uncoated, granular flux filled shear connector or anchor studs by Nelson Stud Welding Division of TRW, Lorain, OH, or equal.
- J. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time. Grout shall be non-gas-forming, free of oxidizing catalysts and inorganic accelerators, performance and characteristics when mixed to a fluid consistency meeting CRD-C-79 and CRD-C-588, non-staining type in exposed areas.

2.3 FABRICATION

- A. Cleaning and Straightening Materials: Materials being fabricated shall be thoroughly cleaned of scale and rust, and straightened before fabrication. Cleaning and straightening methods shall not damage material. After punching or fabrication of component parts of a member, twists or bends shall be removed before parts are assembled. Produce finished members free from twists, bends, and open joints when erected.
- B. Drilling, Punching, and Reaming: Hole burning to make or enlarge previous holes is allowed only with prior approval. Prepare required holes in structural steel members for attachment or passage of Work of other trades. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Enlarge holes only by reaming. Poor matching of holes is cause for rejection.
- C. Milling: Compression joints depending on contact bearing shall be furnished with bearing surfaces prepared to a common plane by milling.
- D. Use of Burning Torch: Oxygen cutting of members shall be performed by machine. Gouges greater than 1/16 inch that remain from cutting shall be removed by grinding. Reentrant corners shall be shaped notch free to a radius of at least 1 inch. Gas cutting of holes for bolts or rivets is not permitted.
- E. Galvanizing: After fabrication, items indicated or specified to be galvanized shall be galvanized in largest practical sizes. Fabrication includes operations of shearing, punching, bending, forming, assembling or welding. Galvanized items

shall be free from projections, barbs, or icicles resulting from the galvanizing process.

F. Welding:

1. Type of steel furnished in welded structures shall provide chemical properties suitable for welding as determined by chemical analysis. Welds shall conform to the verification and inspection requirements of CBC Chapter 17A. Conform to AWS D1.1, and CBC Chapter 22A.
2. Materials and workmanship shall conform to the requirements specified herein and to CBC requirements, modified as follows:
 - a. No welded splices shall be permitted except those indicated on Drawings unless specifically reviewed by the Architect.
 - b. Drawings will designate joints in which it is important that welding sequence and technique be controlled to minimize shrinkage stresses and distortion.
3. Welding shall be performed in accordance with requirements of the AWS Structural Welding Code.
 - a. Welded Joint Details: Comply with AISC 341, AISC 358 and drawing details.
4. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for Architecturally Exposed Structural Steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.
5. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Shop Finish:

1. Notify the IOR when Work is ready to receive shop prime coat. Work shall be inspected by the IOR before installation of primer.
2. Structural steel and fittings, except galvanized items, which will be exposed when building is completed, shall receive a coat of primer.
3. The primer specified shall be spray applied, filling joints and corners and covering surfaces with a smooth unbroken film. The minimum dry film thickness of the primer shall be 2.0 mils.
4. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete or high strength bolted.

H. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

- I Fabricate Architecturally Exposed Structural Steel with exposed surfaces smooth, square, and free of surfaces blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
 - 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.
 - 2. Comply with fabrication requirements, including tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.
- J. Architecturally Exposed Structural Steel: use special care in unloading, handling and erecting the steel to avoid marking or distorting the steel members. Minimize damage to any shop paint when temporary braces or erection clips are used. Avoid unsightly surfaces upon removal. Grind smooth tack welds and holes filled with weld metal or body solder. Plan and execute all operations in such a manner that the close fit and neat appearance of the structure will not be impaired.
- K. Reduced Beam Sections (RBS's): Fabrication of RBS's as defined in AISC 341 and 358.
- L. Contact: Pin components parts of built-up members and maintain in close contact using clamps or temporary bolting during welding operations. Accurately mill compression bearing surfaces of joints depending on contact bearings or saw cut square to axis, or as detailed. Cut other joints straight and true.
- M. Joining: Provide members of the sizes, weights, shapes, and arrangements indicated, closely fitted and finished true to line and in precise position as necessary to allow proper joining of parts in the field. Drifting to enlarge unfair holes is not allowed without prior approval.
- N. Holes For Anchor Bolts: Punch and drill or ream holes in base and bearing plates. Do not make or enlarge the holes by burning except for grouting holes in column bases without prior approval by the Architect.

2.4 CONNECTIONS:

- A. Make connections with bolts as noted on the Structural Drawings.
- B. High-Strength Steel Bolting: For joints connected by high strength steel bolts, hardened washers, and nuts tightened to high tension, conform materials, method of installation and tension control, and wrenches to Reference Standards and CBC Chapter 22A, Division III. Install all high-strength bolts under inspection required by CBC Section 1704A.3.3.
 - 1. Connections shall be the "bearing bolt type" (A325-N) unless noted to be "slip-critical" (A325-SC and A490-SC). Refer to drawings. All bolts of Seismic Load Resisting System (SLRS) shall be pretensioned meeting the requirements for slip critical fraying surfaces in accordance with AISC 360-05, Section J3.8 with a class 'A' surface per section 7.2 of AISC 341-05.
 - 2. Bolt lengths shall be the grip plus 1-1/4".

3. Tightening of nuts shall be done with properly calibrated wrenches or by the turn-of-the-nut method for A325-SC and A490-SC bolts. Tightening of the nuts for A325-N bolts to snug tightness shall be to Ref. Spec. Allowable bolt stresses shall conform to CBC Chapter 22A and referenced standards.
 4. Check calibrated wrenches individually for accuracy not less than once daily for actual conditions of application.
 5. Clean all contact surfaces of bolted parts and threads free of scale, slag, burrs, pits, dirt, paint, and other foreign material or defects which would prevent solid seating of connected parts.
 6. Install hardened washers per AISC Standards and CBC Chapter 22A.
 7. Tighten bolts systematically from most rigid part of connection to the free edges.
 8. Retighten first installed bolts that may have loosened by tightening of subsequent bolts so all bolts are tightened to correct tension.
 9. Mark fully tightened bolts with identifying symbol.
 10. The contractor shall torque test 25% of the bolts in connections designated with A325-SC or A490-SC Bolts.
- C. Load Indicator Washers: As manufactured and licensed by Cooper and Turner, Bethlehem Steel, or approved equal, may be used for the field installation of the high-strength bolts. Load indicator washers may not be substituted for any required washer, but may be used in conjunction with the required washers. Conform tightening to Paragraph 5e of the Reference Spec listed under Section 1.2 . After sufficient bolts in a joint are snugged to bring the members into close contact, tightening shall progress from the most rigid part to the free edges until the load indicators on all bolts are closed to the required gap of 0.015" under bolt heads or 0.010" under the nuts. Do not completely close the gap to prevent overtightening and damage to the bolts. Conform to ASTM F959, A325 and A490.
- D. Tension Set or Load Indicator Bolts, Nuts, and Washers: As manufactured by Cold Form Specialties, Bethlehem Steel, or approved equal, may be used for field installation of the high-strength bolts. In multi-bolt joints, the nuts shall be tightened in stages (a little at a time) without breaking the spline in any of them until the final stage, to minimize slackening of the installed bolts.

2.5 WELDING:

- A. Conform to CBC Section 1704A.3.1.1, AWS D1.1 as modified by referenced AISC Standards, and as indicated or noted on Drawings. Employ welding operators qualified in accordance with AWS D1.1, as applicable, who are thoroughly trained and experienced in arc welding and that produce uniformly reliable groove and fillet welds in flat, vertical, and overhead positions, and make neat and consistent welds. Weld all structural steel joints by shielded electric-arc method unless otherwise shown, specified, or approved. Conform welding in

both shop and field, including the prequalification of welds and welder qualifications, to AWS D1.1.

- B. **Storage and Care of Electrodes:** Coatings of low-hydrogen type electrodes shall be thoroughly dry as used. Conform to AWS D1.1; use electrodes as taken from hermetically sealed packages within time limit specified therein after package is opened. Electrodes not used within allowable time period and electrodes that have been exposed more than one hour to air having a relative humidity of 75% or greater, or as required by the manufacturer, shall be dried according to AWS D1.1 before they are used, or shall be reconditioned according to electrode manufacturer's recommendations. Electrodes so dried or reconditioned not used within allowable time period after drying is completed shall be redried before use. Electrodes of any class that have been wet shall not be used under any conditions.
- C. **Preparation:** Clean steel surfaces to be welded of all paint, grease, oil, mill scale, and foreign matter. Clean weld each time the electrode is changed. Chip full surface of hand guided and controlled flame cut edges before welding. Surfaces prepared with automatic or mechanically guided and controlled equipment need not be ground or chipped before welding.
- D. **Weld Finishing:** Grind exposed welds subject to contact to smooth surfaces free of holes, slag, or other defects, flush with the adjoining surfaces. No finish treatment is required for permanently concealed welds and other exposed welds.
- E. **Procedures:** During assembling and welding, hold components of a built-up member with adequate clamps or other means to keep parts straight and in close contact. Do no welding in wind until adequate protective screening is set up. Cut out defective welds or parts of welds with a chisel or air arc and replace.
- F. **Weld Characteristics:** Conform to AWS D1.1, Chapter 8, Statically Loaded Structures. Clean and wire brush all welds. Visual inspection of finished welds must show uniform section, smoothness of welded metal, feather edges without undercuts or overlays, freedom from porosity and inclusions, and good fusion and penetration into base metal at edges and ends of fillet welds.

2.6 SHOP PRIMING

- A. Clean surfaces according to AISC Specifications. Apply one shop coat of specified metal primer to minimum 1.0 mil dry film thickness. Work primer into joints. Do not prime the following:
 - 1. Steel surfaces embedded in concrete or masonry with the exception of those steel surfaces that support anchored brick veneer.
 - 2. Contact surfaces of high-strength bolted connections or field welded connections.
 - 3. Surfaces to receive directly adhered fireproofing.
- B. ***Cleaning of exterior steel members exposed to atmosphere and concealed members located outside exterior weatherproofing envelope:***

1. ***Preparation: Clean by SSPC SP6 - Commercial Blast Cleaning.***
2. ***Primer: Organic Urethane Zinc Rich conforms to SSPC Paint 20 type II and with the requirements of AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts" for a Class B Coating by testing method to determine the slip coefficient for coatings used in bolted connections. Products known to comply include the following: Tnemec Company: 90-97 Tneme-Zinc @ 2.5 to 3.5 mils DFT.***
3. ***Do not paint within 2 inches of field welds and on contact surfaces of slip-critical connections.***
4. ***Clean and paint surfaces inaccessible after shop assembly prior to assembly. (12.19.14)***

2.7 SHOP AND FIELD QUALITY CONTROL

- A. A special inspector, approved by DSA to inspect the Work of this section, shall inspect high-strength bolted connections. The Owner will provide a DSA approved independent testing laboratory to perform tests and prepare test reports in accordance with CBC 1704A.3.3. The IOR shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.
- B. An AWS CWI certified special inspector, approved by DSA to inspect the Work of this section, shall inspect welded connections in accordance with CBC 1704A.3.1. The Owner will provide a DSA approved independent testing laboratory to perform tests and prepare test reports. The IOR shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.
- C. The independent testing laboratory shall conduct and interpret test and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.
- D. Provide access to all places where structural steel Work is being fabricated or produced so required inspection and testing can be performed.
- E. The independent testing laboratory may inspect and/or test structural steel at plant before shipment; however, Architect reserves the right at any time before Contract Completion to deem materials not in compliance with the specified requirements as defective Work.
- F. Correct defects in structural Work when inspections and laboratory test reports indicate noncompliance with specified requirements. Perform additional tests as may be required to reconfirm noncompliance of original Work, and as may be required to show demonstrate compliance of corrected Work.
- G. Welding: Inspect and test during fabrication and erection of structural steel assemblies as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the Work. Record Work required and performed to correct deficiencies.
2. Inspect welds. Welds shall be visually inspected before performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. Testing shall be performed to AWS D1.1 Table 6.3 cyclically loaded non-tubular connections.
3. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Repair and test defective welds.
4. Rate of Testing: Completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.
5. Welds, when installed in column splices, shall be tested by either ultrasonic testing or radiography.
6. Base metal thicker than 1-1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected by shear wave methods for discontinuities directly behind such welds. Tests shall be performed at least 48 hours after completed joint has cooled down to ambient air temperature.
7. Any material discontinuities shall be reviewed based on the defect rating in accordance with the criteria of AWS D1.1 table 6.3 by the Architect and DSA.
8. Other method of non-destructive testing and inspection, for example, liquid dye penetrate testing, magnetic particle inspection or radiographic inspection may be performed on weld if required.
9. Lamellar Tearing: Lamellar-tearing resulting from welding is a crack (with zero tolerance) and shall be repaired in accordance with AWS D1.1.
10. Lamination: The rejection criteria shall be based on ASTM A435.
11. Where testing reveals lamination or conditions of lamellar tearing in base metal, the steel fabricator shall submit a proposed method of repair for review by the Architect. Test repaired areas as required.
12. Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1 – Qualification.

- H. Lamellar Tearing: Prior to welding plates 1 to 1-1/2 inches thick and greater and rolled shapes within the distance from 6 inches above the top of the joint to 6 inches below the bottom of the joint shall be checked by ultrasonic testing for laminations in base metal which may interfere with the inspection of the completed joint. Should these defects occur, members will be reviewed by the Architect and DSA. Welding procedure specifications in sub-section 1.5G specify welding practices to minimize lamellar tearing.
- I. Prior Testing of Base Material: Test material before fabrication.
- J. Lines and levels of erected steel shall be certified by a State of California licensed surveyor as set forth in related Division 01 section.
- K. Welded studs shall be tested and inspected by the special inspector in accordance with requirements of AWS D1.1 – Stud Welding.
- L. Record Drawings: After steel has been erected, correct or revise Shop Drawings and erection diagrams to correspond with reviewed changes performed in the field.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify governing dimensions and conditions of the Work before commencing erection Work.
 - 1. Report discrepancies between drawings and field dimensions to Architect before commencing work.
 - 2. Beginning of installation means erector accepts existing conditions and surfaces underlying or adjacent to work of this section.
- B. Provide temporary shoring and bracing, and other support during performance of the Work. Remove after steel is in place and connected, and after cast-in-place concrete has reached its design strength.

3.2 ERECTION

- A. Install structural steel accurately in locations, to elevations indicated, and according to AISC specifications and CBC requirements.
- B. Clean surfaces of base plates and bearing plates.
 - 1. Install base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate before packing with grout.
- C. Maintain erection tolerances of structural steel within AISC Code of Standard Practice for Steel Buildings and Bridges.

1. Architecturally Exposed Structural Steel members and components, plumbed, leveled and aligned to a tolerance not to exceed one-half the amount permitted for structural steel. Contractor to provide adjustable connections between Architecturally Exposed Structural Steel and the structural steel frame or the masonry or concrete supports, in order to provide the erector with means for adjustment.
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact after assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
- E. Do not permit thermal cutting during erection of structural steel.
- F. Where indicated for field connections, provide standard bolts complying with ASTM A307.
- G. Install high strength steel bolts at locations indicated. Assembly and installation shall be in accordance with CBC requirements.
 1. Allowable hole sizes: 1/16 inch larger than bolt size except as noted.
 2. Use friction type connection with standard hardened steel circular, square or rectangular washer under bolt nut.
 3. Thoroughly clean area under bolt head, nut and washer. Remove all paint, lacquer, oil or other coatings except organic zinc-rich paints in accordance with SSPC, SP-2.
 4. Tighten bolts by power torque wrench or hand wrench until twist-off.
- H. Contractor shall be responsible for correcting detailing and fabrication errors and for correct fitting of all members and components.
- I. Erect structural steel plumb and level and to proper tolerances as set forth in the AISC Manual. Provide temporary bracing, supports or connections required for complete safety of structure until final permanent connections are installed.
- J. Steel Columns: Set column bases in exact position for alignment, plumb and straight, supported on adjustable bolt supports or shims until grout has set. Set center of base true to column center within 1/16" and adjust column height exactly. Maintain bases at exact position and level during grouting. Fill grout space solid with non-shrink grout.
- K. Provide anchor bolts with templates and diagrams. Contractor shall be responsible for proper location and installation of bolts. Correct deficiencies and errors.
- L. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

- M. Connections: Hold steel in correct position during welding and bolting, and provide for dead loads, wind, and all erection stresses. Do no welding or final bolting until members have been aligned and plumbed.
 - 1. Field Welding: Conform to requirements for shop fabrication.
 - 2. Common Bolts: Tighten and upset bolt threads to preclude loosening, or use approved self-locking nuts.
 - 3. High-Strength Bolting: Tighten by turn of the nut method or with calibrated torque wrenches as specified for the shop high-strength bolting and according to Code, AISC Standards and the Reference Standard.
- N. Damaged Members: During erection, straighten or replace members which are bent, twisted, or damaged as directed. If heating is required, perform heating by methods that ensure a uniform temperature throughout the entire member. When directed, remove members damaged to an extent impairing appearance, strength, or serviceability and replace with new members at no extra cost to the Owner.
- O. Employ qualified riggers and plan erection to require minimum cutting. Erect members plumb, true to line and level, and in precise positions. Provide temporary bracing and guying to resist loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation.

3.3 FITTING

- A. Closely fit members, finished true to line and in precise position required to allow accurate erection and proper joining in the field.
- B. Drilling to enlarge unfair holes will not be allowed. Allow only enough drifting during assembly to bring parts into position, but not enough to enlarge holes or distort the metal. Do not heat rolled sections, unless approved by Architect.

3.4 PUNCHING AND DRILLING

- A. Punch material 1/16 inch larger than nominal diameter of bolt, wherever thickness of metal is equal to or less than the diameter of the bolt plus 1/8 inch.
- B. Drill or sub-punch and ream where metal is equal to or more than the diameter of the bolt plus 1/8 inch. Make diameter for sub-punched and sub-drilled holes 1/16 inch larger than nominal diameter of bolt.
- C. Precisely locate holes to ensure passage of bolt through assembled materials without drifting. Enlarge holes when necessary to receive bolts by reaming; flame cutting to enlarge holes is not acceptable. Structural Steel members with poorly matched holes will be rejected.

3.5 FINISHING

- A. After erection, spots or surfaces where paint has been removed, damaged, or burned off and field rivets, bolts, and other field connections not concealed in the work, shall be cleaned of dirt, oil, grease, and burned paint and furnished with a spot coat of the same primer installed during shop priming.

- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Install paint to exposed areas with the same material installed during shop painting. Install by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- C. ***Painting: All Steel members exposed to view in the final condition to building users other than maintenance staff shall be finished per 09 96 00 High Performance Coatings. (12.19.14)***

3.6 FIELD QUALITY CONTROL

- A. Owner will provide a special inspector and independent testing laboratory to perform field inspections and tests and to prepare test reports.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. All welders shall be qualified for each process and position per the latest edition of AWS D1.1, Chapter 4, Part C - Performance Qualifications. The welder's qualification shall be considered as remaining in effect indefinitely unless the welder is not engaged in a given process of welding for which the welder is qualified for a period exceeding six months or unless there is some specific reason to question a welder's ability.
- D. Inspection of Shop Fabrication: Required for structural steel according to CBC Section 1704A.3.2.1.
- E. Inspection of Shop and Field Welding: Required for all structural steel according to CBC Section 1704A.3.1.1.
- F. Inspection of High Strength Bolt Installation: Required for both shop and field installation according to CBC Section 1704A.3.3 and 2212A.2.
- G. Erection Inspection: Inspector shall inspect all erection including the grouting under base plates
- H. Non-Destructive Welding Inspection: The Special Inspector(s) shall continuously inspect and test all welds by ultrasonic or other non-destructive tests as approved. Test procedure for ultrasonic tests shall conform to AWS D1.1 and requirements herein.
 - 1. Required Testing: Test following welds by ultrasonic testing method:
 - a. Full Penetration Groove welded connections of column to column, column to girder, girder to girder, and like connections.
 - b. Other welded connections indicated to be ultrasonically tested on Structural Drawings.
 - c. Other welds directed to be ultrasonically tested by the Architect, Structural Engineer, or Inspector Of Record.

2. Ultrasonic Testing: An AWS Certified Welding Inspector, approved by DSA shall operate ultrasonic testing equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Defective welds shall be repaired in accordance with AWS D1.1, latest revision, and costs for retesting defective welds shall be responsibility of the Contractor. Tests shall be complete tests according to AWS D1.1, latest revision.
3. Rate of Testing: Test welds requiring ultrasonic testing at 100 percent. No reduction in testing rate will be permitted.
4. Backing Strips: Remove backing strips whenever ultrasonic indications arising from weld roots can be interpreted as either a weld defect or a backing strip, and retest weld if no root defect is visible. If no defect is disclosed by retest and no significant amount of the base and weld metal is removed, joint needs no further repair or welding. Repair all defects disclosed. Contractor shall bear the cost of removals and repairs.
5. Ultrasonic Instrumentation: Calibrated by technician to evaluate the quality of welds in accordance with AWS D1.1-06, Sections 5 and 6.
6. Acceptance Criteria: In accordance with larger reflector criteria of AWS D1.1, latest revision.

3.7 CLEAN UP

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

3.8 PROTECTION

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

3.9 HANDLING

- A. Both in shop and in the field, transport, handle and erect to prevent damage or overstressing of any component.

END OF SECTION

SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel. (AESS)
 - 1. Refer to Section 05 12 00 - 'Structural Steel' for all other requirements regarding steel work not included in this section.

1.02 SUBMITTALS

- A. See Section 01 33 13 Submittal Procedures.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of AESS components.
 - 1. Provide erection drawings clearly indicating which members are considered as AESS members.
 - 2. Include details that clearly identify all of the requirements listed in sections 2.03 "Fabrication" and 3.03 "Erection" of this specification. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
 - 4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate which direction bolt heads should be oriented.
 - 5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
 - 6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
- D. Qualification data for firms and persons specified in the 'Quality Assurance' Article to demonstrate their capabilities and experience. Include

lists of completed projects names and address, names and addresses of architects and Glendale Unified School Districts, and other information specified.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Division 5 Section 'Structural Steel', engage a firm experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.
- B. Erector Qualifications: In addition to those qualifications listed in Division 5 Section 'Structural Steel', engage an experienced Erector who has completed AESS work similar in material, design, and extent to that indicted for this Project and with a record of successful in-service performance.
- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges," latest edition, Section 10 as amended herein.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. One full panel section of guardrail attachment to stair stringer per 1/A10.70. Include all horizontal and vertical HSS and woven wire mesh panel attachments.
 - 2. Do not proceed with remaining work until workmanship are approved by Architect.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.
- C. Erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning members frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by Project Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by Project Architect prior to erection.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.06 COORDINATION

- A. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. Anchorage concepts shall be as indicated on drawings and approved on final shop drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Meet requirements Division 5 Section 'Structural Steel' as amended below.
- B. High-Strength Bolts, Nuts, and Washers: Per section 05120 heavy hex heads and nuts Provide rounded bolt heads with twist off bolts. Provide standard carbon steel Cadmium plated Mechanically galvanized finish.

2.02 PRIMERS

- A. Compatibility: The General Contractor shall submit all components/procedures of the paint system for AESS as a single coordinated submittal. As a minimum identify required surface preparation, primer, intermediate coat (if applicable) and finish coat. All of the items shall be coordinated with the finish coat specified in division 9.
- B. Primer: Fast curing, universal modified alkyd, rust inhibiting shop coat with good resistance to normal atmospheric corrosion. Primer shall comply with all federal standards for VOC, lead and chromate levels
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds and repair painting galvanized steel, with dry film coating not less than 90 percent zinc dust by weight.

2.03 FABRICATION

- A. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Project Architect. Detail AESS assemblies to minimize field handling and expedite erection.
- B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock up. Use special care in handling and shipping of AESS both before and after shop painting.
- C. In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.
 - 1. Welds ground smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within+ 1/16", -0" of plate thickness.
 - 2. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.
 - 3. Continuous Welds: Where welding is noted on the drawings, provide continuous welds of a uniform size and profile.
 - 4. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
 - 5. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8" ± 1/32 at all copes and blocks.
 - 6. Joint Gap Tolerance: Maintain a uniform gap of 1/8" ± 1/32.
 - 7. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.
 - 8. Mill Mark Removal: Fabricator shall deliver steel with no mill marks (stenciled, stamped, raised etc) in exposed locations. Mill marks shall be omitted by cutting of mill material to appropriate lengths where possible. Where not possible, the fabricator may fill and/or grind to a surface finish consistent with the approved mock up.
 - 9. Grinding of sheared edges: Fabricator shall grind all edges of sheared, punched or flame cut steel to match approved mockup.
 - 10. Seal Welds: Seal weld open ends of round and rectangular hollow structural section with

3/8" closure plates. Provide continuous, sealed welds at angle to gusset plate connections and similar locations where AESS is exposed to weather.

2.04 SHOP CONNECTIONS

- A. Bolted Connections: Make in accordance with Section 05120. Provide bolt type and finish as noted herein and align bolt heads as indicated on the approved shop erection drawings.
- B. Weld Connections: Comply with AWS D1.1 and Section 05120. Appearance and quality of welds shall be consistent with the mock up. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.

2.05 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections, if primer does not meet the specified AISC slip coefficient.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC Specifications as follows:
 - 1. SSPC-SP 3 "Power Tool Cleaning." (This level of surface prep is the minimum for most AESS projects. It may be acceptable for alkyd primers and acrylic or alkyd finish coats, particularly in interior applications.)
 - 2. Coordinate the required blast profile with the approved paint submittal prior to beginning surface preparation.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.06 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to AESS indicated for galvanizing according to ASTM A 123. Fabricate such that all connections of assemblies are made in the field with bolted connections. Provide galvanized finish on members and assemblies within the range of color and surface textures presented in the mock ups.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by Project Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION

- A. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. In addition to the special care used to handle and erect AESS, employ the following erection techniques:
 1. AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per Chapter 7 of the AISC "Code of Standard Practice for Steel Buildings and Bridges.
 2. AESS Erection Tolerances: Erection Tolerances shall meet the requirements of chapter 10 of the AISC "Code of Standard Practice for Steel Buildings and Bridges".
 3. Welds ground smooth: Erector shall grind welds smooth in the connections of AESS members. For groove welds, the weld shall be made flush to the surfaces each side and be within $\pm 1/16"$, $-0"$ of plate thickness.
 4. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required and grind to provide

a smooth transition and match profile on approved mock-up.

5. Continuous Welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
 6. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
 7. Bolt Head Orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.
 8. Removal of field connection aids: Run out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up, and welding in the field shall be removed from the structure. Field groove welds shall be selected to eliminate the need for backing bars or to permit their removal after welding. Welds at run out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth.
 9. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled. Filling shall be executed with proper procedures to minimize restraint and address thermal stresses in group 4 and 5 shapes.
- C. Field Welding: Weld profile, quality, and finish shall be consistent with mock-ups approved prior to fabrication.
- D. Splice members only where indicated.
- E. Obtain permission for any torch cutting or field fabrication from Project Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.
- F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are mis aligned where holes cannot be aligned with acceptable final appearance.

3.04 FIELD CONNECTIONS

- A. Bolted Connections: Install bolts of the specified type and finish in accordance with Division 5 section "Structural Steel".

- B. Welded Connections: Comply with AWS D1.1 for procedures, and appearance. Refer to Division 5 section "Structural Steel" for other requirements.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.
 - 2. Obtain Project Architects approval for appearance of welds in repaired or field modified work.

3.05 FIELD QUALITY CONTROL

- A. Structural requirements: The Glendale Unified School District will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports. Refer to Division 5 section "Structural Steel" for detailed bolt and weld testing requirements.
- B. AESS acceptance: Project Architect shall observe the AESS steel in place and determine acceptability based on the mockup. The Testing Agency shall have no responsibility for enforcing the requirements of this section.

3.06 ADJUSTING AND CLEANING

- A. Touchlip Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with manufacturer's instructions as specified in Division 9, Section "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.
 - 1. One option is to repair damaged galvanized surface zinc repair or solder stick applying hot zinc to damaged area, see www.rotometals.com.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Equipment bases and support curbs.
 - 2. Related framing anchors and connectors

1.03 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Exposed Framing: Dimension lumber not concealed by other construction.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. RIS - Redwood Inspection Service.
 - 3. APA – American Plywood Association.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

1.04 SUBMITTALS

- A. Product Data:
 - 1. For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

2. Custom and heavy metal framing connectors.

1.05 QUALITY ASSURANCE

- A. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
 1. WCLIB - West Coast Lumber Inspection Bureau.
 2. WWPA - Western Wood Products Association.
- B. Industry Standards:
 1. Lumber Grading Agency: Certified by WCLIB or WWPA as pertinent to product.
 - a. Do not apply inspection service grade mark on timber shown as exposed in the work and with transparent finish.
 - b. Submit certificate of grade compliance, obtained from grading agency with each shipment.
 2. Plywood Grading Agency: Certified by APA.
- C. Regulatory Requirements: Conform to California Building Code (2013 CBC) Chapter 23 for member and fastener sizes and type of fasteners, unless otherwise indicated on Drawings.
- D. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Lumber Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.
 1. Stack lumber as well as plywood and other panels.
 2. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated on structural drawings.
5. Concealed Lumber: provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
6. Exposed Lumber: provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
7. Sill Plates: Pressure preservative treated, No. 1 or better, douglas fir.
8. Structural Framing, Posts: 4-inches thick, 4-inches and wider, No. 1 and Better grade, douglas fir, unless otherwise indicated on Drawings.
9. Miscellaneous Framing: For site structures and other exposed conditions, provide No. 1 grade douglas fir-larch or better, selected for appearance, unless noted otherwise on drawings. At site structures, provide light sandblast finish on exposed wood framing.
10. Wane: Limit wane to 5 percent of members in accordance with WWPA standards. Do not locate members with wane at plywood sheathing joints, at solid blocking or at double plates.

2.02 PRESERVATIVE TREATED WOOD PRODUCTS

- B. Wood Treatments, General: Where used for exposed locations, treatment materials shall be types guaranteed to not adversely affect durability and appearance of applied finishes.
1. Treatment materials having a highly persistent, noticeable residual odor will not be permitted.
 2. After treatment, kiln or air dry lumber and plywood to a moisture content of 19 percent or less.

- C. Preservative Treatment, Members Intended for Finishing: Water-borne salt preservatives for painted, stained, or exposed natural wood product, AWPB LP-2, above ground application and AWPB LP-22, ground contact application.
- D. Preservative Treatment, Members Not Intended for Finishing: Oil-borne preservatives for any construction except when in contact with salt water, AWPB LP-33, ground contact application, light petroleum solvent.

2.03 CONNECTORS

A. Framing Connectors:

1. Specified Manufacturer: Simpson Strong-Tie Co., Pleasanton, CA (510/460-9912 or 800/999-5099; local representatives, Brea, CA (714/871-8373 or 800/999-5099).
2. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Product Requirements. Substitutions shall have equivalent values according to current ICC Research Report and shall be used only with prior approval of DSA and Architect, based on review by Structural Engineer.
3. Light framing connectors: Simpson Strong-Tie Connectors, formed of sheet steel, catalog number as indicated on the Drawings and to suit Project conditions.
4. Heavy framing connectors: Simpson Strong-Tie Connectors, formed of steel plate or heavy gage steel sheet, catalog number as indicated on the Drawings and to suit Project conditions. Provide custom or special-order framing connectors as necessary to suit Project conditions and as indicated on the Drawings.
 - a. Stock framing connectors: Simpson - Strong Tie Connectors, catalog number as indicated on the Drawings and to suit Project conditions.
 - b. Custom framing connectors: Fabricated as indicated on Drawings and as specified in Section 05 50 00 - Metal Fabrications.
5. Finishes:
 - a. Light framing connectors: Provide manufacturer's standard galvanized finish.
 - b. Heavy framing connectors, exterior: Hot-dipped galvanized, equivalent to ASTM A525, Coating Designation G90.
 - c. Heavy framing connectors, interior: Plain steel with shop primer paint finish, as specified in Section 05 50 00 - Metal Fabrications.
 - d. Custom framing connectors: Fabricated as specified in Section 05 50 00 - Metal Fabrications. At interior and concealed locations, provide plain steel

with shop primer paint finish. At exterior locations, provide hot-dipped galvanized finish.

2.04 FASTENERS AND ANCHORS

- A. Fasteners, General: Size and type as required by 2013 CBC and DSA requirements and as indicated on Drawings. Provide hot-dipped galvanized at exterior locations. Provide electro-galvanized finish at interior high humidity locations and where in contact with concrete and preservative treated lumber. Plain finish may be provided for interior, dry conditions only.
- B. Anchor Bolts: ASTM A36/A307 or as indicated on Drawings, galvanized steel at exterior locations.
 - 1. Do not upset threads on bolts.
 - 2. Anchor bolts for hold-downs shall be headed.
- C. Machine Bolts: ASTM A307, hex head and nut, full bearing on unthreaded shank, length for maximum 1-1/2 inch beyond nut, with steel washer under head and nut. Provide hot-dipped galvanized finish at exterior locations.
- D. Lag Bolts and Screws: Fed Spec FF-S-588, size as indicated on Drawings.
- E. Nails, Typical: Common wire, sizes as indicated on Drawings and as required by Los Angeles Building Code (LABC) Chapter 23, Table No. 23-II-B-1 and applicable reference standard.
 - 1. No box nails shall be used.
 - 2. Machine applied nailing will be subject to approval as specified on the Drawings and as approved by code authority having jurisdiction.
- F. Screws: Fed Spec FF-S-85, Fed Spec FF-S-92 and Fed Spec FF-S-111, type and grade best suited for the purpose, size as indicated on Drawings.
- G. Construction Adhesive: APA Spec. AFG-01.
- H. Grout for Sill Plates: Type S or Type M mortar cement grout in accordance with 2013 CBC Table 2103A.8.

2.05 WOOD PRESERVATIVE TREATMENTS

- A. Wood Preservative Treatments, General: Where lumber or plywood is indicated as preservative-treated or is specified to be treated, comply with applicable requirements of AWPA C2 (Lumber) and AWPA C9 (Plywood).

1. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by American Lumber Standards Committee (ALSC) Board of Review.
 2. Comply with 2013 CBC Section 2303.1.8
- B. Wood Members Located Above Ground: Pressure-treat above ground items with water-borne preservatives to a minimum retention of 0.25 pcf. After treatment, kiln dry lumber and plywood to a maximum moisture content of, respectively, 19 percent and 15 percent. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members related to roofing, flashing, vapor barriers and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 3. Wood floor plates installed over concrete slabs directly in contact with ground.
- C. Wood Members Located in Contact with Ground: Pressure-treat wood members in contact with ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.
- D. Coordination with Fabrication: Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces in compliance with AWP A M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Published requirements of metal framing anchor manufacturer.
 2. 2013 CBC Table 2304.9.1.

- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- E. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.02 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

END OF SECTION

SECTION 07 25 01

WEATHER RESISTANT MEMBRANES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Weather resistant membranes behind Portland Cement Plaster (Specification 09 24 00) and Fiber Cement Lap Siding (Specification 07 46 10).

1.02 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.03 SUBMITTALS

- A. See Section 01 33 13 - Submittal Procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, and limitations. Shop
- C. Drawings: Provide drawings of special joint conditions.
- D. Test Results: Submit copies of test results showing performance characteristics equaling or exceeding those specified.
- E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- F. Quality Assurance Submittals:
 - 1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 - 2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
 - 3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer shall have three years of experience with installation of weather barrier assemblies under similar conditions.
 - 2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
 - 3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.05 MOCK-UP

- A. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
 - 1. Mock-up size: One panel from reveal to reveal as directed by Project Architect, approximately 10 x 14 feet.

2. Mock-up Substrate: Match wall assembly construction, including window opening.
 3. Mock-up may remain as part of the work.
- B. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
 - C. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 Product Requirements.
- B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.07 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.
- B. Minimize UV exposure of membrane to comply with manufacturer's requirements. PART

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.
- B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. Provide all weather resistant membranes from a single manufacturer.

2.02 PERFORMANCE CHARACTERISTICS

- A. Performance Characteristics:
 1. Air Penetration: 0.001 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. 0.04 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2357.
 2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
 3. Water Penetration Resistance: Minimum 280 em when tested in accordance with AATCC Test Method 127.
 4. Basis Weight: Minimum 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
 6. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882,

Method A.

7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84.
Flame Spread: 10, Smoke Developed: 10.

2.03 ACCESSORIES

- A. Seam Tape: As recommended by the weather barrier manufacturer. B.
Fasteners:
 1. 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer
- C. Sealants: Sealants recommended by the weather barrier manufacturer.
- D. Adhesives: Provide adhesive recommended by weather barrier manufacturer.
- E. Primers: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
- F. Flashing: See Section 07 65 26- Self-Adhering Sheet Flashing. PART

PART 3 - EXECUTION

3.01 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.02 INSTALLATION

- A. Install weather resistant membranes in accordance with manufacturer's instructions over exterior sheathing.
- B. Install weather barrier prior to installation of windows and doors.
- C. Window and Door Openings: Extend weather barrier completely over openings.
- D. Seal joints and penetrations through weather resistant membranes with tape and fasteners before installation of finish material.
- E. Overlap weather barrier
 1. Exterior corners: minimum 12 inches.
 2. Seams: minimum 6 inches.
- F. Membrane Attachment: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
- G. Ensure that weather resistant membranes are air tight, free from holes, tears, and punctures.

3.03 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

- B. Seal any tears or cuts as recommended by weather barrier manufacturer.
- C. Tape all window and door penetrations in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Notify manufacturer's designated representative to obtain [required] periodic observations of weather barrier assembly installation.

END OF SECTION

SECTION 07 46 10

FIBER CEMENT LAP SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiber cement lap siding, panels, single, trim, fascia, moulding and accessories, James Hardie HZ5 Engineered for Climate Siding.

1.2 RELATED SECTIONS

- A. Section 05 41 00 - Load-Bearing Metal Studs
- B. Section 06 16 00 - Sheathing.
- C. Section 07 21 00 - Insulation: Exterior wall insulation.
- D. *Section 07 25 01 – Weather Resistant Membranes (12.19.14)***

1.3 REFERENCES

- A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets
- B. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. 4' x 7' section including transitions to cement plaster, aluminum window, base and corner as per details xx/xx. Mock-up may become part of final installation if accepted.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
 - 1. HardiePlank HZ5 lap siding for 30 years.
- B. Product Warranty: Limited, product warranty.
 - 1. HardieTrim HZ and HZ5 boards for 15 years.
- C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Email: [request info \(info@jameshardie.com\)](mailto:info@jameshardie.com);

- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 SIDING

- A. HardiePlank HZ5 lap siding for Materials:
 - 1. Fiber-cement Siding - complies with ASTM C 1186 Type A Grade II.
 - 2. Fiber-cement Siding - complies with ASTM E 136 as a noncombustible material.
 - 3. Fiber-cement Siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
 - 4. CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.
 - 5. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).
 - 6. City of Los Angeles, Research Report No. 24862.
 - 7. US Department of Housing and Urban Development Materials Release 1263d.
 - 8. California DSA PA-019.
- B. Lap Siding: HardiePlank HZ5 Lap siding with a sloped top, beveled drip edge and nailing line as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth 6-1/4 inches (159 mm) with 5 inches (127 mm) exposure.
- ~~C. Lap Siding: HardiePlank HZ5 Lap siding as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Beaded Smooth 8 1/4 inches (210 mm) with 7 inches (178 mm) exposure.
 - 2. Type: Beaded Cedarmill 8 1/4 inches (210 mm) with 7 inches (178 mm) exposure. (12.19.14)~~
- D. Trim:
 - 1. HardieTrim HZ5 boards and HardieTrim HZ boards as manufactured by James Hardie Building Products, Inc.
 - ~~2. Artisan HZ5 Accent trim as manufactured by James Hardie Building Products, Inc. (12.19.14)~~

2.3 FASTENERS

- A. Metal Framing:
 - 1. Metal Framing: 1-1/4 inches (32 mm) No. 8-18 by 0.375 inch (9.5 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 2. Metal Framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 3. Metal Framing: 1 inch (25 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant ribbed buglehead screws.
 - 4. Metal Framing: 1 inch (25 mm) No. 8-18 by 0.311 inch (7.9 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 5. Metal Framing: 1.5 inch (38mm) [AGS-100] .100 inches by 25 inches (2540

mm by 635 mm) ET&F Pin or equivalent pneumatic fastener.

2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: Factory primed by James Hardie.
 - 2. Topcoat: Refer to Section 09 90 00 and Exterior Finish Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Review substrate to ensure preparation is free from defects that would cause siding installation to appear visually wavy.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Minimum 20 gauge 3-5/8 inch (92 mm) C-Stud 16 inches maximum on center or 16 gauge 3-5/8 inches (92 mm) C-Stud 24 inches (610 mm) maximum on center metal framing complying with local building codes, including the use of water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements. ***The term “water-resistive barrier” shall be interchangeable with the term “weather barrier” as listed in the Drawings. See Specification 07 25 01 Weather Resistant Membranes. (12.19.14)***
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- ~~E. Install Engineered for Climate™ HardieWrap™ weather barrier in accordance with local building code requirements. (12.19.14)~~
- F. Use HardieWrap™ Seam Tape and joint and laps ***products of same manufacturer of water-resistive barrier. (12.19.14)***

- G. *Install HardieWrap™-flashing, and HardieWrap™-Flex Flashing products of same manufacturer of water-resistive barrier. (12.19.14)*

3.3 INSTALLATION - HARDIEPLANK HZ5 LAP SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Align vertical joints of the planks over framing members.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Locate splices at least one stud cavity away from window and door openings.
- G. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
- H. Locate splices at least 12 inches (305 mm) away from window and door openings.

3.4 INSTALLATION - HARDIETRIM HZ5 BOARDS

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with a single board trim both side of corner.
- F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
- G. Allow 1/8 inch gap between trim and siding.
- H. Seal gap with high quality, paint-able caulk.

- I. Shim frieze board as required to align with corner trim..
- J. Fasten through overlapping boards. Do not nail between lap joints.
- K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
- L. Shim frieze board as required to align with corner trim.

3.5 FINISHING

- A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
- B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 62 50

TUBULAR DAYLIGHTING DEVICE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; configuration as indicated on the drawings.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 03 30 00 – Cast-In-Place Concrete
- B. Section 06 10 00 - Rough Carpentry
- C. Section 07 22 00 - Roof and Deck Insulation
- D. Section 07 51 13 - Built-up Asphalt Roofing
- E. Section 07 60 00 – Flashing and Sheet Metal
- F. Section 09 29 00 – Gypsum Board
- G. Section 09 51 13 – Acoustical Panel Ceilings
- H. Division 26 – Electrical

1.3 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008a.
- C. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process; 2006.
- D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process; 2007.
- E. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

- F. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System; 2006.
- G. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors; 2002.
- H. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference; 2000.
- I. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- J. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
- K. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position; 2006.
- L. ASTM D-1929 - Test Method for Ignition Properties of Plastics; 1996 (2001).
- M. UL 181 - Factory Made Air Ducts and Air Connectors
- N. ICC AC-16 - Acceptance Criteria for Plastic Skylights; 2008.

1.4 PERFORMANCE REQUIREMENTS

- A. Completed tubular daylighting device assemblies shall be capable of meeting the following performance requirements:
 - 1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
 - 2. Water Resistance Test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
 - 3. Uniform Load Test:
 - a. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa), or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPa) if tested per ICC AC-16 Section B.
 - b. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
 - 4. Fire Testing:
 - a. When used with the Dome Edge Protection Band, all domes meet fire

- rating requirements as described in the International Building Code.
- b. Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
- c. Smoke Density - Rating no greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
- d. Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
- e. Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 01.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including anchorage, flashings and accessories.
- D. Electrical wiring diagrams for connection of daylight dimmer.
- E. Verification Samples: As requested by Architect.
- F. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Daylighting Device: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Solatube International, Inc., which is located at: 2210 Oak Ridge Way ; Vista, CA 92081; Toll Free Tel: 888-765-2882; Tel: 760-477-1120; Fax: 760-597-4488 ; Email: [request_info \(commsales@solatube.com\)](mailto:request_info@commsales.solatube.com); Web: www.solatube.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 TUBULAR DAYLIGHTING DEVICES

- A. Tubular Daylighting Devices General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
- B. SolaMaster Series: Solatube Model 750 DS-C Penetrating Ceiling, 21 inch (530 mm) Daylighting System:
 - 1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - a. Outer Dome Glazing: Type DA, 0.125 inch (3.2 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV C), impact modified acrylic blend.
 - b. Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
 - c. Inner Dome Glazing: Type DAI, 0.115 inch (3 mm) minimum thickness acrylic classified as CC2 material.
 - 2. Roof Flashing Base:
 - a. One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M, or ASTM A 792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.15 mm) thick.
 - 1) Base Style: Type FC, Curb cap, with inside dimensions of 27 inches by 27 inches (685 mm x 685 mm) to cover curb by others per Drawings.
 - 3. Curb Insulator: Type CCI, Thermal isolation material for use under flashing Type FC.
 - 4. Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
 - 5. Tube Ring Seal: Attached to the base of the dome ring; butyl glazing rope 0.24 inch (6 mm) diameter; to minimize air infiltration

6. Dome Seal: Adhesive backed weatherstrip, 0.63 inch (16 mm) tall by 0.28 inch (7 mm) wide.
7. Reflective Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm).
 - a. General:
 - 1) Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Specular reflectance for visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum reflectance (400 nm to 2500 nm) less than 80.2 percent.
 - 2) Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
 - b. Top Tube Angle Adapter, Type AK:
 - 1) Reflective 45 degree adjustable Top Tube Angle Adapter, 16 inches (406 mm) long.
 - c. Extension Tube:
 - 1) Reflective extension tube, Type EXX, Notched for Open Ceiling diffuser attachment, 24 inches (610 mm) long or 48 inches (1220 mm) long.
8. Diffuser Assemblies for Tubes Penetrating Ceilings: Solatube Model 750 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube; 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.
 - a. Round to square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch (2.8 mm) thick.
 - b. Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.
 - c. Supplemental Natural Effect Lens made of acrylic, classified as CC2, Class C, 0.060 inch (1.5 mm) thick, with open cell foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283.
9. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use. Provided with dimmer switch and cable.
 - a. Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; Maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02: circuited, 4 conductor, 22 gauge cable; providing daylight output between 2 and 100 percent.
 - b. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: A maximum of 10 units can be connected to one switch.
 - c. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft.)

for multiple unit DC connection.

10. Accessories:
 - a. Security Bar: Type B Security Bar 0.375 inch (95 mm) stainless steel bar across flashing diameter opening.
 - b. Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.
11. Catalog Number: S750 DS-C-DAI-FC-B-AK-EXX-L1-LN-CCI-D-SW-CA

2.3 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.
- C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to all work of this section, contractor shall hold pre-construction meeting with all related trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Coordinate all roof penetrations, tube runs, and diffuser terminations and confirm that they are compatible with the related architectural layouts prior to making roof penetrations for each room.
- C. Contact Architect immediately in the event of a discrepancy.
- D. Do not proceed with installation in areas of discrepancies until all such discrepancies have been resolved.
- E. Do not begin installation until substrates have been properly prepared.
- F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Coordinate requirements for power supply, conduit and wiring.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.
- C. Installer Qualifications: Must be certified Solatube installer with a minimum 5 years experience installing Solatube products.
- D. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes: Finish hardware except as otherwise specified or specifically omitted herein.

- B. Related Sections:

- 1. Section 08 11 13 - Hollow Metal Doors and Frames.
- 2. Section 08 21 00 - Wood Doors.
- 3. Section 08 41 13 - Aluminum Storefronts and Entrances.

- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

- 1. Windows.
- 2. Cabinets and locks.
- 3. Signs.
- 4. Toilet accessories.
- 5. Installation.
- 6. Rough hardware.

1.03 REFERENCES

- A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply unless noted otherwise).
- B. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
- C. BHMA - Builders Hardware Manufacturers Association.
- D. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- E. DSA - Division of the State Architect.
- F. NFPA 80 - Fire Doors and Windows.
- G. UL - Underwriters Laboratories

1.04 SUBSTITUTIONS & SUBMITTALS

- A. Requests for substitutions must be made in writing 10 days prior to bid date to allow architect to issue an addendum. If proposing a substitute, submit that product data attached to one showing specified item and indicate savings to be made. Provide sample if requested. No other substitutions will be allowed.

1. Items listed with no substitute manufacturers have been requested by Owner to match existing.
- B. SUBMITTALS: Submit six copies of schedule within 4 weeks after project has been awarded. Organize schedule into "Hardware Sets" with an index of doors and heading, indicating complete designations of every item required for each door or opening. Include the following information:
1. Type, style, function, size, quantity and finish of each hardware item.
 2. Name, part number and manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Location of hardware set cross referenced to indications on drawings both on floor plans and in door schedule.
 5. Explanation of all abbreviations, symbols, and codes contained in schedule.
 6. Mounting locations for hardware.
 7. Door and frame sizes and materials.

1.05 QUALITY ASSURANCE

- A. Qualifications:
1. Obtain each kind of hardware (latch and lock sets, exit devices, hinges, and closers) from only one manufacture, although several may be indicated as offering products complying with requirements.
 2. Hardware supplier shall be a direct factory contract supplier who has in his employment a certified hardware consultant (AHC) who is available at all reasonable times during the course of the work for project hardware consultation to the Owner, Architect, and Contractor.
- B. Schedule Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, unless they are not equal in design, size, weight, finish, function, or other quality of significance. See 1.04.A for substitutions.

1.06 REGULATORY REQUIREMENTS

- A. Fire-Rated Openings: Comply with CBC Section 715 and NFPA No. 80. Provide only hardware tested and listed by UL for the type and size of each door required, which complies with the requirements of the door and frame labels.
1. Where exit devices are required on fire rated doors, provide supplementary marking on door UL label indicating "Fire Door to be Equipped with Fire Exit Hardware", and provide UL label on exit device indicating "Fire Exit Hardware".
- B. Conform to applicable requirements of the Americans with Disabilities Act Accessibility Guidelines regarding accessibility requirements for door and entrance hardware.
- C. Door hardware shall meet the requirements of CBC Sections 11B-404.2.9.1, and 1008.1.9.
- D. Hand activated door opening hardware, handles, pulls, latches, locks, and other operating devices on accessible doors shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbs. (22.2N), per CBC Section 11B-309.4. Hardware shall be centered between 34 inches to 48 inches above the finished floor, per CBC Section 1008.1.9 and 11B-308.2.1.
- E. Maximum operating force required to push or pull open a door shall not exceed 5 lbs. (22.2N) for exterior doors and 5 lbs. (22.2N) for interior doors. Required fire doors shall have the minimum opening force allowable by the DSA authority, not to exceed 15 lbs (66.72N). Push or pull force for a

hinged door shall be measured perpendicular to the door face at the door opening hardware or 30 inches from the hinged side, whichever is farther from the hinge, per CBC Sections 1008.1.3 and 11B-404.2.9 /ADAAG 4.13.11.

- F. Door and gate closers, when provided, shall have sweep period adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum, measured to the leading edge of the door, per CBC Sections 1003.3.1 Exception and 11B-404.2.8.1.
- G. Thresholds shall comply with CBC Sections 1008.1.7 and 11B-404.2.5.
- H. Floor stops shall not be located in the path of travel and 4 inches maximum from walls, per DSA Policy 99-08.
- I. Hardware (including exit devices) shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met per DSA Interpretation 10-08 DSA /AC (External), revised 4/28/09. Such conditions must be clearly demonstrated and indicated in the specifications:
 - 1. Such hardware has a 'dogging' feature.
 - 2. It is dogged during the time the facility is open.
 - 3. Such 'dogging' operation is performed only by employees as their job function (non-public use).
- J. Exit devices shall comply with CBC Section 1008.1.10
- K. Exit devices shall be so mounted (centered at 40 inches above finished floor as recommended) that the clear width of the exitway is not less than 32 inches measured between the face of the door and the opposite stop with the door open 90 degrees, per CBC Section 11B-404.2.3.
- L. The unlatching force of an exit device shall not exceed 5 lbs. (22.2N), applied in the direction of travel, per CBC Section 11B-309.4.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site: Individually package each unit of finish hardware complete with proper fastening and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.
- B. Deliver packaged hardware items at the times and to the locations (shop or field) for installation, as directed by the Contractor.

1.08 PROJECT CONDITIONS

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.09 WARRANTY

- A. Provide guarantee from hardware supplier as follows:
 - 1. Closers: Five years, except electronic closers, two years.
 - 2. Exit Devices: Two years.

3. All other Hardware: Two years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.04.A.

Item:	Manufacturer:	Acceptable Substitute:
Butt Hinges	McKinney	Bommer, Ives
Continuous Hinges	Markar	Select, Ives
Locksets	Schlage	Sargent
Cylinders	Schlage	Owners standard
Armor Collars	Keedex	Or equal
Exit Devices	Von Duprin	Sargent
Surface Closers	LCN	Norton
Anti Vandal Pulls	Ives	Rockwood, Trimco
Kick Plates	Trimco	Rockwood, Ives
Door Stops	Trimco	Rockwood, Ives
Silencers	Trimco	Rockwood, Ives
Thresholds/Seals/Sweeps	Pemko	Reese, NGP

- B. Furnish items of hardware required to complete the work in accordance with these specifications and the manufacturers' instructions. Items of hardware not specified shall be provided even though inadvertently omitted from this specification. Items shall be of equal quality and type.
- C. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having as nearly as practicable the same operation and quality as the type specified, subject to Architect's approval.
- D. Carefully inspect Project for the extent of the finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, furnish finish hardware to specification.

2.02 MATERIALS

- A. Locksets: Locksets and latchsets shall be as specified. Strikes shall be 16 gage curved steel, bronze or brass with 1" deep box construction, and have lips of sufficient length to clear trim and protect clothing.
1. Comply with requirements of local security ordinances.
 2. Provide approved fusible links at levers for labeled doors.
 3. Lock Series and Design: Schlage L series 06N lever and Schlage ND series Rhodes lever.
- B. Butt Hinges: Outswinging exterior doors shall have nonremovable (NRP) pin. Hinge open widths shall be minimum, but of sufficient size to permit door to swing 180 degrees.
1. Furnish 3 hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 2. Provide 5 inch heavy weight hinges on doors over 3 feet 5 inches width.
- C. Continuous Hinges: Hinge open widths shall be minimum, but of sufficient size to permit door to swing 180 degrees. Where necessary to maintain door clearance at jamb trim, frame conditions, door reveals and similar conditions, furnish white throw hinges as approved by Architect. Where door is indicated as having fire resistance rating, provide UL listed and labeled hardware. At openings specified with concealed auto door bottoms, prep continuous hinge so door plunger can project from hinge edge.

- D. Exit Devices: Furnish devices at wood doors with sex bolts unless otherwise specified. Lever handle trim shall match locksets.
 - 1. Provide glass bead kits of proper thickness where the rail assembly of the exit device crosses a lite.
- E. Surface Door Closers: Full rack and pinion type with removable non-ferrous case. Provide sex bolts and grommets at wood doors and hollow metal doors without reinforcement. Place closers inside building, stairs, and rooms. Closers shall be non-handed, non-sized, and installed to permit door to swing 180 degrees.
 - 1. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over.
 - 2. Provide drop brackets, shoe supports, and blade stop spacers as required at narrow top rails.
- F. Kick Plates: Provide with four beveled edges, .050 inches minimum thickness, 10 inches high by width less 2 inches. Furnish with machine or wood screws of bronze or stainless steel to match other hardware.
- G. Floor Stops: Floor mounted door stops are prohibited where located in the path of travel. Where provided, install maximum 4 inches from wall surface.
- H. Seals: Seals shall be finished to match adjacent frame color. UL label shall be applied on rated doors.
- I. Screws: Exposed screws shall be Phillips head. Do not use self-drilling, self-tapping screws, unless furnished by hardware manufacturer for the specific condition or for mounting flat-goods such as push plates and kick plates.
- J. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors.
- K. Thresholds: Change in level between 1/4 inch and 1/2 inch shall be beveled with a slope no greater than 1 unit vertical to 2 units horizontal (50 percent slope). The floor or landing shall not be more than 1/2 inch lower than the threshold or doorway.

2.03 FINISH

- A. Generally to be BHMA 626 Satin Chromium.
 - 1. Areas using BHMA 626 shall have push, pulls and kick plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.
- B. Spray door closers to match other hardware, unless otherwise noted.
- C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYING REQUIREMENTS

- A. Contact the District Locksmith with Glendale Unified School District (818-242-0003) for keying requirements.
 - 1. Key system shall be Schlage Everest Primus 29, T-145 keyway, Level 9G.
- B. Stamp master keys and grand master keys with a registry number. Do not stamp “Master” or letter “M”.
- C. Stamp individual room keys with plain identification number. Do not indicate key cut.

- D. Factory cut keys and stamp "DO NOT DUPLICATE".
- E. Cylinders shall be Full Size Interchangeable Core (FSIC). Provide temporary cores for construction. Temporary cores shall be returned to the Contractor. District to change cores at completion of project and return temporary cores to Contractor.
- F. Contractor and hardware supplier shall meet with the Owners Representative and Architect to establish the keying schedule and to provide the correct grand master, pass and change key groups to properly operate locking devices.
- G. Provide record and registration system as directed by the Architect.
- H. Locksets and cylinders shall be keyed, master keyed, and grand master keyed at the factory. Supply 4 change keys for each lock and one master and grand master for each set of locks.
- I. Contractor shall be responsible for completion of keying schedule and ordering construction and permanent keys.
- J. Key Control:
 - 1. Permanent cores and sample set of permanent keys shall not be used during the construction phase of the Project. Temporary construction cores and keys used for securing the Work is included as part of the Work of this Section and shall be provided by the Contractor.
 - 2. Upon Substantial Completion of the Work, sample set of original keys shall be returned to the District Representative. Duplication of District keys, or retaining keys, is not permitted.
 - 3. Secure from District Locksmith a Letter of Authorization/Permission to order the District standard cylinders/cores.
 - 4. Deliver keys directly to District Locksmith by registered security shipment direct from hardware manufacturer. Hardware supplier shall not cut keys.

PART 3 - EXECUTION

3.01 HARDWARE LOCATIONS

- A. Mounting heights for hardware:
 - 1. Lockset: 30 to 44 inches above finished floor. Verify manufacturers' template with door design.
 - 2. Exit Device: 40 inches above finished floor. Verify manufacturers' template with door design.
 - 3. Door Pull: 40 inches from bottom of door to center of pull.
 - 4. Floor Stop: Installed at a maximum of 4 inches from the face of the wall or partition.
- B. Conform to CCR, Title 24, Part 2, and ADAAG for the positioning requirements for accessibility.

3.02 INSTALLATION

- A. Pre-Installation Meetings: Initiate and conduct with supplier, installer, and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware, and door closers in the meetings.

- B. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

3.03 ADJUSTING

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Inspection: Hardware supplier shall inspect hardware furnished within 10 days of contractors request and include with his guarantee a statement that this has been accomplished. Inspector or Contractor will sign off the hardware as being complete and correctly installed and adjusted. Further corrections of defective material shall be the responsibility of his representative.

3.04 SCHEDULE OF DOOR HARDWARE

- A. Legend of listed manufacturers:

IVE Ives
 KEE Keedex
 LCN LCN
 MAR Markar
 MCK McKinney
 PEM Pemko
 SCH Schlage
 TRM Trimco
 VON Von Duprin

- B. The last column in the Schedule of Door Hardware refers to the manufacturer listed above.
- C. The Door Schedule on the Drawings indicates which Hardware Set is used with each door.
- D. Schedule of Door Hardware:

HW-1

Exterior single door from Classroom

1	CONTINUOUS HINGE	FM-300-WEP x CHS-1	630	MAR
1	EXIT DEVICE	XP99NL-OP x 110NL	626	VON
1	I/C RIM CYLINDER	20-057-ICX	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
1	ARMOR COLLAR	K-24	626	KEE
1	ANTI VANDAL PULL	VR910NL	630	IVE
1	SURFACE CLOSER	4040XP-SHCUSH x 4040-30	689	LCN
1	KICK PLATE	KO050 - 10 x 2 LDW B4E	630	TRM
1 SET	DOOR SEALS	BY FRAME MFR	---	---
1 SET	SOUND SEALS	S88 HEAD & JAMBS	BLK	PEM
1	AUTO DOOR BOTTOM	434RL	628	PEM
1	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-2

Exterior single door to Staff Restroom

3	HINGE	T4A3386 - 4-1/2 x 4-1/2	630	MCK
1	LOCKSET	L9486T x LLL x 06N x L283-150 x L583-363 x L583-375	630	SCH
1	I/C CORE CYLINDER	30-120	626	SCH
1	ANTI VANDAL PULL	VR900LLP (PREP F/INDICATOR)	630	IVE
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	KO050 - 10 x 2 LDW B4E	630	TRM
1	MOP PLATE	KM050 - 6 x 1 LDW B4E	630	TRM
1	WALL BUMPER	1270CVPV	626	TRM
1	COAT HOOK	3071	626	TRM
1 SET	DOOR SEALS	2891S HEAD & JAMBS	628	PEM
1	DOOR BOTTOM	222PK	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-3

Interior single door to Electrical Room

3	HINGE	T4A3786 - 4-1/2 x 4-1/2	652	MCK
1	LOCKSET	ND80TD x RHO x K510-066	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
1	KICK PLATE	KO050 - 10 x 2 LDW B4E	630	TRM
1	FLOOR STOP	1214	626	TRM
3	SILENCERS	1229A	GRY	TRM

HW-4

Exterior single door to Boys/Girls Restroom

3	HINGE	T4A3386 - 4-1/2 x 4-1/2	630	MCK
1	DEADBOLT	B663T	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
1	ANTI VANDAL PULL	VR900LLP	630	TRM
1	PULL PLATE	1014-3 - 4 x 16 x CFTT	630	TRM
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	KO050 - 10 x 2 LDW B4E	630	TRM
1	MOP PLATE	KM050 - 6 x 1 LDW B4E	630	TRM
1	WALL BUMPER	1270CVPV	626	TRM
3	SILENCERS	1229A	GRY	TRM
1	DOOR BOTTOM	222PK	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-5

Exterior pair door from Riser Closet

6	HINGE	T4A3386 - 4-1/2 x 4-1/2 NRP	630	MCK
2	FLUSH BOLT	3913	626	TRM
1	DUST PROOF STRIKE	3910	626	TRM
1	DEADBOLT	B660T	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
2	DOOR HOLDER	PAH-60 x ST3213	689	LCN
2	KICK PLATE	KO050 - 10 x 1 LDW B4E	630	TRM
1	ASTRAGAL	357 x SP	600	PEM
1 SET	DOOR SEALS	2891S HEAD & JAMBS	628	PEM

2	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM
	Install door seals before holder			

HW-6

Exterior single door from Custodian / IDF Closet

3	HINGE	T4A3386 - 4-1/2 x 4-1/2 NRP	630	MCK
1	EXIT DEVICE	XP99NL-OP x 110NL	626	VON
1	I/C RIM CYLINDER	20-057-ICX	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
1	ARMOR COLLAR	K-24	626	KEE
1	ANTI VANDAL PULL	VR910NL	630	IVE
1	DOOR HOLDER	PAH-60 x ST3213	689	LCN
1	KICK PLATE	KO050 - 10 x 2 LDW B4E	630	TRM
1 SET	DOOR SEALS	2891S HEAD & JAMBS	628	PEM
1	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM
	Install door seals before holder			
	Adjust exit device backset 1/4-inch to allow for jamb seal			

HW-7

Exterior pair door from Elevator Closet

6	HINGE	T4A3386 - 4-1/2 x 4-1/2 NRP	630	MCK
2	FLUSH BOLT	3913	626	TRM
1	DUST PROOF STRIKE	3910	626	TRM
1	EXIT DEVICE	XP99NL-OP x 110NL x 1609 STK	626	VON
1	I/C RIM CYLINDER	20-057-ICX	626	SCH
1	I/C CORE CYLINDER	20-740	626	SCH
1	ARMOR COLLAR	K-24	626	KEE
1	ANTI VANDAL PULL	VR910NL	630	IVE
2	SURFACE CLOSER	4040XP-SCUSH x ST1595	689	LCN
2	KICK PLATE	KO050 - 10 x 1 LDW B4E	630	TRM
1	ASTRAGAL	357 x SP	600	PEM
1 SET	DOOR SEALS	2891S HEAD & JAMBS	628	PEM
2	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM
	Install door seals before closer			

END OF SECTION

SECTION 09 24 00

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Lath and Portland cement plaster and stucco as indicated.
 - 2. Scratch coat plaster as a substrate for ceramic wall tile.
- C. Related Sections:
 - 1. Section 05 41 00: Load Bearing Metal Studs.
 - 2. ***Section 07 25 01: Weather Resistant Membranes (12.19.14)***
 - 3. Section 09 22 16: Metal Support Assemblies.
 - 4. Section 09 30 00: Tiling.

1.02 DESIGN REQUIREMENTS

- A. Provide pre-formulated finish coat products that require only addition of clean water for mixing.

1.03 SUBMITTALS

- A. Shop Drawings: Submit elevations and details indicating locations and types of components, splices, connections and accessory items. Indicate locations and types of framing substrates.
- B. Material Samples: Submit minimum 48 inch x 48 inch samples of each stucco and Portland cement plaster texture for review. Samples shall be representative of texture, color, and proposed workmanship. Maintain reviewed Samples on Project site for reference.
- C. Product Data: Submit manufacturer's catalog data for each material and component proposed for installation.
- D. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

- E. Mock-ups: Provide a mock-up at least 10 feet x 10 feet x 1 foot. Include at least one control joint and, corner condition and one window opening flashing. Locate where required by the Architect.
- F. Product Data verifying compliance with CHPS EQ2.2.1 for adhesives and sealants

1.04 QUALITY ASSURANCE

- A. Coordinate with related Work to provide backing support for items mounted on finished surfaces and to provide allowances for pipes and other items in wall cavities.
- B. Comply with the following ASTM Standard Specifications as a minimum requirement:
 - 1. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM C150 – Standard Specification for Portland Cement.
 - 4. ASTM C206 – Standard Specification for Finishing Hydrated Lime.
 - 5. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.
 - 6. ASTM C842 – Standard Specification for Installation of Interior Gypsum Plaster.
 - 7. ASTM C847 - Standard Specification for Metal Lath.
 - 8. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement-Based Plasters.
 - 9. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.
 - 10. ASTM C933 – Standard Specification for Welded Wire Lath.
 - 11. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 - 12. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.

13. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 14. ASTM C1509 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- C. Exterior and Interior Lath: Where lath is fastened to wood supports, comply with CBC requirements.
 - D. Plaster: Conforming to requirements of the Portland Cement Plaster (Stucco) Manual published by the Portland Cement Association.
 - E. Metal Lath: NAAMM Standard ML/SFA 920 Guide Specifications for Metal Lath and Furring.
 - F. Adhesives and sealants shall meet the requirements of CHPS EQ2.2.1:
 1. Meet the VOC content requirements in the applicable category of South Coast Air Quality Management District (SCAQMD) Rule 1113, Adhesive and Sealant Applications (amended July 2007, or current version).
 2. Adhesives and sealants shall be tested and meet VOC emission requirements of the California Department of Public Health's (CDPH) Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Chambers (2004), including its 2004 Addenda.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect metal lathing and plastering materials before, during and after installation. In event of damage immediately provide required repairs and replacements.
- B. Deliver and store Portland cement materials on the Project site in a manner to provide protection from exposure and damage by moisture. Pile materials to permit easy access for proper inspection and identification of each shipment. Stockpile adequate supplies of sand on the Project site to permit sampling and testing before installation. Store to avoid inclusion of foreign material.
- C. Deliver plaster materials to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 LATH AND ACCESSORY MATERIALS

- A. Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight and manufacturer's name.

- B. Water Repellant Backing:
1. Weather-exposed for Horizontal Surfaces: W.R. Grace & Co., "Bituthene 4000" sheet, 0.060 inch thick, consisting of polyethylene sheet and rubberized asphalt, self-adhering, or equal.
 2. Flashing and back-up for joints and reveals: W.R. Grace Co. VYCOR 0.040 inch thick rubberized asphalt, self-sealing and self-adhering, or equal.
- C. Adhesives and sealers for water repellant backing: Types as recommended by manufacturer for installation with specified membrane sheet.
- D. Expanded Metal Lath: ASTM C847, small diamond mesh expanded metal lath, 3.4 pounds per square yard, expanded from steel sheets with hot-dip galvanized coating G60 in accordance with ASTM A653. Lath shall be V-grooved self-furring type for installation over sheathing and flat type for installation over spaced framing. Install 3/8 inch ribbed lath when framing is over 24 inches on center.
- E. Weather Barrier: Polypropylene Fabric Backing for Metal Lath - Tyvek, Typar, or equal. *See Specification 07 25 01 (12.19.14)*
- F. Cornerite and Striplath: Flat or shaped lath reinforcing units, galvanized expanded metal weighing no less than 2.5 pounds per square yard, with 3 inch legs when formed for angle reinforcement and 2 inch minimum legs for galvanized wire type.
- G. Plastering Accessories: Minimum 0.0172 inch galvanized steel or 0.0207 zinc alloy with expanded wings. PVC is not permitted. Furnish casing beads, expansion and control joints, weep and vent screeds.
1. Exterior Stress Relief Joints: Sizes and profiles, indicated or required. Control joints shall have expanded wings. Manufactured by Amico, Cemco, Dietrich, Keene or Superior.
 - a. Expansion Joints: Two piece sections designed to accommodate expansion, contraction and shear forces.
 - b. Control Joints: One-piece sections, with integral wings, installed as indicated on drawings, where cracks can be expected.
 2. Drip Scream: Similar to Superior No. 10.
 3. Casing Beads: Expanded flange type with minimum 7/8 inch grounds to establish plaster thickness.
 4. Exterior Corner Reinforcement: Welded-wire type as manufactured by Stockton Products, Tree Island Industries Ltd. or Jaenson Wire.

5. Ventilating Screeds: Alabama Metal Industries, or equal, soffit vent screed, perforated web type, with integral plaster grounds.
6. Foundation Weep Screeds: Alabama Metal Industries, or equal, integral plaster ground and weep screed.

H. Fasteners:

1. Screws: USG corrosion resistant.
 - a. Type S or S-12 for metal studs.
 - b. Type A for wood and metal studs 20-25 gauge.
2. Wire for fastening lath to metal framing, fastening lath together and fastening corner beads, metal grounds and base screeds to lath and framing shall be 18 gage, galvanized conforming with ASTM A641.
3. Nails: 11 gage galvanized roofing nails, 7/16 inch head, barbed shanks, 1-1/2 inch long for horizontal application and providing a minimum of 3/4 inch penetration for vertical surfaces. Furnish fiber wadded furring nails for attaching lath to wood sheathing unless self-furred type of plaster reinforcement is approved.
4. Power driven nails shall be used for attaching lath to concrete and concrete masonry. Nails shall be a code recognized fastener such as Pneutek, Inc. fasteners or approved equal. Each fastener shall provide minimum withdrawal resistance of 50 pounds minimum.
5. Staples: Minimum 3/4 inch crown, 16 gauge galvanized steel. Staples shall have sufficient length to penetrate studs at least 3/4 inch.

I. Wire: Galvanized soft-annealed steel wire in conformance to ASTM A641.

1. Hanger wire for suspended ceilings, minimum 9 gauge.
2. Wire for fastening metal channels together, 16 gauge.
3. Wire for fastening lath to supports, tying ends and edges of lath sheets, and securing accessories to lath, 18 gauge.

2.02 PLASTER MATERIALS

- A. Portland Cement: ASTM C150, Type II, low alkali.
- B. Hydrated Lime: ASTM C206, Type S.
- C. Sand: Washed natural sand conforming to ASTM C897, except gradation of sand shall be as follows:

Percentage retained, each sieve, by weight:

<u>Sieve Size</u>	<u>Maximum</u>	<u>Minimum</u>
No. 4	0	0
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	95

- D. Water: Clean, potable and from domestic source.
- E. Exterior Finish Coat Plaster: Shall consist of one of the following systems:
1. Three Coat Systems: Mineral Stucco as fabricated by California Stucco, La Habra, Highland Stucco, Merlex, Omega Stucco, Inc, or equal. Furnish formulations requiring only addition of water for installation. Sand shall pass No. 20 sieve. Mix and sand shall provide specified finish. Furnish integral colored stucco in color as selected by Architect.
- F. Plaster Bonding Agent: "Weld-Crete", manufactured by Larsen Products Co., Upco/Div., Emhart Corp. Bonding Adhesive No. 705, or Merlex Stucco "Acrylex".
- G. Base Coat Reinforcement: Alkali resistant fiberglass shorts, 1/2 inch chopped strands, Type AR, manufactured by OCF, PPG Industries, or equal.
- H. Plaster Patching Materials:
1. Bonding Agent: Acrylic resin type, Acryl 60, LHP Bonder, or equal.
 2. Patching Plaster: Manufactured by Merlex Stucco, Inc., Orange, CA, or equal. Furnish fast setting, compatible with existing plaster materials, "Exterior Pronto Patch," Portland cement base coat material, requiring only addition of water. Material shall provide initial set within 20 minutes, and final set within one hour.
- I. Underlayment: Single ply self-adhesive waterproofing membrane as manufactured by W.R. Grace Company, Jiffy-Seal by Protecto Wrap, or equal. Furnish for installation behind stress relief joints and backing on horizontal and vertical surfaces exposed to weather; under metal copings and flashings; and window jambs and sills.
- J. Miscellaneous Material: Provide additional components and materials required for a complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that overhead or concealed Work is finished, completed, tested and inspected as required before starting Work of this Section.

3.02 INSTALLATION-WEATHER BARRIER MEMBRANE

- A. Install one layer of underlayment over areas to receive lath with weather barrier membrane. Install horizontally with each course weather lapped 2 inches over layer below and 6 inches on ends.
- B. Install lath over underlayment in accordance with manufacturer's instructions. Repair and seal tears and holes in weather barrier prior to applying plaster.
- C. Install single ply self-adhesive waterproofing membrane per manufacturer's recommendations in areas indicated on the Drawings.
- D. Flashing Around Openings: Install self-adhering, self-sealing membrane to make openings weather tight in accordance with details shown on drawings.

3.03 LATH INSTALLATION

- A. General: Where exterior and interior lath is fastened to horizontal wood supports, the current edition of the CBC shall be complied with. Refer to Section 01420: Testing and Inspection.
- B. Exterior Lathing, General: Comply with requirements of ASTM C1063 and ML/SFA 920, whichever is more restrictive.
 - 1. Application of Metal Lath: Metal lath or wire fabric lath shall be installed in accordance with the provisions of CBC current editions. Lath shall be furred out from vertical supports or backing not less than 1/4 inch.
 - 2. Self-furring lath meets furring requirements. Furring of expanded metal lath is not required on supports providing a bearing surface width of 1-5/8 inch or less.
 - 3. Where external corner reinforcement is not installed, lath shall be furred out and carried around corners, extending and fastened to at least one support.
 - 4. A weep screed shall be provided at or below foundation plate line on exterior stud walls. Screed shall be installed a minimum of 4 inches above grade and shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.

5. Ends of lath on open framing (unsheathed) shall occur over supports. Where necessary, install additional studs to provide support for lath ends and support for separate flanges of stress relief joints.

3.04 PLASTER APPLICATION - GENERAL

- A. Proportion, mix, apply and cure plaster in conformance with ASTM C926.
- B. Install each plaster coat to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.
- C. Provide sufficient moisture or curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions. If water cured, each basecoat shall be continuously damp for at least 48 hours, including weekends and holidays. Other curing methods, spray applied curing compounds such as Expo-Cure, or OEHS approved equal are permitted.
- D. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.05 EXTERIOR PLASTERING

- A. Concrete surfaces, except where noted as "Exposed Concrete" or "Painted Concrete," shall be finished with stucco dash finish coats, as specified.
- B. Preparation of Surfaces:
 1. Exterior concrete and masonry surfaces to be plastered shall be free of oily or waxy substances, and loose or foreign material. Uniformly spray with nozzle-type water spray at least 12 hours before installation of plaster.
 2. Concrete and masonry surfaces to receive two coat application of 5/8 inch thick Portland cement plaster shall be treated with bonding agent. This surface preparation shall not be installed instead of a brown coat of plaster.
 3. Concrete surfaces to receive stucco dash finish shall be lightly sandblasted to provide a roughened surface.
 4. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.

- C. Number of Coats and Thickness: Exterior plaster shall be portland cement as follows with minimum thickness from face of supports or surfaces to finish face of plaster as follows:
1. Lathed Surfaces:
 - a. 3 coats, scratch, brown and finish, 7/8 inch thick, one inch thick where required by CBC.
 - b. 2 coats, controlled pre-mix single base coat and finish, 7/8 inch thick, one inch thick where required by CBC.
 2. Stucco Dash Finish Coats: 2 coats, 1/8 inch thick.
 3. Concrete and Masonry Base: 2 coats, brown and finish, 5/8 inch thick.
- D. Proportions:
1. Proportion ingredients for Portland cement. Calibrated boxes are required to determine the accuracy of proportioning. Proportions shall adhere to current edition of CBC.
 2. Dash Bond Coat: Mixed in the proportion of 1 cubic foot of standard portland cement to 1-1/2 cubic feet of sand. Omit dash coat when bonding agent is used.
 3. Stucco Finish: Stucco shall be factory prepared, exterior type, colored stucco containing a portland cement base, required aggregates and mineral pigments. Colors shall be as selected by the Architect. Selected colors are not limited to standard stock colors and certain Work, such as ceilings, soffits and walls, may be finished in non-standard colors as selected.
 4. Acrylic Based Stucco Finish: Shall be factory prepared exterior type, acrylic based colored stucco finish. Colors and textures shall be as selected by the Architect.
- E. Mixing: Provide plaster mix: cementitious materials and aggregate in proportions specified, furnishing only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within 1/2 hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight. Maximum allowable slump shall be 2-1/2 inch, based on a 2 inch by 4 inch by 6 inch slump cone.
- F. Application:
1. Dash Bond Coat: Dash on concrete or masonry surfaces, leave undisturbed, and maintain damp for at least 24 hours following installation. Omit Dash bond coat when liquid bonding agent is used.

2. Scratch Coat: Install with sufficient material to completely cover laths and scratch across supports.
 3. Brown Coat: Rod to a straight, true, even within 1/8 inch tolerance in 5 feet of surface and float to receive finish coat.
 4. Single Base Coat: As an alternative to scratch and brown coats, apply in conformance to ASTM C926.
 5. Stucco Finish Coat: Install in 2 coats to a total thickness of 1/8 inch, each coat covering surface uniformly. First coat shall completely cover basecoat with uniform color. Second color shall provide a uniform texture.
 - a. First coat shall be installed by providing several passes with nozzle to completely cover surface.
 - b. The second coat shall be installed by doubling back same day, when first coat is sufficiently dry.
 - c. Over concrete surfaces, second coat shall be installed 24 hours after installation of first coat. In warm weather, first coat shall be cured by light water spray after material has set.
 - d. Protection: Protect those surfaces, which are not to receive dash finish coats. Such surfaces shall be shielded and shall have any sand left from dashing operation removed.
- G. Curing Exterior Plaster: Adhere to current edition of CBC for curing requirements.
- H. Option for Machine Application, Scratch and Brown Coats, or Single Base Coat: Instead of hand installed plaster, the furnishing of plastering machines for interior or exterior scratch and brown coats or single base coat is permitted. Machine installation shall be in accordance with the following:
1. Qualifications: Provide proper equipment and apparatus.
 2. Apparatus: Pump shall be equipped with an air pressure gage and required safety devices. Hoses and connections shall be tight and pressure shall be maintained constant.
 3. Tests: Tests for determining proper consistency of plaster mix shall be taken at nozzle using slump cone method. Tests shall be observed by the IOR at least twice each day and as often as deemed necessary. Perform required tests and maintain an accurate log of such tests to ascertain compliance with material slump requirements. Material slump shall not exceed 2-1/2 inches at nozzle. Furnish an adequate number of standard 2 inch x 4 inch x 6 inch slump cones for testing. Cones shall

be on the Project site before Work is started and at all times during performance of the Work of this section.

4. Proportion and Application: Proportioning, mixing, number of coats and thickness shall be same as specified for hand application. Cement aggregate and water shall be mixed to plaster machine. Plaster mix shall be projected into and conveyed through a hose to the nozzle at end of hose and deposited by pressure in its final position ready for manual straightening and finishing.
5. Follow-Up: Perform scoring operation of plaster, based on settings and drying conditions at time of installation. Curing shall be as previously specified.
6. Protection: Before installing any plaster, thoroughly protect other adjacent Work.

3.06 QUALITY CONTROL

- A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/8 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.07 TESTING

- A. Written certification of sand compliance is required. Samples of sand shall be obtained at the Project site. Tests may be performed as deemed necessary by the IOR.
- B. When plastering machine is used, provide a supply of 2 inch x 4 inch x 6 inch high cones for slump testing of Portland cement plaster. Samples of plaster taken at nozzle shall have a maximum slump of 2-1/2 inches. Plaster material not complying with this requirement shall be deemed as defective Work.

3.08 REPAIR REQUIREMENTS FOR DAMAGED PLASTER

- A. Plaster Detached from Framing:
 1. Remove loose and broken plaster.
 2. Repair or replace damaged water-resistant backing and lath in compliance with specified standards.
 3. Remove stucco finish from surrounding area in the same plane by sandblasting.
 4. Install a scratch coat and a brown coat mixed with liquid bonding agent instead of water to the areas devoid of plaster.
 5. Install a coat of liquid bonding agent to entire wall plane.

6. Install a 1/8 inch thick stucco finish coat to entire wall plane and match existing texture and color.

B. Cracked Plaster 1/8 inch to 1/2 inch:

1. Remove loose material from crack with a wire brush.
2. Fill crack with slurry of stucco and liquid bonding agent.
3. Install a coat of liquid bonding agent to entire wall plane.
4. Install 1/8 inch thick stucco finish to entire wall plane and match existing texture and color.

C. Cracks Larger Than 1/2 inch - Painted:

1. Remove loose material from crack with a wire brush.
2. Fill crack with slurry of one part portland cement to 3 parts masonry/stucco sand and liquid bonding agent to match existing texture of adjacent surface.
3. Paint entire wall plane, color to match existing.
4. Where patching of plaster over existing lath is feasible, fasten loose lath and install new lath with nails at 6 inch centers. Where metal is furnished, lap new lath over existing 6 inches and tie at 6 inch centers. Install paper backings as required, shingled into existing..
5. Patching of Holes, Cracks, and Gouges: Holes, cracks, gouges, missing sections, and other defects in existing improvements shall be patched. For holes over 1 inch in size, cut small sections of lath and place in opening attached to existing material. Install 3 coats of plaster. For holes one inch and smaller, install bonding agent to existing surfaces and neatly fill hole with plaster, installing necessary coats to match adjacent surfaces, eliminate cracks and match existing surface texture. Cracks, gouges, and other defects shall be filled with plaster or spackle as required and neatly finished to match adjacent existing improvements.

3.09 CLEANING

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

3.10 PROTECTION

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

END OF SECTION

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Ceramic tile.
 - 2. Quarry tile.
 - 3. Waterproof membrane for tile.
 - 4. Stone thresholds.
 - 5. Mortar setting beds for floor and wall tile.
- C. Related Sections:
 - 1. Section 03300: Cast-In-Place Concrete.
 - 2. Section 09220: Portland Cement Plaster and Metal Lath.
 - 3. Section 06100: Rough Carpentry
 - 4. Section 09250: Gypsum Board
 - 5. Section 07920: Joint Sealants

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data, standard specifications, Material Safety Data Sheets, and other technical information for each product specified.
- B. Material Samples: Manufacturer's standard palette, indicating full range of tile colors, textures, and grout colors.
- C. Mock-Ups: For each type, color, and texture, minimum 1' x 1' or three full tile courses, on plexiglass to demonstrate proper bond mortar and coverage; grout color, hardness and depth.

- D. Installation Instructions: Manufacturer's preparation and installation instructions.
- E. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements of this Specification.
- F. Product Data verifying compliance with CHPS EQ2.2.1 for adhesives and sealants.

1.03 QUALITY ASSURANCE

- A. Comply with applicable parts of the following codes or standards as a minimum requirement:
 - 1. ANSI A108, American National Standard Specifications for the Installation of Ceramic Tile.
 - 2. ANSI A118, American National Standard Specifications for Ceramic Tile Installation Materials.
 - 3. ANSI A136.1, Standard Specifications for Ceramic Tile.
 - 4. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 5. ASTM C185 - Standard Test Method for Air Content of Hydraulic Cement Mortar.
 - 6. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 7. ASTM C150 - Standard Specification for Portland Cement.
 - 8. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
 - 9. ASTM C206 - Standard Specification for Finishing Hydrated Lime
 - 10. ASTM C503 - Standard Specification for Marble Dimension Stone.
 - 11. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 - 12. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.

13. Tile Council of America (TCA) – Current edition of “Handbook for Ceramic Tile installation”.
 - B. Grade Certificate and Labeling: With each delivery of tile, furnish manufacturer’s “Master Grade Certificate” to IOR.
 - C. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
 - D. Consistent Quality: Products shall be consistent in appearance and physical properties.
 - E. Comply with all requirements of California Building Code and ADA.
 - F. Qualifications of Tile Manufacturer: Company specializing in ceramic tile, mosaics, pavers, trim units, and thresholds with five years minimum experience.
 - G. Qualification of Installation System Manufacturer: Company specializing in installation systems/ mortars, grouts/ adhesives with ten years minimum experience.
 - H. Qualifications of Installer: Company specializing in installation of ceramic tile, mosaics, pavers, trim units and thresholds with five years experience with installations of similar scope, materials, and design.
 - I. Pre-Construction Meetings: Prior to start of Work of this section and after approval of submittals, schedule an on-site meeting between Contractor, OAR, IOR, and representatives of the material manufacturer and tile installer to review construction conditions and Drawings for conformance with the requirements of this Specification for each substrate.
 - J. Adhesives and sealants shall meet the requirements of CHPS EQ2.2.1:
 - A. Meet the VOC content requirements in the applicable category of South Coast Air Quality Management District (SCAQMD) Rule 1113, Adhesive and Sealant Applications (amended July 2007, or current version).
 - B. Adhesives shall be tested and meet VOC emission requirements of the California Department of Public Health’s (CDPH) Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Chambers (2004), including its 2004 Addenda.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver tile and other materials in sealed containers, with manufacturer's labels intact.

- B. Keep all materials clean and dry.

1.05 MAINTENANCE

- A. Extra Materials: Provide a minimum of 5 percent of each type and color as the installed tile, in manufacturers' cartons and labeled.

1.06 WARRANTY

- A. Manufacturer shall provide a 5 year material warranty.
- B. Installer shall provide a 5 year labor warranty.
- C. For waterproofing, manufacturer shall provide a 10 year material warranty for waterproofing installation, tile setting, and grouting materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Tile: To establish quality, Specification is based on ANSI A137.1 Standard Grade. Equivalent tile products from the following manufacturers may be provided:
 - 1. Dal-Tile Corporation.
 - 2. American Olean Company.
- B. Installation Materials: To establish quality for setting and waterproofing materials, Specification is based on ANSI A137.1. Products and methods of the following manufacturers may be provided:
 - 1. Laticrete International, Inc.
 - 2. Custom Building Products.
 - 3. Mapei.

2.02 MATERIALS

- A. Colors, Textures, and Patterns: Tile shall be from manufacturer's standard product line. 80% shall be from "price group 4", and "20% from price group 2", unless indicated otherwise. Tile trim and accessories shall match adjoining tile. Grout color shall match tile unless otherwise indicated.
- B. Tile sizes: Tile sizes specified are modular dimensions unless otherwise indicated.

- C. Mortar Sand: ASTM C 144.
- D. Portland Cement: ASTM C 150, Type I or II.
- E. Hydrated Lime: ASTM C 207, Type S; or ASTM C 206 Type S
- F. Portland Cement Mortar: ANSI 118.1
- G. Portland Cement Mortar Bed: Sand-cement mortar mix gauged with Laticrete Acrylic Admix or Custom Building Products Thin-Set Mortar Admix.
- H. Portland Cement Mortar Bed for Shower Areas: Laticrete 226 Thick Bed Mortar Mix Gauged with Laticrete 3701 Mortar and Grout Admix or on site mix per ANSI A108.1A with Custom Building Products Thin-Set Mortar Admix.
- I. Latex Portland Cement Bond Mortar: Laticrete 317 Floor & Wall Thinset gauged with Laticrete 3701 Admix, or Custom Building Products Master Blend mixed with Thin-Set Mortar Admix.
- J. Waterproof Membrane: Cold-applied, single component liquid with embedded reinforcing fabric where recommended by manufacturer: Laticrete Hydro Ban Waterproof Membrane or Custom Building Products Red Guard Waterproof Membrane.
- K. Reinforcing Wire Fabric: 2-inch x 2-inch, 16 x 16 gage, galvanized electrically welded wire reinforcing, per ASTM A 185.
- L. Latex Portland Cement Grout: Laticrete Sanded Grout (1500 Series), Custom Polyblend Sanded Grout or Laticrete Unsanded Grout 1600 Series (for joints smaller than 1/8"), Custom Polyblend Unsanded Grout.
- M. Epoxy Grout for Quarry Tile: Laticrete Spectralock Pro Epoxy Grout for Floors and Walls or Custom 100% Solids Epoxy Grout.
- N. Cleavage Membrane and Wall Backing Paper: Cleavage membrane shall be 15-pound asphalt-saturated felt manufactured according to ASTM D226-97a Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- O. Separation Material (for all caulked joints including perimeters and quarry-tile fields of floor mortar beds): Quality Foam, QF 200 white, 3/8" wide x 5" high.
- P. Backer Rod for sealants (for ceramic mosaic fields): Polyethylene foam, closed-cell, flexible and compressible, 3/16" diameter.

Q. Cleaner and Sealer:

1. Cleaner and sealer shall be from one manufacturer, acceptable to tile and grout manufacturers. To establish quality, the Specification is based on Aqua Mix Inc. Equivalent products from Miracle Sealants Co. or Watco Tile and Brick may be provided.
2. Cleaner: Aqua Mix Concentrated Tile Cleaner, neutral phosphate-free cleaner, or Custom Building Products Tile Lab Concentrated Tile/ Stone Cleaner.
3. Sealer: Aqua Mix Penetrating Sealer, fungus- and bacteria-resistant, stain-resistant, and slip-resistant as specified for tile, or Custom Building Products Tile Lab Surface Gard.

R. Sealant:

1. Sealant and primer shall be from one manufacturer, acceptable to tile and grout manufacturers. To establish quality, the Specification is based on the following products. Equivalent products from other approved manufacturers may be provided (see Section 07920, Joint Sealants).
2. Sealant for Ceramic Mosaic Tile: Pecora 898 Silicone Sanitary Sealant or Laticrete Latasil NS.

S. Sealant for Quarry Tile: Pecora Dynatrol II-S6, polyurethane, slope grade, traffic grade or Laticrete Latasil HD

2.03 TILE

A. Unglazed Ceramic Mosaic Floor Tile:

1. Size: 2 inch x 2 inch or as indicated.
2. Colors and patterns as selected by Architect from price groups specified.
3. Slip Resistance: Resistant to slipping appropriate to the installed conditions of use, as required by the California Building Code and ADA.
 - a. As a minimum, the coefficient of friction as measured by ASTM C 1028 shall be 0.6 except ramps shall be 0.8.
 - b. For tile in shower and locker areas, incorporate grit into tile to increase slip resistance.

B. Glazed Wall Tile:

1. Size: 4-1/4 inch x 4-1/4 inch face dimensions x 5/16 inch thick (ceramic mosaic tile may also be used on walls).
2. Colors and patterns as selected by Architect from price groups specified.

C. Unglazed Paver Tile:

1. Porcelain, flat tile.
2. Size: 12 inch x 12 inch, or as shown.
3. Colors and patterns as selected by Architect from price groups specified.
4. Slip Resistance: Resistant to slipping appropriate to the installed conditions of use, as required by the California Building Code and ADA. As a minimum, the coefficient of friction as measured by ASTM C 1028 shall be 0.6 except ramps shall be 0.8.

D. Trim:

1. Integral bullnose at external corners.
2. Provide bullnose where tile projects from jamb.
3. Mosaic tile base with wall tile above: A3401.
4. Mosaic tile base without wall tile above: S3619T (6-inch high sanitary coved base).
5. Bullnose at wainscot: A4200 and A4402.

E. Quarry Tile:

1. Size: 6 inch x 6 inch x 1/2 inch, square edge.
2. Slip Resistance: The coefficient of friction shall be 0.6 except for ramps, which shall be 0.8. when tested in "wet conditions"
3. Kitchen Floor Color: Blaze Flash (red).
4. Non-Kitchen Floor Colors: As selected by Architect from manufacturer's standard colors.
5. Base: Trim shape Q 3565, 6 inch x 5 inch x 1/2 inch cove base, round top with integral bull nose or cove forming corners, and related trim pieces.

F. Stone Thresholds:

1. Exterior installation: Marble thresholds with minimum abrasive hardness value of 10 tested in accordance with ASTM C241.
2. White honed marble complying with Marble Institute of America Group "A," unless other color indicated.
3. Size and profile shaped to provide transition between tile surfaces and adjoining finished floor surfaces, or as indicated. Width not less than 4." Edges beveled on a slope of no greater than 1:2. Cut to fit door frame profile.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with installation requirements. Verify that all penetrations through substrate have been installed. Proceed with Work only after all conditions are in compliance.
- B. Substrates shall be firm; dry; clean and within flatness tolerances required by relevant ANSI A108 tile installation standards. Prepare surfaces as follows:
 1. Concrete Floors: Allow concrete floors to cure for 28 days minimum before beginning tile and grout installation. Remove laitance, sand, dust, and loose particles.
 2. Plywood Subfloors: Before installing mortar setting bed over plywood sub-floors, install cleavage membrane over sub-floor. Anchor firmly in place and lap joints 6 inches minimum. Turn membrane up 6" at walls and beneath building felt on walls.
- C. Substrates to receive wall tile and base shall be:
 1. Scratch coat of cement plaster, as specified in Section 09220: Portland Cement Plaster and Metal Lath (required in student restrooms, showers and locker rooms, and quarry tile bases).
 2. Cementitious backing panels, as specified in Section 09250: Gypsum Board.
- D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical items of Work, and similar items located in or behind tile has been completed before installing tile.

- E. Verify that joints and cracks in tile substrates are coordinated with caulked-joint locations; if not coordinated, adjust as required by the Architect.
- F. Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are maintained in compliance with referenced standards and manufacturer's written instructions.
- G. Protect adjacent surfaces during progress of Work of this section.

3.02 TILE INSTALLATION, GENERAL

- A. Install tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Center the tile fields in both directions for each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- B. For tile mounted in sheets: Joints between tile sheets shall be the same width as joints within tile sheets.
- C. Extend Work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without damaging tile. Carefully grind the cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Locate joints, directly above joints in concrete substrates, at horizontal and vertical changes in plane, or where indicated during installation of mortar beds. In quarry tile floors, provide at 12 feet on center maximum. Provide 3/8-inch wide foam at joints. Do not saw-cut joints after installing tiles.
- F. Prepare and clean joints to be caulked. Apply sealants to comply with requirements of Section 07920: "Joint Sealants."
- G. Conform to manufacturers printed instructions, and applicable requirements of ANSI and TCA Standards.

3.03 TILE INSTALLATION, FLOOR

- A. Install reinforcing and latex Portland-cement mortar setting bed over cured concrete slab or cleavage membrane on plywood floor. Lap reinforcing at least one full mesh, and support or lift so that it is approximately in the middle of mortar bed. Do not

abut against vertical surfaces. Install foam separation material at perimeters and expansion joint locations for caulked joints.

- B. Mix setting mortar in accordance with ANSI recommendations.
- C. Once begun, mortar installation must continue until room is completed. Discard any batch not floated and finished within ½ hour of mixing. Firmly compact before screeding. Screed to true plane and pitch as indicated. Slope mortar bed sufficiently that water flows to drain and no puddling will occur. Slope mortar down to floor drains for proper installation of waterproof membrane. After screeding, firmly rub down with steel or wood float.
- D. Cure mortar bed with a light fog spray of water and cover with 6-mil Visqueen for 72 hours.
- E. Waterproof Membrane:
 - 1. Install waterproof membrane where indicated and in all kitchen, toilet, shower, and locker areas according to TCA Standards. Extend membrane up wall mortar or backing board as follows:
 - a. 3” above top of curb wall.
 - b. 6” minimum above floor.
 - c. In shower rooms, install from floor to ceiling.
 - 2. Insure that all layers of membrane are fully inserted into clamping ring of floor drain. After membrane installation and before tile setting, install pea gravel around sub drain to prevent blockage of weep holes and place mortar to proper level for setting tile.
 - 3. Before setting tile and after seven days curing, water test membrane by damming drains and doors, filling floor with water to 4-inch minimum depth, and leaving for 24 hours. Correct any leaks and re-test before proceeding. After testing, protect membrane from traffic until tile Work begins.
- F. Thin Set Method: Confirm substrate is completely clean and free of dust. Cut foam at floor perimeters flush with top of mortar bed. Insure that bond coats do not intrude into joints to be caulked. Install tile over properly cured setting bed or waterproof membrane utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5.
- G. Minimum coverage of bond mortar shall be 80% except 95% in shower areas, for quarry tile, and exterior installations. Place tile into fresh mortar press tile to insure

full contact. Before setting proceeds, set and remove three tiles or sheets of tiles to confirm specified coverage of bond mortar. If coverage is insufficient, utilize a larger toothed trowel or back butter tiles until proper coverage is provided.

- H. Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 to 1/8 inch.
 - 2. Quarry Tile: 1/4 to 3/8 inch.
 - 3. Paver Tile: 3/16 to 3/8 inch.
- I. Install base tile for quarry tile floors on a mortar bed, with joints matching floor.

3.04 TILE INSTALLATION, WALLS

- A. Install wall mortar beds before floor mortar beds.
- B. On plaster walls, clean scratch coat surface of loose or foreign materials, fog spray with water, and install brown coat mortar bed over scratch coat to a thickness not less than 3/8" and not greater than 3/4 inch. Once started, wall mortar installation must continue until wall is completely floated. Discard any batch not floated and finished within 1/2 hour of mixing. As soon as wall mortar is dried to sufficient hardness, but still plastic, firmly rub with wood float.
- C. Cover cure with 40 wt. Kraft paper for 72 hours minimum.
- D. Install tile over properly cured setting bed, waterproof membrane, or cementitious backing panels utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5. Confirm substrate is completely clean and free of dust. Insure that bond coats do not intrude into joints to be caulked.
- E. Minimum coverage of bond mortar shall be 80% except 95% in shower areas or exterior installations. Set and test as specified for floors.
- F. Lay out Work so tiles will be centered on each wall or section of wall in order to minimize tile cuts. Lay out tile wainscots to next full tile beyond dimensions indicated. Spot setting bed with mortared tile, set plumb and true, accurately indicate plane of finished tile surfaces.
- G. Install tile on walls with following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch.
 - 2. Ceramic Mosaic Tile: 1/16 to 1/8 inch.

3. Quarry Tile: 1/4 to 3/8 inch..
 4. Special Large Tile: 3/16 to 3/8 inch.
- H. Horizontal joints shall be level, vertical joints plumb with surfaces true and plumb, edges of tiles flushed.
 - I. Rub exposed cuts smooth with a fine stone; no cut edge shall be set against a fixture or adjoining surface without a 1/16 inch joint to be caulked.
 - J. Install access doors where required, furnished under another section, in correct location, plumb or level, flush with adjacent construction, and securely fastened to framing.

3.05 GROUTING

- A. Prior to starting, ensure that all tile surfaces are clean and excessive bond mortar is scraped and vacuumed from joints (approximately 2/3 depth of tile should be open for grouting). Follow manufacturer's instructions for mixing grout. Once grout Work commences, proceed until complete wall or floor area is finished utilizing one batch of grout.
- B. Latex portland cement grouting: Dampen tile surface and joints with water using sponge, but leaving no puddles in joints. Force grout into joints using sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not over water.
- C. Curing latex Portland cement grout: Remove final grout haze with clean soft cloth, and cover with 40-weight Kraft paper to cure. Leave paper in place for protection. Cover wall surfaces with 40-weight Kraft paper for 72 hours.
- D. Epoxy grouting: Do not dampen tile. Follow manufacturer's instructions for mixing grout. Force grout into joints with sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not allow grout to harden on face of tile.
- E. Curing epoxy grout: Do not cover floor, but do not allow foot traffic for 72 hours. Then, if grout is not tacky, cover with 40-weight Kraft paper for protection.

3.06 CLEANING AND SEALING

- A. If grout scum is not visible on tile surface after curing, clean tile surface with clear water. Remove and replace cracked, broken or defective Work with proper material.

- B. If, when curing membrane is removed, grout scum is visible on tile surface, use the following cleaning method:
1. Immediately recover floor with paper or felt and allow to continue curing for a minimum of 14 days; uncover floor and maintain entire tile surface saturated with clean cool water for not less than 2 hours.
 2. Utilize a neutral cleaner acceptable to manufacturers of tile and grout, and follow manufacturer's instruction. Do not provide generic acid cleaners.
 3. Wet tile floors and apply cleaning solution to floor surface, then scrub with a brush. Rinse area several times with clean water to flush solution off floor surface.
- C. Apply penetrating sealer in accordance with manufacturer's instructions utilizing a dense sponge applicator, paint pad, sprayer or brush. Avoid overlapping, puddling, and rundown. Completely wipe surface dry within 3 to 5 minutes using cotton or paper towels; do not allow sealer to dry on tile. After 2 hours, test surface by applying water droplets to surface. If water is absorbed, apply a second coat. Avoid surface traffic for 24 hours.

3.06 CAULKING

- A. Insure joints to be caulked are free of all setting and grouting materials and construction debris. Do not permit any foot traffic on installed caulking for a minimum of 48 hours or protect with hardboard strips.
- B. Install in accordance with Section 07920: Joint Sealants.

3.07 PROTECTION

- A. Admit no traffic where tile is installed until mortar and grout has set for a minimum of 72 hours.
- B. Protect Work of this section until Substantial Completion.

3.08 CLEAN UP

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

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provisions of Division 01 apply to this section.
- B. Work Included:
 - 1. Lay-in acoustical ceiling systems and metal suspension system.
- C. Related Sections:
 - 1. Section 09 22 16: Metal Support Assemblies.
 - 2. Section 09 29 00: Gypsum Board.
 - 3. **Section 12 49 40: Roller Shades (12.19.14)**
 - 4. Division 23: Mechanical.
 - 5. Division 26: Electrical.

1.02 QUALITY ASSURANCE

- A. Ceiling systems shall consist of lay-in acoustical ceiling panels by a single manufacturer and suspension systems by a single manufacturer for the entire project.
- B. Qualifications of Installer: Minimum 5 years experience in installing acoustical ceiling systems of the types specified.
- C. Design Criteria:
 - 1. Deflection of finished surface to 1/360 of span or less.
 - 2. 1/8 inch maximum permissible variation from true plane measured from 10 foot straightedge placed on surface of finished acoustical fiber units.
 - 3. Made from rapidly renewable BioAcoustic substrate (45% rapidly renewable content, post-consumer fibers with 23% recycled content) with rapidly renewable binders.

4. Panel materials shall meet the requirements of CHPS EQ2.2.6.
5. CHPS Low-Emitting Materials Table: Materials submitted must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory as prescribed by CHPS.
6. Materials shall be tested and meet VOC emission requirements of the California Department of Public Health's (CDPH) Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Chambers (2004), including its 2004 Addenda.

D. Requirements of Regulatory Agencies:

1. Conform to CBC requirements and UL - Tunnel Test for Fire Hazard Classification of Building Materials.
2. CISCA: Acoustical Ceilings Use & Practice.

E. American Society for Testing and Materials (ASTM):

1. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
5. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
8. ASTM E1414 - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

- F. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

1.03 SUBMITTALS

- A. Samples:
 - 1. Lay-in panels of each specified type, 6 inch x 6 inch minimum size.
 - 2. Suspension System: 12 inch long samples of suspension system members, connections, moldings and wall angles, for each color specified.
- B. Shop Drawings:
 - 1. Indicate complete plan layouts and installation details.
 - 2. Indicate related Work of other sections which is installed in, attached to, or penetrates ceiling areas, such as air distribution and electrical devices.
- C. Product Data:
 - 1. Suspension System for Lay-in Ceiling: Printed data for all suspension system components, including load tests, indicating conformance to specified tests and standards.
 - 2. Acoustical units: Printed data indicating conformance to specified tests and standards.
- D. Maintenance Materials: Provide extra panels equal to 1 percent of the area of each typical module size of acoustical panel, but not less than 8 of each specified size, style and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project site in original sealed packages.
- B. Storage: Store materials in building area where they will be installed, in original package. Keep clean and free from damage due to water or deteriorating elements.
- C. Handle in a manner to prevent damage during storage and installation.

1.05 PROJECT CONDITIONS

- A. Installation of acoustical ceiling system shall not begin until the building is enclosed, permanent heating and cooling is in operation, and residual moisture from plaster and concrete work has dissipated. Building areas to receive ceilings shall be free of construction dust and debris.
- B. Environmental Requirements: Maintain temperature in space at 55 degrees F or above for 24 hours before, during, and after installation of materials.
- C. Scheduling:
 - 1. Before concealing Work of other sections, verify required tests and inspections have been completed.
 - 2. Coordinate with related Work of other sections. Coordinate location and symmetrical placement of air distribution devices, electrical devices, and all penetrations with related Work section.

1.06 WARRANTY

- A. Manufacturer shall provide a 10 year material warranty.
- B. Installer shall provide a 2 year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. USG Corporation.
- B. Armstrong World Industries.
- C. CertainTeed Ceilings Corp.

2.02 SUSPENSION SYSTEM

- A. Metal suspension system for acoustical lay-in tile shall be hot-dipped galvanized steel conforming to ASTM A653. Main beams and cross tees shall be double-web steel construction with exposed flange design, with factory punched cross tee slots, hanger holes and integral couplings.
- B. Metal suspension system for acoustical lay-in tile shall conform with ASTM C635, and section 13.5.6 of ASCE 7, as modified in CBC section 1615A.1.16, for installation in high seismic areas.
- C. Structural classification of suspension systems shall be heavy-duty in conformance to ASTM C635.
- D. Vertical Strut: USG Donn Compression Post, or equal, or as indicated; types and designs complying with requirements of authorities having jurisdiction and seismic Zones D, E and F requirements. Provide base attachment clip for connection of vertical strut to main beams.
- E. Wall Molding: Fabricated from galvanized steel with 2 inch horizontal leg and hemmed edges, same finish as main and cross tees.
- F. Spacer/Stabilizer Bars: Provide for tying together the ends of main runners and cross tees that are not attached to wall molding.
- G. Hanger Wire: No. 12 gage (9 gage for pendant fixtures), galvanized soft annealed mild steel wire as defined in ASTM A641, Class 1 coating.
- H. Provide attachment devices and any other required accessories for a complete suspended ceiling system installation.
- I. Total recycled content: 63%

2.03 ACOUSTICAL CEILING PANELS

- A. Acoustical ceiling panels shall be class A in accordance to ASTM E1264.
- B. Acoustical panels shall meet the following surface-burning characteristics when tested in accordance to ASTM E84 for Class A materials:
 - 1. Maximum Flame Spread: 25.
 - 2. Maximum Smoke Developed: 50.
- C. Mold and Mildew Resistance: All panels and faces shall be treated with a biocide paint additive or an antimicrobial solution to inhibit mold and mildew.

2.04 CEILING TYPES

- A. ACT 1 - Classrooms:
 - 1. Acoustical Ceiling Panels:
 - a. Panel Name: Armstrong ~~Tierra~~*Optima (12.19.14)* – BioAcoustic substrate or equal.
 - b. Panel Size: 2 foot x 4 foot.
 - c. Panel Thickness: 3/4 in.
 - d. Edge Detail: Lay-in.
 - e. Light Reflectance: 0.82 minimum, complying with ASTM E1477.
 - f. CAC: Minimum 35 - 39, UL Classified, complying with ASTM E1414.
 - g. NRC: Minimum 0.85, UL Classified, complying with ASTM C423.
 - h. Color: White.
 - i. Recycled Content: Minimum 23 percent.
 - j. Anti-Microbial: BioBlock Plus
 - k. Sag Resistance: HumiGuard Plus

2. Suspension System:
 - a. Suspension System Name: Prelude XL HRC (high recycled content) by Armstrong or equal
 - b. Color: White.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Furnish layouts for inserts, clips or other supports and struts required to be installed by the Work of other trades that depend on the suspended ceiling system for support.
- B. Coordinate related Work to ensure completion prior to installation of clips or fasteners.
- C. Compare layouts with construction conditions. Tile shall be spaced symmetrically about the centerlines of the room or space, and shall start with a tile or joint line as required to avoid narrow tiles at the finish edges unless indicated otherwise. Joints shall be tight with joint lines straight and aligned with the walls. Ceiling moldings shall be provided where tile abuts wall with matching caulking to eliminate any space.

3.02 INSTALLATION OF SUSPENSION SYSTEMS

- A. General:
 1. Install suspension system in accordance with ASTM C636.
 2. System shall be complete; with all joints neatly and tightly joined and securely fastened; suspension members shall be installed in a true, flat, level plane.
 3. Hanger Wires: 12 gage minimum; larger sizes as indicated or required.
 - a. Fasten wires to panel points and structure above per most stringent requirements of fabricator and CBC and as indicated on Drawings.
 - b. Wires exceeding 1:6 out-of-plumb shall be braced with counter-sloping wires.

- c. Maintain wires 8 inches minimum clear of non-braced ducts, pipes, and other items.
 - d. Install wire along main runners at 4 feet on center. Terminal ends of each main runner and cross tee must be supported within 8 inches of each wall with a perimeter wire.
 - e. Where obstructions prevent direct suspension, provide trapezes or equivalent devices; 1-1/2 inches minimum cold-rolled channels back to back may be installed for spans to 6 feet max.
 - f. Wire shall be straight, without extraneous kinks or bend. Hanger wire connections must be capable of carrying a 200 - pound pull without stretching or shifting the suspension clip.
4. Bracing Wires to Resist Seismic Forces: 12 gage minimum, larger sizes as indicated or required.
- a. System for Bracing Ceilings: Lay-In Ceiling Systems: Install one four-wire set of sway-bracing wires and a vertical strut for each 144 square feet maximum of ceiling area. Locate wire-sets and struts at 12 feet maximum on center. At ceiling perimeters, wire-sets shall be installed within 6 feet of walls.
 - b. Install four-wire sets and struts within 2 inches of cross-runner intersection with main runner; space wires 90 degrees from each other.
 - c. Do not install sway bracing wires at an angle greater than 45 degrees with the ceiling plane.
 - d. Wires shall be tight, without causing ceiling to lift.
 - e. Fasten struts in accordance with CBC requirements.
5. Provide all additional wires, 12 gage minimum, necessary to properly support suspension at electrical devices, air distribution devices, vertical soffits, and other concentrated loads.
6. Suspension:
- a. Suspension members shall be fastened to 2 adjacent walls; but shall be 3/4 inches minimum clear of other walls.

- b. Any suspension members not fastened to walls shall be interconnected to prevent spreading, near their free end, with a horizontal metal strut or 7445 stabilizer bar or 16 gage taut tie wire.
- c. Provide additional tees or sub-tees to frame openings for lights, air distribution devices, electrical devices, and other items penetrating through ceiling, which do not have an integral flange to support and conceal cut edges of acoustic panels. Provide cross-bracing necessary to securely support any surface mounted fixtures or other items.

7. Attachment of Wires:

- a. To Metal Deck or Steel Framing Members: Install as required by current code.
- b. To Suspension Members: Insert through holes in members or supporting clips.
- c. All wires shall be fastened with three tight turns minimum for hanger wires and four tight turns minimum bracing wires. All turns shall be made in a 1-1/2 inches maximum distance.

B. Suspension System for 2 Foot x 4 Foot Lay-in Acoustical Ceilings:

- 1. Main Runners: Install main runners 48 inches apart; 12 gage hanger wires space 48 inches on center maximum along runners, and within 8 inches of ends.
- 2. Install wall moldings with fasteners to studs. Install corner caps at molding intersections.
- 3. Cross-Tees: Install between main runners in a repetitive pattern of 2 foot spacings.
- 4. Sub-Tees: Install at edges of penetrations.

3.03 INSTALLATION OF ACOUSTICAL PANELS

- A. Install panels into suspension system. Partial panels shall be neatly cut and fitted to suspension and around penetrations and/or obstructions. Duplicate tegular edges at partial panels; cuts to be straight. Repaint cut tiles to match color or as directed by manufacturer for mylar facing at visually exposed conditions or as required by the Architect.

3.04 AIR DISTRIBUTION DEVICES

- A. Refer to and coordinate with Division 23: Mechanical.
- B. Install air distribution grilles and other devices into suspension system. Install 4 taut wires, each 12 gage minimum, to each device within 3 inches of device corners, to support their weight independent of the suspension system.

3.05 LIGHT FIXTURES

- A. Refer to and coordinate with Division 26: Electrical.
- B. Fixtures weighing less than 56 pounds: Install fixtures into suspension systems and fasten earthquake clips to suspension members. Install minimum 2 slack safety wires, each 12 gage minimum, to each fixture at diagonally opposite corners, to support their weight independent of the system.
- C. Fixtures weighing 56 Pounds or more: Install fixtures into suspension system and fasten earthquake clips to suspension system members as required by the Drawings and/or code. Install not less than 4 taut 12 gage wires capable of supporting four times the fixture load.

3.06 CLEANING

- A. General: After installation of acoustical material has been completed, clean all surfaces of the material, removing any dirt or discolorations. Replace panels as required.
- B. Acoustical Panels: Minor abraded spots and cut edges shall be touched up with the same paint as was used for factory applied finish of the lay-in panels.
- C. Remove and replace work that can not be successfully cleaned and repaired to eliminate evidence of damage.

3.07 CLEAN UP

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

3.08 PROTECTION

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

END OF SECTION

SECTION 09 52 00
TACKABLE WALL SYSTEMS - SITE FABRICATED

PART 1 – GENERAL

1.1 SUMMARY

- A. Provide Site Fabricated Tackable Wall Systems as shown on the drawings, as specified herein and as needed for a complete and proper installation.
- B. Provide manufacturers standard "No Cost" 15-Year Fabric Replacement Program.

1.2 RELATED WORK

- A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical data, installation instructions and maintenance and cleaning instructions.
- C. Certified Test Reports: Submit test data from an independent testing agency, acceptable to authorities having jurisdiction, evidencing that panel assemblies comply with requirements indicated for acoustical and fire performance characteristics.
- D. Provide copy of manufacturers standard "No Cost" 15-Year Fabric Replacement Program and 5-Year Warranty on all work included in this section.
- E. Samples:
 - 1. Fabric – Submit manufacturer's standard size swatches of material indicated as facing for acoustical/tackable wall panels, showing full range of colors, textures, and patterns available for each type required.
 - 2. Core Material – Submit 12" X 12" samples of each core material used, showing full range of materials, thicknesses, acoustics, and density.
 - 3. Track – Submit samples of manufacturer's "Track" showing full range

of edge profiles, thicknesses, and details for each type of acoustical/tackable panel. Where more than one edge profile is used on a panel clearly show how each edge profile transitions into a different edge profile.

4. Accessory Package: Submit one FS-900 Accessory Package.
5. Samples – Provide 12" X 12" samples of each type of panel used, including representative samples of each thickness and panel type. Install samples on a substrate of sufficient firmness to allow the samples to be handled without damage.

F. Shop Drawings:

1. Show each interior elevation with types and locations of track and seams with dimensions; and how each type of track transitions into adjacent track.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of wall panel as produced by a single manufacturer, including recommended primers, adhesives and sealants. The manufacturer's published product literature shall clearly indicate compliance of wall panels with requirements indicated.
- B. Installer: A firm specializing in site fabricated Track systems with not less than 5-years of documented experience in installing TRACK systems and use only installers licensed by the manufactured product being used, with not less than 3-years of documented experience in installing TRACK systems
- C. Fire Performance Characteristics: Provide acoustical/tackable wall panels with surface-burning characteristics as indicated below, as determined by testing assembled materials and construction according to ASTM E-84, by a testing organization acceptable to authorities having jurisdiction.
 1. Flame Spread: 25 or less
 2. Smoke Developed: 25 or less
 3. Flame Contributed: 0

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect the fabric, core material, and track from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material until wet work such as concrete and plaster are completed.

1.6 PROJECT CONDITIONS

- A. Do not begin installation until spaces to receive acoustical/tackable panels have been enclosed and maintained at approximately the same humidity and temperature conditions as planned for occupancy. Maintain temperature and humidity as recommended by panel manufacturer.

1.7 EXTRA MATERIALS

- A. Deliver extra materials to District. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels.
 - 1. Accessory Package: furnish an extra 10 percent of the FS-900 Accessory Packages issued.
 - 2. Manufacturer to provide District additional system materials at distributor prices. See Part 3.6.3

PART 2 – PRODUCTS

2.1 TACKABLE WALL PANEL MATERIALS

2.2 Available Manufacturers: Subject to compliance with requirements, the manufacturer approved by the District, offering products that may be incorporated into the work include the following.

- A. Tackable Site Fabricated Track System, as distributed by Fabricmate Systems 805-642-7470
 - 1. Fabricmate Systems Acoustical/Tackable wall panels shall be considered basis for specification or approved equal
 - 2. Provide Fabricmate Systems standard "No Cost" 15-Year Fabric Replacement Program.
- B. Design Requirements:
 - 1. Stretched fabric panel system shall consist of continuous perimeter and intermediate mounting extrusions that are site fabricated, and applied directly to the wall surface.
 - 2. Fabric face shall be stretched over core materials and tucked into the track's locking jaws, leaving fabric floating above core surface. Installation of fabric facing shall not utilize any adhesives, nails, tacks, screws or tape.
 - 3. System shall allow for removal and replacement of fabric from individual panels. Removal of fabric shall provide access to surface

behind fabric. Fabric shall be easily replaceable for future remodeling or replacement of damaged panels. Fabric shall be removable and replaceable without dismantling, removal, damaging, or replacement of the track extrusions or core material.

4. All fabrics shall be cleared by Fabricmate Systems for suitability with this system, its application and warranty.
5. Framework: Multi-piece and 1 piece extruded polymer track system with jaws of sufficient strength to securely hold fabric in place after repeated applications. Minimum wall thickness shall be .062".
6. Edge detail: Square profile.
7. Intermediate detail: Butt joint "square".
8. Outside Corner Detail: Fabric shall wrap around corners in one piece without seams or joints.
9. Prefabricated panels "fabric or vinyl wrapped" do not satisfy the intent of this specification and will not be accepted.
10. Hinged, self-locking (snap-lock) type mounting extrusions do not satisfy the intent of this specification and will not be accepted.
11. Fire resistance: complete panel assembly shall have an ASTM E-84 Class A (1) or NFPA 255 rating.

C. Tackable wall panels: Fabricmate Systems field assembled track system.

1. Track profile: Fabricmate Systems FS-100, FS-200 series or other profiles as indicated on drawings.
2. Core material: 1/2" thick 15-lb PCF Industrial Insulation Board or equal notched to fit within track's perimeter. (or as indicated on drawings)
 - a) NRC: .50 (with fabric installed)
3. Fabric: Guilford of Maine FR-701.
 - a) Color/Pattern/Texture: As selected by Architect from manufacturer's standard fabrics.
4. Fabricmate Systems accessory package: Supply one FS-900 package for every room with tackable panels.

PART 3 – EXECUTION

3.1 Inspection

- A. Installer must examine substrates and conditions under which the acoustical/tackable system are to be applied and notify Architect in writing of conditions detrimental to proper and timely completion. Do not proceed with work until unsatisfactory conditions have been corrected and acceptable to installer.
- B. Verify all stationary objects abutting acoustical/tackable panels are installed i.e. casework, markerboards, door and window jams, ceiling, etc.

3.2 INSTALLATION

- A. Install acoustical/tackable wall panels in locations indicated on plans. Comply with manufacturer's printed instructions for installing site fabricated track systems.
- B. Track - Install perimeter and intermediate track using screws, anchors and staples as project conditions warrant. Secure track base to wall (or ceiling) to prevent track framework from separating away from the wall. For masonry surfaces use a continuous bead of PL200 or equal with conical anchor and pin/nail every 6-8 inches.
 - 1. Follow contours of the wall and scribe to adjoining work accurately at borders, penetrations, and imperfections.
 - 2. Track around all openings within a panel when needed as per manufacturers instructions.
 - 3. Allow spacing for insertion of installation tool.
 - 4. Wrap fabric around outside corners in one piece without seams or joints, creating one panel on two different wall planes. Fabric shall float over the PVC corner track or equal matching the adjacent tracks' detail.
- C. Core Material – Prep surfaces that receive treatment, remove wall plates and other obstacles. Apply a nontoxic, low vapor clay-base adhesive. Cut and notch core material to accurately fit inside tracked perimeter, maintaining the same plane. Mechanically fasten core to prevent air gaps between core and wall and to assure proper adhesion.
 - 1. Assure that all fixtures have the necessary backing to keep them flush with the acoustical/tackable panels.
- D. Fabric – Stretch fabric into the track's locking jaws using the manufacturer's recommended "rolling tool", keeping fabric weave plumb, level and true in proper relation to building lines without ripples, waviness or "hourglass" effects.

1. Use of adhesives or mechanical fasteners are strictly prohibited.
2. Fabric shall not be attached to the core material in any way.
3. Fabric shall be stretched and tensioned sufficiently taut to avoid sagging under varying year-round temperature and humidity conditions.
4. Fabric shall maintain its shape after being touched or leaned against without leaving any indentations, sags, or blisters.
5. Ceiling applications shall not deviate more than 1" from true plane of ceiling in a 20' span.
6. Seaming of fabric shall not be allowed, unless it is part of the design and indicated on the drawings.

3.3 CLEANING AND PROTECTION

- A. Clean exposed surfaces of acoustical/tackable panels; comply with manufacturer's instructions for cleaning and repair of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- B. The installer shall advise the contractor of the required protection for the Fabricmate Systems panels, such as; temperature and humidity limitations and dust control, so that the finished work will be without damage and deterioration at the time of acceptance by the Owner/District.

3.4 WARRANTY

- A. All Acoustical/Tackable and Acoustical wall and ceiling panels shall have a warranty against defects or workmanship of not less than 5-Years, commencing on the date of substantial completion.

3.5 SECURITY

- A. Contractor shall provide fingerprint certification as described by the California Education Code §45125.1 for no less than 25% of all workers present at active school site.

3.6 15 YEAR FABRIC REPLACEMENT PROGRAM

- A. Contractor shall provide Fabricmate Systems district standard "No Cost" 15-Year Fabric Replacement Program and is applicable with the use of Manufacturers approved wallcoverings, commencing on the date of Notice of Completion.
 1. Contract shall be at "No Cost" to the District.

2. Contractor shall provide materials and labor to replace the fabric, on up to 10% of the originally installed panels at "No Cost" to the District.
 - a) Panels covered under this sub-section shall include panels that are damaged due to neglect, vandalism or reasons not covered under the 5-Year Warranty.
3. Contractor and Manufacturer of installed product shall make available to the District extra materials and installation tools for the Tackable Wall System at distributor prices for future repairs or small panel additions to this project.
4. Contractor shall train for a minimum collective time of 40 hours District personnel as to correct installation, maintenance & repair procedures of the product at no cost to the Owner/District.
5. Contractor shall also maintain & update information regarding any & all technical changes that may affect product usage and application.
6. Contractor shall a copy of the "No Cost" 15-Year Fabric Replacement Program signed by the Contracting Company at time of bid.

END OF SECTION

SECTION 09 68 16

SHEET CARPETING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. General Conditions, Supplementary Conditions and Division 01 of these specifications apply to the work specified in this section.
- B. Related Sections:
 - 1. 03 30 00 – Cast-in-Place Concrete
 - 2. 09 65 13 – Resilient Base & Accessories

1.2 DESCRIPTION OF WORK

- A. All bidders shall quote in accordance with the exact specification as detailed in this document.
- B. Work includes but is not limited to the receiving, storing and and installation of broadloom carpet, as well as all related labor, installation materials and installation accessories and moldings as specified in the following text.

1.3 SUBMITTALS

- A. Shop Drawing showing columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required as well as direction of carpet pile and pattern, location of edge moldings and edge bindings shall be submitted to the Architect for approval prior to installation.
- B. Provide a proper estimate of carpet material needed to complete the project.
- C. Carpet schedule using same room designations indicated on drawings.
- D. Product Data: Provide data on specified products, describing physical and performance characteristics, sizes, patterns, colors available and method of installation. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial color selection.
- E. Verification Samples: Submit (3) 18" x 18" samples illustrating color and pattern for each carpet material specified

- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Include maintenance procedures, recommendation for maintenance material and equipment and suggested schedule for cleaning.
- H. Manufacturer's Carpet Warranty: Ten (10) years.
- I. Installer's Labor Warranty: Ten (10) years. The labor warranty will read as follows: Contractor has been responsible for the application of materials, materials have been installed per manufacturer specifications and they meet the integrity set forth by the manufacturer. This includes proper application of wall base, thresholding, carpet, sheet vinyl, VCT and any other flooring materials contracted.

1.4 INSTALLATION QUALITY ASSURANCE

- A. Flooring contractor to be a specialty contractor, certified by carpet manufacturer Tandus-Centiva Flooring contractors shall be listed on the carpet manufacturers certified installer's list before commencement of installation.
- B. Flooring contractor will be responsible for the proper product installation, including floor testing (Calcium Chloride testing) and preparation, in those area indicated in the Drawings. The maximum amount of moisture evacuation from the floor is 3.0 pounds of water per 1,000 square feet in a 24 hour period. The acceptable floor ph range is between 7.0 and 9.0. Contractor is responsible for floor testing.
- C. Tandus-Centiva to provide a representative to assist in project start-up as required by the job. Tandus-Centiva will notify Owner, Architect, General Contractor or another designated contact if any installation instructions are not followed.
- D. Standards: All carpeting shall meet the provisions as outlined in 2010 California Building Code (CBC), Chapter 11B, Section 1124B.3 Carpet.

1.5 JOB CONDITIONS

- A. Sub-floor preparation is to include all required work to prepare the floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in the Manufacturer's installation instructions.
- B. All materials used in sub-floor preparation and repair shall be recommended by the manufacturer or shall be chemically and physically compatible with the material being bid.

1.6 RECEIPT, DELIVERY AND STORAGE

- A. Full or cut rolls of carpeting shall be cut, packaged and identified by the factory. Distributor, dealer, or vendor cutting, re-packaging, and re-labeling is not permitted.
- B. Contractor is responsible for identifying inherent abnormalities related to manufacturer supplied products. The Owner, Architect, and General Contractor must be notified prior to installation in the case where materials may compromise the proper application of flooring.
- C. Deliver all material to the installation site in the manufacturer's original packaging. Packaging to contain manufacturer's name, product name and identification number and other related information.
- D. All materials should be stored in a cool (above 65° F and below 90° F), dry location, safe from damage and soiling. Stack rolls horizontally no higher than two (2) high on a flat surface. Materials must be conditioned per installation instructions prior to installation.
- E. Materials must be available for inspection as required by the Owner, Architect, General Contractor or manufacturer.

1.7 EXTRA MATERIAL

- A. Provide additional 5% of each type, color, and pattern furnished; product to be boxed and, when necessary, palletized. Coordinate storage location with Owner.
- B. Deliver all unused carpet and large scraps to Owner for "attic stock".

PART 2 – SUSTAINABLE REQUIREMENTS

2.1 PRODUCTS

- A. Product must meet FTC guides for recyclability and must be on hundred percent (100%) closed-loop recyclable back into carpet. Products containing both recyclable and non-recyclable components, manufacturer must adequately report which portions of the product are recyclable per FRTC guides 16 CFR section 260.7(d). Note: A manufacturer cannot claim that a product and any portion of a product that is incinerated is recyclable, even if incineration is used to produce heat and power (i.e. waste-to-energy) per FTC guides 16 CFR section 260.7(d) example 3.
- B. Carpet shall be a minimum of 10-percent post-consumer recycled content.
- C. Recyclability of a product installed must be the same as those required by Project requirements.
- D. No antimicrobials are to be added to the product during the manufacturing process for the purpose of health claims. Antimicrobial treatments are registered pesticides with EPA as preservatives of the products only and no health benefit should be claimed or expected.

PART 3 – PRODUCT

3.1 WARRANTY

- A. Chair pads are not required, but are recommended for optimum textural performance. Absent the use of chair pads, more intensive maintenance will be required for areas in direct contact with chair caster traffic and appearance change is to be expected.
- B. Warranty shall be for a specifically defined non-prorated period of thirty years. “Lifetime” warranties are not acceptable.
- C. The non-prorated thirty year warranty shall specifically warrant against:
 - Excessive surface Wear: More than 15% loss of pile fiber weight
 - Excessive Static Electricity: More than 3.0 kV per AATCC 134
 - Resiliency Loss of the Backing: More than 10% loss of backing resiliency
 - Delamination
 - Edge Ravel
 - Zippering
- D. Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.

- E. Manufacturer shall provide a written warranty that 100% of vinyl backed carpet tile returned to manufacturing plant for recycling will be recycled and that no portion of the carpet will be land filled or incinerated. Other product, e.g. non-vinyl-backed broadloom carpet, shall be reclaimed and recycled locally in Los Angeles County.

3.2 PERFORMANCE ASSURANCE – TESTING

- A. Test reports for the following performance assurance testing to be submitted upon request. Submitted results shall represent average results for production good of the referenced style. Requirements listed below must be met by all Products.
 - 1. Flooring Radiant Panel – ASTM E-648 / MFPA 253: Class 1
 - 2. Federal Flammability – CPSC FF 1-70: must pass
Smoke Density – ASTM E-662 / NFPA258:
 - 3. ≤ 450 Flaming Mode
 - 4. Electrostatic Propensity – AATCC 134 (Step & Scuff): 3.0 kV or less
 - 5. Static Coefficient of Friction – ASTM C-1028: Must pass ADA Requirements for Accessible Routes

3.3 MANUFACTURING SPECIFICATIONS

- A. Product Type 1 – Broadloom Carpet
 - 1. Manufacturer: Tandus / C&A Floorcoverings Inc.
 - 2. Backing to be: Powerbond Cushion RS, 6' roll goods.
 - 3. Style: Aftermath II
 - 4. Color: TBD
 - 5. Seams: Installation requires welded seams to be impermeable to air & moisture.

3.4 ACCESSORIES

- A. Materials recommended by manufacturer for patching, leveling, priming, etc.
- B. Base, carpet edge, thresholds, and transition strips as specified in applicable specification sections.

PART 4 – NOT USED

PART 5 – EXECUTION

5.1 PRE-INSPECTION AND PREPARATION

- A. All floors must be inspected and approved by the carpet manufacturer's representative and the installation contractor prior to installation of carpet. Flooring Contractor to coordinate with Tandus-Centiva Floorcoverings Inc. representative.
- B. There will be no exceptions to the provision stated on the carpet manufacturer's installation instructions.

5.2 INSTALLATION

- A. Product installation to proceed as specified in the carpet manufacturer's installation instructions.

5.3 PROTECTION AND CLEANING

- A. All rubbish, wrappings, debris, trimmings, etc. to be removed from the site and disposed of properly.
- B. All usable scraps of carpet should be left for use by the owner. Flooring Contractor to coordinate with District Project manager.
- C. Carpet to be completely vacuumed using a beater brush/bar commercial vacuum after installation.
- D. Carpet to be protected as need from damage from other trades.

PART 6 – CLEANING AGENTS

6.1 APPROVED CARPET CLEANING AGENTS

- A. Crystal Dry – manufactured by Whittaker
- B. Syon 5 – distributed by Tandus-Centiva Floorcoverings Inc.

END OF SECTION

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SECTION 09 96 00

HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High performance coatings on exterior galvanized steel including the following:
 - 1. Handrails, including steel support framing.
 - 2. Guardrails, including steel support framing.
 - 3. Infill steel mesh panels at guardrails.
 - 4. Exposed exterior steel structure.
 - 5. ~~Sheet metal fascia at roof and second floor deck.~~
- B. Special preparation of surfaces.

1.02 RELATED REQUIREMENTS

- A. ~~Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.~~
- B. Section 05 12 00 - Structural Steel.
- C. Section 05 50 00 - Metal Fabrication.
- D. ~~Section 05 73 00 - Decorative Metal Railings.~~
- E. ~~Section 05 73 13 - Metal Picket Rails~~
- F. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. ASTM D 16- Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D 4263- Indicating Moisture in Concrete by the Plastic Sheet Method.
- C. ASTM F 1869- Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- D. International Concrete Repair Institute (ICRI) Guideline No. 03732- Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- E. SSPC-SP 1 - Solvent Cleaning.
- F. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings.
- G. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings.
- H. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.

1.04 DEFINITIONS

- A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.
- B. Dry Film Thickness (OFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.
- C. Samples: Submit two samples 8-1/2 x 11 inch in size illustrating selected colors.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention. Include surface preparation requirements.
- E. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
- F. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.
 - 1. Single Source Responsibility: Coatings and coating application accessories shall be products of a single manufacturer.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience.
 - 1. Applicator's Personnel: Employ persons trained for application of specified coatings.
- C. Pre-application Meeting: Convene a pre-application meeting two weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review the following:
 - 1. Environmental requirements.
 - 2. Protection of surfaces not scheduled to be coated.
 - 3. Surface preparation.
 - 4. Application.
 - 5. Repair.
 - 6. Field quality control.
 - 7. Cleaning.
 - 8. Protection of coating systems.
 - 9. One-year inspection (scheduled within the 11th month after acceptance of installation)
 - 10. Coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
 - 1. Coating or material name.
 - 2. Manufacturer.
 - 3. Color name and number.

4. Batch or lot number.
5. Date of manufacture.
6. Mixing and thinning instructions.

B. Storage:

1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not use materials beyond manufacturer's shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 FIELD CONDITIONS

A. Weather:

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.

B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.

C. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants.
2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

D. Provide lighting level of 80ft candles measured mid-height at substrate surface.

E. Restrict traffic from area where coating is being applied or is curing.

1.09 WARRANTY

- A. See Section 01 78 00- Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five (5) year period after Date of Substantial Completion.
- C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. High-Performance Coatings:

1. Basis of Design: Tnemec Company, Inc: www.tnemec.com.
2. Carboline Company: www.carboline.com.

3. PCI Coatings, www.precisioncoatingsinc.com
4. Substitutions: Section 01 25 00 – Substitutions - Product Options.

2.02 COATING SYSTEMS FOR marginally PREPARED STEEL- EXTERIOR

- A. Mild to Moderate Climatic Conditions:
1. System Type: Inorganic Epoxy/ Acrylic.
 2. Surface Preparation: SSPC-SP 6
 3. Primer: Series 27 WB. 3.0 to 4.0 mils.
 4. Finish Coat: Series 1028 Enduratone. OFT 2.0 to 3.0 mils.
 5. Total OFT: 5.0 to 7.0 mils.
 6. Finish Color: As indicated on the drawings.

2.03 COATING SYSTEMS FOR GALVANIZED STEEL AND NONFERROUS METAL- EXTERIOR

- A. Moderate to Severe, UV Exposure:
1. System Type: Epoxy/urethane.
 2. Surface Preparation: SSPC-SP 7. Abrasive blast and/or chemically clean per Tech Bulletin 10-78
 3. Primer: Series 115 UniBond. OFT 2.0 to 3.0 mils.
 4. Finish Coat: Series 1028 Enduratone. OFT 2.0 to 3.0 mils.
 5. Total OFT: 4.0 to 6.0 mils.
 6. Finish Color: As indicated on the drawings.

2.04 ACCESSORIES

- A. Coating Application Accessories:
1. Accessories required for application of specified coatings in accordance with manufacturer's instructions, including thinners.
 2. Products of coating manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.
- B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.03 SURFACE PREPARATION OF STEEL

- A Prepare steel surfaces in accordance with manufacturer's instructions.
 - B. Fabrication Defects:
 - 1. Correct steel and fabrication defects revealed by surface preparation.
 - 2. Remove weld spatter and slag.
 - 3. Round sharp edges and corners of welds to a smooth contour.
 - 4. Smooth weld undercuts and recesses.
 - 5. Grind down porous welds to pinhole-free metal.
 - 6. Remove weld flux from surface.
 - C. Ensure surfaces are dry.
 - D. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.
 - E. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than eight (8) hours.
 - F. Shop Primer: Prepare shop primer to receive field coat in accordance with manufacturer's instructions.
- 3.04 SURFACE PREPARATION OF GALVANIZED STEEL AND NONFERROUS METAL
- A Prepare galvanized steel and nonferrous metal surfaces in accordance with manufacturer's instructions. Surface preparation recommendations will vary depending on substrate and exposure conditions.
- 3.05 APPLICATION
- A Apply coatings in accordance with manufacturer's instructions.
 - B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
 - C. Keep containers closed when not in use to avoid contamination. Do not
 - D. use mixed coatings beyond pot life limits.
 - E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
 - F. Uniformly apply coatings at spreading rate required to achieve specified OFT.
 - G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
 - H. Stripe paint with brush critical locations on steel such as welds, corners, and edges using specified primer.
- 3.06 REPAIR
- A Materials and Surfaces Not Scheduled To Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
 - B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire

surface where touch-up result is visibly different, either in sheen, texture, or color.

- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.07 FIELD QUALITY CONTROL

A. Inspector's Services:

1. Verify coatings and other materials are as specified.
2. Verify surface preparation and application are as specified.
3. Verify OFT of each coat and total OFT of each coating system are as specified using wet film and dry film gauges.
4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
5. Report:
 - a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
 - b. Report nonconforming work not corrected.
 - c. Submit copies of report to Architect and Prime Contractor.
 - d. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.08 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.09 PROTECTION

- A. Protect finished work from damage.

3.10 ONE-YEAR INSPECTION

- A. Owner will set date for one-year inspection of coating systems (within the 11th month after installation).
- B. Inspection shall be attended by Owner, Contractor, Architect, and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Architect in accordance with manufacturer's instructions.

END OF SECTION

SECTION 09 96 23

GRAFFITI RESISTANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Related Sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete
 - 2. Section 09 90 00 - Painting & Coating
- C. This Section applies to sitework:
 - 1. Cast-in-Place Concrete Benches
 - 2. Cast-in-Place Concrete Retaining, Planter and Ramp Walls

1.2 SUBMITTALS

- A. Provide submittals in accordance with Division 01.
- B. Samples: Submit Samples of coating system.
- C. Product Data: Submit anti-graffiti coating manufacturer's technical data and installation instructions, recommended coverage rates for types of surfaces to be treated, and evidence that coatings conform to all requirements specified. Submit evidence of code approvals.
- D. Furnish Samples on the same materials to which coating will be applied on. Indicate satin or flat finish. Coat one-half of each Sample, with the other half non-coated.
- E. Installer: Submit written evidence the installer for the Work of this section has completed at least 5 projects of similar complexity within the past 5 years.
- F. Certificate and Summary Statement: Before Substantial Completion, submit a certificate stating that coatings applied conform to reviewed submittals and all specified requirements. Provide a summary statement setting forth the following:
 - 1. Number of square feet of each surface treated with coating, classified as to the kind of material treated, open pore or closed pore type, and whether vertical or horizontal.
 - 2. The number of gallons of each type, class, or grade of coating required to treat all involved surfaces, based on the number of square feet of each type and orientation of the material the coating was installed on.
 - 3. Total gallons of each coating type, class, or grade installed.
- G. Maintenance Instructions: Furnish manufacturer's recommended graffiti removal instructions, and recommendations for recoating. Furnish names and addresses of cleaning firms and of suppliers of maintenance materials.

- H. Maintenance Material: Furnish two five -gallons of each product specified.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Observation: Start coating application under the observation of the coating manufacturer's technical representative. Notify the IOR and coating manufacturer at least 72 hours before starting installation.
- B. Preliminary Tests: Perform tests on each kind of surface to be treated to establish the actual application rates required to provide the surfaces resistant to defacing and meet warranty requirements. Tests shall demonstrate the coating does not yellow, darken, mottle, or discolor any treated surface and those surfaces to be treated are dry. Established application rates shall not be less than those recommended in the coating manufacturer's technical data for the kind and surface orientation of the material.
- C. Compliance with Regulations: Materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous materials in coatings.
- D. Materials shall meet requirements of SCAQMD regarding emission of solvents and other pollutants.
- E. Qualifications:
 - 1. Manufacturer: Anti-graffiti coating shall be product of a manufacturer who has been regularly engaged in manufacturing anti-graffiti coatings for at least 10 years. Manufacturer shall supply references of at least 5 satisfactory installations in which anti-graffiti coating has been in service for at least 5 years.
- F. Mock-up: 48" long section of cast-in-place concrete bench on both horizontal and vertical surfaces with water-repellant sealer and anti-graffiti coating system. Mock-up shall serve as the standard for quality and shall be located on the project site. Verify location with Architect. If accepted by Architect, mock-up may become part of the permanent installation.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver all coating materials to the Project site in containers bearing name and batch number of manufacturer, with seals intact.

1.5 PROJECT CONDITIONS

- A. Protection: Install temporary coverings and protection, and do not allow any coating to contact plastic, planting soil, plants, asphaltic paving, roofing membranes, or other materials that are likely to be damaged by coating.
- B. Weather Conditions: Do not install coating during windy, wet, or excessively hot or dry weather conditions.

1.6 WARRANTY

- 1. Manufacturer shall provide a 10 year material warranty.
- 2. Installer shall provide a 3 year labor warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

- A. All exposed site cast-in-place concrete benches and retaining walls shall receive Anti Graffiti Coating, either manufacturer applied or per the manufacturer's instructions.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product by the following manufacturer:
 - 1. Vandlguard TEN non-sacrificial anti-graffiti coating with a three-coat system by RainGuard International.
 - 2. Bare surface of concrete shall be coated first with penetrating water-repellant sealer prior to application of anti-graffiti coating system. Water-repellant sealer shall be a compatible product as approved by same manufacturer of anti-graffiti coating system. RainGuard Microseal shall be used with Vandlguard TEN.

2.2 PROPERTIES

- A. Coatings shall not darken or discolor the treated surfaces and shall be non-toxic, compatible with all standard polymer type caulking and sealing materials, conforming to AQMD 1113, and certified by manufacturer as suitable over paint finish.
- B. Colors of opaque materials shall match adjoining colors as required, or shall be as selected from manufacturer's standard and custom colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not start installation of coating if conditions are present that prevent or interfere with the correct preparation of surfaces or installation of coating system.

3.2 PREPARATION

- A. Remove dust, dirt, oil, grease, other deleterious substances and stain, and efflorescence and laitance from surfaces. Repair cracks and holes over 1/16 inch size. Spot prime cracks and holes 1/16 inch size and smaller and prime all horizontal surfaces other than soffits with a heavy duty coating supplied by same coating manufacturer. Mask and protect adjoining surfaces and glass, unless coating is harmless and easily removed.

3.3 APPLICATION

- A. Install the anti-graffiti coating to surfaces as indicated on drawings.
- B. Application Rates: Apply a minimum of 3 coats or more as recommended by manufacturer published application instructions, in the quantity of coating and coverage rates per coat established by preliminary tests, except total quantity shall be not less than the rate recommended for the involved surface in manufacturer's technical data.
- C. Spray Application: Install each coat by airless spray with nominal 20 psi nozzle pressure. Obtain complete coverage of each coat. Indicate areas that are coated when application is stopped for lunch or at the end of the day.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION

SECTION 10 11 01

MARKER BOARDS

PART I – GENERAL

1.01 SECTION INCLUDES

- A. Markerboards.

1.02 SUBMITTALS

- A. See Section 01 33 13 – Submittal Procedures
- B. Product Data: Provide manufacturer’s data on markerboard, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details. Samples:
- D. Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard, tackboard, and trim.
- E. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard, bulletin board, bulletin board surfacing and trim.
- F. Manufacturer’s printed installation instructions.
- G. Maintenance Data: Include data on regular cleaning, stain removal.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.04 WARRANTY

- A. See Section 01 78 00 – Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Visual Display Boards:

1. Claridge Products and Equipment, Inc.; LCS II Commercial Series:
www.claridgeproducts.com.
2. Substitutions: See Section 01 60 00 – Product Requirements.

2.02 VISUAL DISPLAY BOARDS

A. Markerboards: Porcelain enamel on steel, laminated to core.

1. Color: Low gloss White.
2. Metal Face Sheet Thickness: 0.024 inch (24 gage).
3. Core: Particleboard, 401b MedDens, ½ inch thick, minimum, laminated to face sheet.
4. Backing: 0.015 inch Aluminum sheet, laminated to core.
5. Size: As indicated on drawings.
6. Accessories: marker tray, map rail, flag holder, and map hooks.

2.03 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424, Type I, Commercial Sheet, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Aluminum Sheet Baking: 0.015 inch thick.
- D. Adhesives: Type used by manufacture.

2.04 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
 1. Provide no map rail for markerboard directly below short-throw projector.

2. Provide map rails at all other locations.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
- E. Marker Tray: Aluminum, one piece full length of marker board, manufacturer's standard profile molded ends; concealed fasteners, same finish as frame.
- F. Mounting Brackets: Concealed.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings

3.02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.
- C. Butt Joints: Install with tight hairline joints.
- D. Carefully cut holes in boards for thermostats.

3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Toilet accessories as indicated.
- C. Related Sections:
 - 1. Section 06100: Rough Carpentry.
 - 2. Section 05410: Load Bearing Metal Studs
 - 3. Section 10170: Solid Phenolic Toilet Compartments.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements: Comply with CBC requirements and ADA recommendations for accessibility.

1.03 SUBMITTALS

- A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

1.04 QUALITY ASSURANCE

- A. Coordinate related Work as required to ensure proper and adequate provision in framing of backing and wall finish for installation of accessories.
- B. Coordinate requirements of Section 10170: Solid Phenolic Toilet Compartments to ensure that correct openings are provided in partitions for toilet accessories where required.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect accessories from damage.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Accessories shall be provided with necessary anchoring devices and fasteners appropriate for surfaces on which items are to be fastened.
- B. All accessories shall be from the same manufacturer except electric hand-dryers.

2.02 MATERIALS

- A. Classroom Paper Towel Boxes: Surface mounted, Push Paddle Roll type for 8" diameter roll. Georgia-Pacific, MFG# 54338, or equal. Color – translucent smoke.
- B. Electric Hand Dryer: Warm air, high speed, energy efficient self-contained electric hand dryers. Dryer to be MADE IN USA Certified. Comply with ICC/ANSI A117.1. Equipment certified by Underwriters Laboratory, Inc., with UL labels. Surface mounted; entire dryer internally grounded. Basis of Design Model: XLERATOR by Excel Dryer; or equal.
 - 1. Warranty Period: 5 years; limited warranty.
 - 2. Controls: Automatic, activated by infrared optical sensor. Operates while hands are under blower. Shut-off within 2 seconds when hands removed, or in 35 seconds if hands not removed.
 - 3. Cover: One piece, heavy duty, rust-resistant, rib-reinforced, die-cast zinc alloy.
 - a. Finish: Stainless steel with brushed finish – Model XL-SB
 - 4. Air Intake: Inlet openings on bottom of cover.
 - 5. Air Outlet: Delivers focused air stream at average hand position of 4 inches (102 mm) below air outlet.
 - 6. Noise Reduction Nozzle: 1.1 noise reduction nozzle.
 - 7. Wall Plate: Injection molded, rib reinforced plate with metal L brackets to attach cover, with ten 5/16 inch (8 mm) diameter holes for surface mounting to wall and three 7/8 inch (22 mm) diameter holes for electrical wiring; bottom hole suitable for surface conduit.
 - 8. Recess Kit – provide at stud walls: ADA compliant recess kit is fabricated of 22 GA 18-8 type 304 stainless steel with #4 satin finish with 16 GA 18-8 type 304 stainless steel dryer mounting plate. All welded construction. 16-3/8 inches (416 mm) wide by 26 inches (660 mm) high by 3-3/8 inches (86 mm) deep.
 - 9. Nominal Size: 11-3/4 inches (298 mm) wide by 12-11/16 inches (322 mm) high by 6-11/16 inches (170 mm) deep.
 - 10. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Air flow rate: 19,000 linear feet per minute (97 meters per second) at air outlet, 16,000 linear feet per minute (81 meters per second) at average hand position of 4 inches (102 mm) below air outlet.
 - 11. Heater: Nichrome wire element, mounted inside blower housing to be vandal proof.
 - 12. Heater Safeguard: Automatic resetting thermostat to open when air flow is restricted and close when air flow is resumed.

13. Air Temperature: 135 degrees F (55 degrees C) measured at average hand position of 4 inches (102 mm) below air outlet. Air Heater Output: 900 watts.
14. All metal parts coated according to Underwriters Laboratories, Inc. requirements.
15. Mount dryers at heights indicated on Drawings.
- C. Liquid Soap Dispenser: High capacity, one-hand push operation. 2000ml. GoJo PRO TDX 2000, SKU# 7200-01 or equal. Color – gray.
- D. Toilet Seat Cover Dispensers: Surface mounted, high impact, white, Std 1”. Maintex #269105
- E. Toilet Paper Dispenser
1. Elementary School (ES) Student Restrooms:
 - a. Non-accessible toilet compartments: Surface mounted, Georgia Pacific Junior Jumbo #59009, or equal.
 - b. Accessible toilet rooms or compartments: Recessed Bobrick B-3888, ASI-0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.
 2. Staff Restrooms:
 - a. Accessible toilet rooms or compartments: Semi-recessed, Bobrick B-3888, ASI-0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.
- F. Sanitary Napkin Disposal Unit: Maintex #264140
- G. Grab Bars: 1-1/2 inches diameter by 18 gage stainless steel tubing, of size and configuration indicated. Ends shall be screwed to 11 gage stainless steel wall plate, with snaplock cover flanges. Grab bars over 36 inches in length shall be furnished with stainless steel support at mid point. Exposed stainless steel to be 180 grit satin finish. ASI 3700 series, Bobrick B-6806 series, Tubular Specialties Manufacturing, Inc. series Q-CS-1, or equal.
- H. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch x 3/4 inch Type 304 stainless steel angle frame, with satin finish. Corners shall be heliarc welded, ground and polished smooth. Glass shall be No. 1 quality 1/4 inch float/plate glass, electrolytically copper-plated. Frame shall be furnished with a continuous integral stiffener on sides. Back of mirror shall be protected by 1/8 inch thick, waterproof, shock-absorbing polyethylene padding and 20 gage galvanized steel back attached to frame with concealed screws. Mirror shall be provided with a 20 gage wall hanger. ASI 0600, Bobrick B-290 series, or equal. 18” x 30”.
- I. Lavatory Pipe Insulation: White, anti-microbial, impact and stain resistant, UV-stable, non-fading, non-yellowing, molded closed-cell. Lav-Guard 2 undersink piping covers #100 EX series by Truebro Inc., or equal.

- J. Janitor Closet Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, type 304, with ½ inch returned edges, 0.06 inch steel wall brackets
1. Drying Rod: stainless steel, ½ inch diameter
 2. Hooks: 2, 0.06 inch stainless steel rag hooks at shelf front
 3. Mop/Broom Holders: 4 sprin-loaded rubber cam holders at shelf front
 4. Length: 36 inches
 5. Length: Manufacturer's standard length for number of holders/hooks
 6. Product: B-233 36 by Bobrick
- K. Waste Receptacle: Recessed, Type 304 stainless steel, satin finish. Bobrick B-3644, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.
- B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

- A. Install toilet accessories in accordance with manufacturer's written recommendations and accessibility requirements. Fasten components firmly in place.
- B. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.
- C. Install recessed accessories into wall openings with sheet metal screws into metal frames.
- D. Install surface-mounted accessories to backing plates with machine screws, plumb, and aligned.
- E. Grab Bars:
1. Fasten to toilet partition with 3-inch diameter stainless steel back plates with studs, couplings, and stainless steel machine screws.

2. At metal stud walls, provide 1/8 inch cold-rolled steel plate, drilled and tapped for machine screws, or 16 gage cold-rolled steel plate complete with threaded sleeves for stainless steel machine screws. Weld plates to studs.
 3. At concrete or masonry walls, install bars with sheet metal screws and expansion anchors.
 4. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.
- F. Mirrors: Install mirror on manufacturer supplied concealed wall hanger and fasten with 2 theft-resistant locking screws.
- G. Before Substantial Completion, deliver keys and maintenance instructions and product data to OAR.

3.03 ADJUSTING AND CLEANUP

- A. Adjust accessories for proper operation.
- B. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.04 PROTECTION

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

END OF SECTION

SECTION 12 49 40

ROLLER SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manually operated sunscreen roller shades.

1.2 RELATED SECTIONS

- A. Section 08 41 13 – Aluminum Windows, Doors and Frames.
- B. Section 09 29 00 – Gypsum Board.
- C. Section 09 90 00 – Paints and Coatings.

1.3 REFERENCES

- A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.
- D. ASTM G 22 - Standard Practice for Determining Resistance of Plastics to Bacteria
- E. ASTM E 21 - Standard Test Method for Elevated Temperature Tension Tests of Metallic Materials
- F. ASTM E 22 - Recommended Practice for Conducting Long Time High Temperature Tension Test of Metallic Materials

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Submit Environmental Certification and Third Party Evaluation per Section 1.5 Qualifications.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.

3. Storage and handling requirements and recommendations.
 4. Mounting details and installation methods.
- D. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
1. Prepare shop drawings on Autocad or Microstation format using base sheets provided electronically by the Architect.
 2. Indicate handedness of chain pulls for manual shades.
- E. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- F. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns. Submittal of shade cloth only, without manufacturer and hardware product data, shall not be acceptable.
- G. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- H. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of ten years experience in manufacturing products comparable to those specified in this section.
- B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of two years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.
- E. Shade cloth to "pass" indoor Air Quality / VOC Testing as per ASTM D 5116-97 and ASTM D 6670-01, USEPA – ETV (U.S. Environmental Protection Agency's Environmental Technology Verification Protocol).

- F. Use only injection-molded Delrin engineered plastics by Dupont for all plastic components of shade hardware. Styrene based, PVC, or glass reinforced polyester thermo polymer plastics are not acceptable.
- G. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly with ceiling pocket for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up at window designated by Architect.
 - 2. Do not proceed with remaining work until, mock-up is accepted by Architect.
- H. Single Source Requirements: To the greatest extent possible, provide products specified in this section from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.
- B. Storage: Store materials in clean, dry area indoors in manufacturer's unopened packaging until ready for installation and in accordance with manufacturer's instructions. Store in a clean, dry area, laid flat to prevent sagging and twisting of packaging.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
 - 1. Building shall be enclosed; windows, frames and sills shall be installed and glazed.
 - 2. Wet work shall be complete and dry.
 - 3. Ceilings, window pockets, electrical and mechanical work above window covering shall be complete.
- B. Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.8 WARRANTY

- A. Roller Shade Hardware, Chain and Shade cloth: Manufacturer's standard non-depreciating, fit-for-use (includes normal wear & tear), twenty-five year limited warranty. Warranty to transfer to owner upon completion of installation.
- B. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

1.9 EXTRA MATERIALS

- A. Attic Stock: Provide two extra blinds of primary size used for Owner's replacement stock.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer, as basis of design, performance and warranty: MechoShade Systems, Inc.; as represented by ARCHITYPE, Tel: (310) 652-2263. Fax: (310) 652-2264, Contact: Jean-Guy Poitras. Email: jean-guyp@mechoshade.com, jgpoitras@architype.com.
- B. Acceptable Manufacturer: SWFcontract, which is located at: 7549 Graber Rd.; Middleton, WI 53562-1096 ; Toll Free Tel: 800-327-9798; Email: [request info \(architectsolutions@swfcontract.com\)](mailto:requestinfo@architectsolutions@swfcontract.com); Web: www.swfcontract.com
- C. Alternates products and manufacturers may be bid as an alternate product in accordance with Section 01 25 00. Any pricing for alternate products shall be listed separately from the base bid specified product. Any alternate pricing must include line-by-line compliance or non-compliance with the specifications. If the alternate product is acceptable to the Architect, the specified manufacturer will be given the opportunity to provide an equivalent proposal.

2.2 APPLICATIONS/SCOPE

- A. Roller Shade Schedule:
 - 1. Shade Type 1:
 - a. Manual operating, chain drive, single, sunscreen roller shades in all exterior aluminum windows of rooms and spaces shown on the Drawing A8.01 Window Types. Shades to be recess-mounted in ceiling above window head. Reverse-roll only if required to clear window hardware.
 - b. Separate shade roll shall be provided for each vertical section of multiple section storefront. Vertical section shall include both transom and larger

fixed window below. Transom above door shall be separate section as well.

- c. Provide extruded aluminum ceiling shade pocket with tile support, closure plate and end caps. Finish to be white power-coated to match ceiling color.

2.3 SHADE CLOTH

- A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
 1. Dense Basket Weave: 1500 series, 3 percent open, 2 by 2 dense basket weave pattern.
 2. Color: Selected from manufacturer's standard colors.

2.4 SHADE BAND

- A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 2. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
 - c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
- B. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
 - 1. Bottom hem weights.

2.6 COMPONENTS

- A. Access and Material Requirements:
 - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 - 3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.
- B. Manual Operated Chain Drive Hardware and Brackets:
 - 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 - 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
 - 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 - 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
 - 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
 - 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable

7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
 - c. The brake shall be an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

- C. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 ACCESSORIES

- A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.
 1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect mounting surfaces, blocking for shade brackets or pocket assemblies, suspended acoustical or gypsum ceiling for recessed shades and verify field measurements. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

- A. Clean surfaces after installation in accordance with manufacturer's written instructions. Do not use cleaning methods involving heat, bleach, abrasives, or solvents.
- B. Protect installed products until completion of project. Repair damaged or improperly installed before Substantial Completion.

END OF SECTION

SECTION 23 09 13
ENERGY MANAGEMENT CONTROL SYSTEM

PART 1- GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK: Provide all work for the complete installation of automatic temperature controls.

- A. Work in this Section: Principal items include:

1. Electronic and electric controls, includes sensors, switches, relays, control panels for instruments.
2. Electric motors for air dampers, valves, etc.
3. Local control panels.
4. Adjustment and validation of control system. Instruction of Owner's representative on maintenance and operation of control equipment.
5. Electric diagrams showing interlocks between equipment furnished under the other sections and control furnished herein.
6. Direct digital control for systems.
7. Wiring and Conduit: low voltage wire for the control system under Division 23, all low voltage control conduit, all required power wiring, high voltage wire and high voltage conduit to be provided under Division 26.
8. Contractor shall install the latest version of DDC Control Software.

1.03 SYSTEM

- A. The Temperature Control System shall be installed as a installed project and shall consist of all sensors, actuators, direct digital controllers, supervisory controller, electrical low voltage (24 VAC) and line voltage control wiring for a complete

and operating installation as specified herein. The system shall be a standard product with the manufacturer who will guarantee ongoing parts availability and factory trained field support for five (5) years after system acceptance.

1.04 RELATED SECTIONS

- A. Refer to Division 09 for patching and painting required for the control system installation. Not work of this section.
- B. Automatic dampers in ductwork, casings, etc. furnished and installed by the Mechanical Division under control people's supervision. The dampers shall be correctly installed so that they operate freely and close tightly. Provide and install blank off plates when the control application requires dampers smaller than duct size.
- C. Refer to Division-26 sections for the following work; not work of this section:
 - 1. Power supply wiring for power source to power connection on controls and/or unit control panels, including starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.05 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. General: The publications listed below form a part of this specification to the extent applicable:
 - ASHRAE Handbook of Fundamentals, Latest Edition.
 - EIA Electrical Characteristics of Balanced Voltage Digital Interface Circuits;
 - RS-485.
 - NEMA Enclosures for Electrical Equipment (1000 volts maximum); 250-1979
 - NFPA 70 National Electrical Code; 1981
 - NFPA 90A Air Conditioning and Ventilation Systems; 1981

1.07

SUBMITTALS

- A. Submit installation drawings, sequences of operation and catalog cut sheets for each device of the proposed system prior to installation for engineer's approval. The drawings shall include the location and intercommunication of all stand-alone and subordinate control panels; the schematic diagrams, of the controlled equipment with sensors and actuators shown interconnected to the system controllers; and logic diagrams that depict the sequence of operation.
- B. After completion of the installation and commissioning of the system including final adjustments, a full set of as-built documentation shall be turned over to the Owner. The as-builts shall include one (1) set of reproducible drawings and two (2) copies of the database on flexible or removable hard disk for each stand-alone controller and the supervisory computer.
 - 1. As-built documentation shall include diagrammatic layouts of the automatic control systems specified herein. Layouts shall show all control equipment, and the function of each item shall be indicated for the different seasons, Layouts shall be located in plastic protective folder and placed in the control panels.
 - 2. All Drawings shall be accompanied with a complete description of sequence of operation. Each control element mentioned in the sequence description shall be identified with the same mark as shown- on the control diagram.
- C. Submittal of Materials:
 - 1. Material submittals shall be manufacturers prepared catalog cuts indicating type, size and technical details.
 - 2. Reference catalog cuts to the applicable specification article (e.g. 2.02A).
 - 3. Catalog cuts shall be submitted in complete groups of manufacturer's material.
 - 4. Partial submittals of groups or systems are not acceptable.
 - 5. Verify that the submittal has been reviewed in detail and is in fact the Contractor's choice of materials.
- D. Upon receipt of contract and prior to the delivery of parts, submit eight copies of the following drawings:
 - 1. Submit eight copies of schematic drawings showing the respective locations of components, as applicable and interconnecting wiring between all devices. Also all field terminal and sensing devices. Also all field

terminal and sensing devices shall be listed by function and point number and shall display interconnecting wiring and terminals of controlled systems and devices.

- E. Submit eight copies of schematic drawings showing electric connection details for actuators, transducers, and other electric components. All connections shall be labeled to coordinate with the description of operation, including descriptions to indicate action of components, normal positions, spring ranges, etc.

1.08 MANUFACTURERS

- A. Carrier I-VU Controls. No substitutions will be accepted.
- B. Controls installation will be by Russell Sigler, Inc. Controls Group Certified Installer, Brea, California.

1.09 WARRANTY

- A. Provide all labor, material and equipment necessary to maintain beneficial performance of the entire Building Automation System for a period of one (1) year after acceptance of the system, or parts thereof, by an authorized representative of the Owner. Any defects in workmanship or material during the warranty period shall be promptly corrected by the Contractor at no charge to the Owner. All work shall be accomplished during normal working hours, Monday through Friday excluding legal holidays. Precaution shall be taken to minimize disruption of facility operations.
- B. A prepaid Warranty Service Agreement shall be turned over to the Owner at the time of the acceptance test as a prerequisite of system acceptance. The contract shall include the terms and conditions stated herein.
- C. Service work shall be performed by service personnel in the direct employ of the control contractors. The service technicians shall be factory trained and certified by the manufacturer to be competent in all aspects of the installed system. The technician shall have a working knowledge of calibration techniques, preventive maintenance, troubleshooting, software diagnostics and microprocessor repair.
- D. System modifications shall be incorporated into the as-built documentation and/or operators and maintenance manuals when operating parameters, control point settings or control strategies are changed. System modifications made by the user

of the controls contractor shall have both parties' approvals in order to maintain the Warranty Service Agreement. All database changes shall be saved on disk for backup to the system.

- E. Software upgrade program shall be implemented on the anniversary or anniversaries of the warranty period. The upgrade shall provide all enhancements offered by the manufacturer for programs in the accepted systems.
- F. System enhancements beyond the scope of the project shall be field upgradable with pull out/plug-in ease. Provided at reasonable value added cost these upgrades may be purchased at the Owner's option.

PART 2 – PRODUCTS

2.01 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet.
- B. Install new wiring and network devices as required to provide a complete and workable control network.
- C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data and status shall be viewable and editable from each internetwork controller.
 - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

- E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.

2.02 FIELD INSTALLED SENSORS

- A. Temperature Sensors
 - 1. Type. Temperature sensors shall be nominal 10K ohm thermistor type.
 - 2. Duct Sensors. Duct sensors shall be single point.
 - 3. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
- B. Status Indication
 - 1. Status indication for fans shall be provided by a current sensing sensor. The sensor shall be installed at the motor starter or motor to provide load indication. The unit shall consist of a current transformer, a solid state current sensing circuit (with adjustable set point) and a solid state switch. A red light emitting diode (LED) shall indicate the on off status of the unit. The switch shall provide a N.O. contact for wiring back to the Field Installed Controller.

2.03 CONTROLLER SOFTWARE

- A. Building and energy management application software shall reside and operate in system controllers. Applications shall be configurable through the operator workstation, web browser interface, or engineering workstation.
- B. Memory and System Time. All controllers shall have a Non-Volatile Memory providing indefinite storage of application and configuration data. The system must have an ability to maintain time, and automatically correct for daylight savings time and leap year adjustments. In the event of power failure or user generated power cycle, all system components must automatically updated with current time and date from a network Time Sync device. The controller shall also have the capability of changing occupancy mode by reading a set of discrete, dry contacts controlled by an external time clock.

- C. Stand alone capability. All controllers shall be capable of providing all control functions of the HVAC system without the use of a computer. The controllers shall include the inherent capability to access the system control selections as well as to monitor system performance by means of a communicating network with a PC and EMS software program.
- D. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms.
- E. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.
- F. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
- G. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of preconfigured minimum on-time and off-time settings, customized for the specific requirements of the application.
- H. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

2.04 CONTROLLERS

- A. General. The control system shall be available as a complete package with the required input sensors and devices readily available. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), and Sensors (SEN) as required to achieve performance specified in Paragraph 2.4.

- B. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L, unless otherwise specified.

- C. BACnet.
 - 1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 4. BACnet Communication.
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
 - d. Each ASC shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

- D. Communication.
1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
 2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
 4. Stand-Alone Operation. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.
- E. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- F. Keypad. Where specified provide a local keypad and display for each BC and ASC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and ASC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.
- G. Serviceability.
1. Controllers shall have diagnostic LEDs for power, communication, and processor.
 2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

3. All controllers in the system shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
- H. Memory.
1. Controller memory shall support operating system, database, and programming requirements.
 2. Each controller in the system shall use nonvolatile memory providing indefinite storage of BIOS, application programming, and all configuration data in the event of power loss.
- I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Rooftop Unit Controller (RTC). Defined as Application Specific Controllers (ASC), shall control all associated HVAC Constant Volume rooftop equipment functions, this operation shall be provided when operating within a zoning system application, as specified for an air source control, in Paragraph 2.4 or in a stand-alone mode. The resident algorithms shall use error reduction logic as designated in ASHRAE standard 90.1 to provide temperature control and energy usage.
1. Capacity control shall be based on the use of a conventional thermostat, or programmable thermostat, or alternatively, a constant volume unit may utilize its own internal time clock and setpoints (cooling and heating) coupled with a room (wired or network communicating) sensor for capacity control. The controls shall provide separate occupied and unoccupied cooling and heating setpoints – except if a conventional thermostat is used.
 2. RTC shall feature and maintain a 365-day Real-Time Clock/Calendar with holiday functions.
 3. RTC shall be capable of stand-alone or networked operation.
 4. In the stand alone mode, each RTC shall establish occupancy scheduling based on its own local occupancy schedule, the closure of a contact connected to an external time clock or EMS system, or by a timed override request (1 to 24 hours) through its space temperature sensor override button.

5. When networked, RTC occupancy may be established by user interface or occupancy signal from other controller located in network.
6. RTC shall utilize fan control, 2 stages of cooling, and up to 3 stages of heating to maintain zone temperature at setpoint.
7. RTC shall provide analog output signal for economizer control.

K. Integration to Lighting Panel(s)

1. Control Contractor Provide a Carrier I-V Link for Intergration BACnet/IP.
2. Lighting panel(s) provided and installed by Division 26 for monitoring and controlling of lighting and operation oriented graphic user interface.
3. Lighting panels provided will support BACnet/IP. Any gateways or additional cards required will be provided and installed by Division 26.
4. Refer to Electrical and Mechanical drawings for points will be integrated to the Carrier I-Vu web server BACnet/IP.

2.05 SYSTEM INTERFACE (District Wide Web Server Existing)

- A. Description. The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and a stand alone web server operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface. Operators with sufficient access level shall have an ability to make changes to all system and equipment graphics in the web server in addition to having full DDC system access to make configuration changes to the control system. Any tools required for making graphic changes shall be provided with web server.
- B. Operator Interface. Operators shall be able to access all necessary operational information in the DDC system via client computer utilizing IE web browser. Client computer and IE web browsing software shall not be furnished under this section.
 1. Web server shall connect via the LAN and be able to simultaneously serve up controller information to multiple operators connected via LAN with IE web browsers. Each client web browser connected to server shall be able to access all system information.
 2. Web server shall be compatible with Wireless Access Protocol (WAP)

enabled cellular telephone or personal digital assistant (PDA). The PDA/WAP interface may be text-based and shall provide a summary of the most important data.

3. With the use of a remote SMTP email server the operators interface web server shall be able to notify personnel of an alarm or record information about an alarm in the DDC system.
- C. **Web Server Hardware.** Furnish one compact web server with Ethernet port for LAN or direct operator client computer access. The web server shall be capable of communicating to the peer to peer DDC controller network. Any required installation or commissioning software shall be pre-installed on the web server. Installation or commissioning of the web server shall be done through a client computer with a standard web browser.
- D. **Communication.** Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135-2004, BACnet Annex J.
- E. **Operator Functions.** Operator interface shall allow each authorized operator to execute the following functions as a minimum:
1. **Log In and Log Out.** System shall require user name and password to log in to operator interface.
 2. **Point-and-click Navigation.** Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.
 3. **View and Adjust Equipment Properties.** Operators shall be able to view controlled equipment status and to adjust operating parameters such as set points, PID gains, on and off controls, and sensor calibration.
 4. **View and Adjust Operating Schedules.** Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
 5. **View and Respond to Alarms.** Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear

(delete) unneeded alarms. Remote users shall be able to receive alarms via emails or cell phone text messages.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.
7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.
9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

F. System Software.

1. Operating System and required software. Web server operator interface shall be a self contained web server without the need for any type of maintenance. Any required operating system or software shall be factory loaded and maintenance free.
2. System Graphics. Operator interface shall be graphical and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
 - a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
 - b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

- d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).
- G. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard Windows compatible PCs with no limit on the number of copies that can be installed under the system license.
1. Automatic System Database Configuration. Each web server shall store internally store a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
 2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
 3. System Configuration. Operators shall be able to configure the system.
 4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.
 5. Security. System shall require a user name and password to view, edit, add, or delete data.
 - a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.
 - b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
 - c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.
 6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
 7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall

be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Points List. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server from each workstation or web browser interface.
11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Points List. Trends shall be BACnet trend objects.
12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:
 - a. Reports shall be filtered based upon the selected equipment
 - b. Alarm Reports
 - 1) Alarm Summary - Current alarms
 - 2) Alarm Sources – List of equipment and associated alarm conditions
 - 3) Alarm Actions – Configured alarm actions such as e-mail and alarm pop-up
 - c. Schedule Reports

- 1) Effective Schedules – Displays effective schedules for each equipment
 - 2) Schedule Instances – Displays all schedules entered
 - d. Security Reports – Maintains audit of all actions taken through user interface
 - e. Commissioning Reports – Provide equipment checkout status and notes
 - f. Equipment Reports – Provide reports showing trended points and available network points
15. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
 16. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.
 17. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

PART 3 - EXECUTION

3.01 GENERAL

- A. All system components and appurtenances shall be installed in accordance with the manufacturer's instructions and requirements. All necessary interconnections, services and adjustments required for a complete and operable system, shall be provided by this contractor who shall be a Carrier certified installer of the systems herein.

3.02 INSTALLATION

- A. GENERAL

1. Electric Wiring: This contractor is responsible for all electrical installation and wiring for a fully operational Building Control System as shown on the drawings and shall include all items not shown on the electrical plans or required as per the electrical specifications. Perform all electrical installation in accordance with local and national electrical codes. Plenum wire may be used in ceilings where anchored support is provided every 10 feet.
2. Provide shields as required by equipment manufacturer.

3.03 PERMITS AND FEES

- A. This contractor shall secure and pay for all necessary permits, licenses and inspections as required by federal, state or local law. This includes providing required notices, plans, licenses, and fees, obtaining any necessary approvals from authorities having jurisdiction, and delivering any certificates of inspection as may be required. No work is to proceed until all proper certificates and licenses are obtained and posted.

3.04 CLEAN-UP

- A. This contractor shall clean up regularly in order to maintain clean site conditions. In general, clean-up programs shall be scheduled by contractor at least once per week; however, the contractor shall clean up more often if required to meet OSHA standards.
- B. This contractor is responsible for coordinating the work with other trades so as to eliminate unnecessary cutting and patching.

3.05 EQUIPMENT INSTALLATION

- A. Space Thermostat and Sensor Locations: In general, locate thermostats and sensors for room control immediately inside door, next to light switch at approximately 48 inches from floor. Coordinate thermostat locations with General Contractor and approval by Engineer.
- B. Local Control Panels: Mount all local control panels as indicated on the control drawings.

3.06 CUTTING AND PATCHING

- A. This contractor is responsible for coordinating the work with other trades so as to

eliminate unnecessary cutting and patching.

3.07 EQUIPMENT INSTALLATION

- A. Space Thermostat and Sensor Locations: In general, locate thermostats and sensors for room control immediately inside door, above light switch at approximately 60 inches from floor. Coordinate thermostat locations with General Contractor and approval by Engineer.

- B. Local Control Panels: Mount all local control panels as indicated on the control drawings.

3.08 OWNER TRAINING

- A. Manufacturer will operate a free 40 hour a week customer support hotline for additional user support services that are required within the first 12 months after installation is accepted by Owner's Representative.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Combination fire and smoke dampers.
4. Turning vanes.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Duct accessory hardware.

B. Related Sections:

1. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detector.

1.03 SUBMITTALS

A. Product Data: For each of the following type of products.

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Combination fire and smoke dampers.
4. Turning vanes.

5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Duct accessory hardware.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G60.
 2. Exposed-Surface Finish: Mill phosphatized.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT DAMPERS

- A. Manufacturers:
 1. Air Balance Inc.; a division of Mestek, Inc.
 2. Greenheck Fan Corporation.
 3. Ruskin Company.
 4. Or approved equal.
- B. Description: Multiple-blade, parallel action gravity balanced, with blades of maximum 6-inches width, with sealed edges, assembled in rattle-free manner with

90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

- C. Maximum System Pressure: 1-inch wg.
- D. Frame: 0.052-inch- thick aluminum sheet.
- E. Blades: Multiple single-piece blades, 0.050-inch- thick aluminum sheet with sealed edges.
- F. Blade Action: Parallel.
- G. Blade Seals: Neoprene.
- H. Blade Axles:
 - 1. Material: Galvanized steel.
 - 2. Diameter: 0.20 inch.
- I. Tie Bars and Brackets: Galvanized steel.
- J. Return Spring: Adjustable tension.

2.03 MANUAL VOLUME DAMPERS

- A. Manufacturers:
 - 1. Rectangular Duct:
 - a. Greenheck
 - b. Air Balance
 - 2. Round Duct:
 - a. OMNI
 - b. Duro-dyne
- B. General Description:
 - 1. Rectangular Dampers:
 - a. Rectangular Volume Dampers: Greenheck Model VCD-1000 galvanized steel assembly with 16 ga. Frame, 16 ga. Interlocked opposed blades, 1/2" pins with nylon bushings, 1/2" extended shaft and Duro-Dyne K-5 locking quadrant.
 - b. Vertical Pressure Relief Dampers: Greenheck Model WD-330 assembly with 18 ga. Galvanized steel frame, interlocked

aluminum parallel blades with felt lined edges, 3/16” pins and nylon bushings.

- c. Horizontal Pressure Relief Dampers: Greenheck Model WD-100 assembly with 18 ga. Galvanized steel frame, spring assisted interlocked aluminum parallel blades with felt line edges, 3/16” pins and nylon bushings.

2. Round Dampers:

- a. Galvanized steel assembly with 22 ga. Blade, 3/8” shaft, Duro-Dyne SB-338 close end bearing and Duro-Dyne KR-3 locking quadrant.

2.04 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:

1. Greenheck Fan Corporation.
2. Air Balance Inc.; a division of Mestek, Inc.
3. Ruskin Company.
4. Or approved equal.

B. General Description;

1. Greenheck Model FSD-212-0C1 State Farm Marshall (SMF listing 3225-981:103) 1 1/1 hour rates multi-blade galvanized steel assembly with (oci option) re-settable switches and re-settable link (RRL option) leakage class II construction and electric damper actuator.
2. Fire/Smoke damper shall be actuated by *the fire alarm system via the area smoke detector*. ~~duct smoke detector, duct smoke detectors shall be purchased from the combination fire/smoke damper manufacturer.~~ **(12.19.14)**
3. Fire/Smoke dampers shall be installed in accordance with the manufacturer’s recommendations complying with the state fire marshal’s requirements.
4. Fire/Smoke dampers shall be provided with adequate access required for inspection and link replacement, but in any case not less than 12” x 12” size.
5. ~~Duct mounted smoke detectors “Air Products” Model SL 2000 N State Fire Marshal listed (SFM listing 3240 1004:1 5) assembly consisting of housing, housing cover, electrical terminal strip, ionization detector, Model 55000 225 APO and STN series sampling tube; sampling tube~~

~~length shall be governed by the duct size as tabulated in the manufacturer's catalog. (12.19.14)~~

6. ~~Duct mounted smoke detectors shall be installed in accordance with the State Fire Marshal's requirements. (12.19.14)~~
7. Combination fire smoke dampers shall be labeled 1-1/2 hour rating by California State Fire Marshal.

2.05 TURNING VANES

- A. Fabricate to: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; For Vanes and Vane Runners: Vane Runners shall automatically align vanes.
 1. Manufactures:
 - a. Ductmate Industries, Inc.
 - b. Duro Dyne Inc.
 - c. METALAIRE, Inc.
 - d. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 - e. Or approved equal.
 2. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. Manufactured Turning Vanes: Fabricate 1-1/2 inch wide double – vane, curved blades of galvanized sheet steel; set 3/4 inch o.c, support with bars perpendicular to blades set 2 inches o.c and set into vane runners suitable for duct mounting.

2.06 DUCT-MOUNTED ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Door: Double wall, rectangular duct mounted fabricated of galvanized sheet metal with insulation fill and 1 inch thickness. Include hinges and latches.
- C. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

2.07 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
 1. Duro Dyne Inc.
 2. Ductmate Industries, Inc.

- B. Flame-retardant or noncombustible fabrics, State Fire Marshal listed. Comply with UL 181, Class 1.
- C. Flexible Connector Fabric:
 - 1. Durolon non-combustible fabric with weather proof, airtight, chemical resistant, and fire retardant coating.
 - 2. Medium and High Velocity usage.

2.08 FLEXIBLE DUCTS

- A. Manufacturers:
 - 1. Omni
 - 2. Flexmaster U.S.A., Inc.
 - 3. McGill Air-Flow LLC.
 - 4. Or approved equal.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film and adjustable sheet metal split collars.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
- C. Flexible Duct Clamps:
 - 1. Clamps: Nylon band with a worm-gear cinch action fastener.

2.09 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Coordinate subparagraphs below with Division 23 Section "Metal Ducts." Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.
 - 3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 4. At each change in direction and at maximum 50-foot spacing.
 - 5. Upstream of turning vanes.
 - 6. Elsewhere as indicated.

- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
- K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible duct connections attached to the ductwork with lock seam. Duct connection shall not be more than 6 inches long.
- M. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers to low-pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- O. Flexible Ducts:
 - 1. Flexible duct collar shall be slipped over the duct and after the installation, collar shall be secured with sheet metal screws spaced at 10 in. on centers around the duct periphery and the connection shall be sealed with 2" wide pressure sensitive tape wrapped twice around the duct periphery.
 - 2. Flexible duct shall be installed fully extended, free of sags and kinks and using minimum length required for making connection.
 - 3. Flexible ducts shall have maximum length of 5 ft. and shall be supported every 3 ft. with 1-1/2" wide galvanized strap fastened to the structure with an 8d nail.
 - 4. Where flexible duct is cut and attached to ductwork and metal split collar is not used slip flexible duct over sheet metal duct apply nylon band and the connection shall be sealed with 2" wide pressure sensitive tape wrapped twice around the duct periphery.
 - 5. Flexible ducts shall be used above T-bar ceiling only.
 - 6. Flexible ducts shall not be used at any wall penetration.
- P. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 26 50 00
LIGHTING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE

- A. Work Included:

All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.
2. General provisions and requirements for electrical work.

1.03 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. General

1. Submit certification letter from manufacturers of Lamps and Ballasts, stating the specific lamp and ballast combination comply with manufacturer recommendation and approval for the combined use, shown on the drawings.
2. Provide complete manufacturers catalog data information for each light fixture (luminaire), ballast, lamp, materials, auxiliary equipment/devices, finishes and photometrics.

- B. Performance Certification

1. Submit manufacturer's certified lamp and ballast tests report data showing compliance with contract document.
2. Submit manufacturer's letter of certification for each fixture type, confirming the proposed combination of specific led luminaires, LED driver and auxiliary components for each light fixture (luminaire) type will function together correctly and perform in compliance with the requirements of the contract documents as follows:

"The proposed led lighting product(s), LED Driver(s)(where, applicable), led lamp sockets and fixture have been tested as an assembly. The proposed fixture products assembly are certified by the manufacturer to function within the required temperature, lumen output, electrical characteristics and operational life described in the contract documents".

C. Light Fixture Samples

1. If requested by the OWNER'S Representative, provide a sample of each fixture proposed as a substitution for a specified fixture. Sample fixture shall be complete with specified lamps, 3 wire grounding "SO" cord and plug for 120-volt 60 Hz, AC plug-in operation. Sample fixtures shall be delivered to the OWNER'S Representative's office for review, the samples shall be picked up within ten (10) working days after review comments have been received; any samples left beyond this time will be discarded by the OWNER'S Representative. Decision of OWNER'S Representative regarding acceptability of any lighting fixture is final.

1.04 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)

A. Work and materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Document requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the requirements describing the more restrictive provisions shall become the applicable contract definition:

1. U.L. – Underwriters' Laboratory
 - a. U.L. –8750: Standards for Lighting Emitting Diode LED Equipment for Use in Lighting Fixtures Products
 - b. U.L. – 8750: LED Drivers
2. NEMA-LE4
3. United States Federal Government
 - a. FCC – Part 18: EMI and RFI emissions limitations.
 - b. EPA: Energy conservation publications and waste disposal regulations.
4. ETL and C.B.M. certified and approved.
5. Electrical installation standards, National Electrical Contractors' Association:
 - a. NEIS/NECA Recommended Practice for
& IESNA – 500: Installing Indoor Commercial Lighting Systems.

- b. NEIS/NECA Recommended Practice for
& IESNA – 501: Installing Exterior Lighting Systems.
6. Illuminating Engineering Society – IES:
- a. IES – LM-79-80: Photometric and Reporting
 - b. IES – LM-80-08: Measuring lumen Maintenances of LED light Sources.
 - c. IES – TM-21-11: Protecting Long Term Lumen Maintenances of LED light Sources.
7. American National Standards Institute:
- a. ANSI – 8750-2009: Standards for Light Emitting Diode (LED) Equipment for Use in Lighting Products.
 - b. ANSI/NEMA/ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
 - b. ANSI/NEMA RP-16-10: Nomenclature and Definitions for Illuminating Engineering.
8. State California
Code of Regulations
Title-24: Energy Code

PART 2 - PRODUCTS

2.01 GENERAL

A. Complete Fixture

- 1. Provide light fixtures complete including LED's, Driver's, lamp holders sockets, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/lenses and outlet boxes.
- 2. Include an allowance of \$300.00 to provide a light fixture for each lighting fixture outlet shown on drawings without a fixture type designation.

B. Specific Fixture Requirements and Fixture Schedule Information

- 1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular manufacturer only. The fixture length, number of lamps and lamp types, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other

components required to fulfill the total description of the fixture based on all drawing information, branch circuits, voltages, specification information, and shall be included in the contract requirements regardless of whether or not the catalog number specifically includes these components.

2. Light Emitting Diode LED Lighting fixtures shall be the types as indicated in fixture schedule on the drawings and as described in the specifications.
3. All fixtures of the same fixture type shall be the same manufacturer and of identical finish and appearance, unless indicated otherwise on drawings.

C. Manufacturer Certification of Operation

1. Light Emitting Diode (LED) source's and LED Drivers shall be recommended and certified by the respective manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

2.02 LED DRIVERS (FOR LED LIGHTING SOURCE)

A. General

1. All Light Emitting Diode LED lighting source, LED driver, lighting fixtures assemblies and components shall be ANSI, ETL approved C.B.M. certified and UL labeled.
2. Maximum total harmonic distortion (THD) created by operation on the line (input) side of the ballast shall not exceed 20-percent, unless indicated otherwise on the drawings.

B. Emergency Lighting

1. Light Emitting Diode LED Light fixtures shown connected to both normal power and external emergency power branch circuits per Manufacturer recommendation for the normal and emergency power circuits.
2. The Light Emitting Diode LED fixtures connected to the external emergency branch circuit shall be in a separate wireway barriered for the LED fixture connected to the normal power branch circuits.

2.03 LIGHT FIXTURES (LUMINAIRES)

A. General

1. Light Emitting Diode LED Lighting fixtures shall have all parts, ballasts, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.

2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing, but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.
3. Where fixture color is indicated to be selected by the ARCHITECT and/or OWNER'S Representative, provide two color chip samples for each color for review.
4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16 AWG "AF" or "CF" type fixture rated copper wires, high temperature wire insulation for not less than 600 volts A.C. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.
5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finish painting of the adjacent surface is completed.
6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.
7. Light fixtures installed outdoors, in damp or wet locations shall be U.L. labeled for said location as "damp-location" and "wet-location" for the respective installation location.
8. Fixtures in contact with thermal/building insulation, shall be UL listed and rated for direct contact installation in thermal insulation systems.
9. Lamp auxiliary support brackets shall be heat-resistant, non-dielectric. Alternatively, metal auxiliary lamp support brackets shall be electrically isolated from the fixture, to prevent glass decomposition.
10. Lighting fixtures installed in masonry and/or concrete construction. The fixture housing shall be rated for "concrete-pour" installation location.

B. Lens and Diffusers

1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixtures lenses, shall be 100-percent virgin material.
2. Thickness of not less than 0.125-inch, as measured at the "THINIST" portion on the diffuser or lens. However, thickness shall be increased to sufficient construction and camber to prevent the lens and diffusers from having any noticeable sag over the entire normal life of the installation.

3. Diffusers shall be formed from cast sheet by a vacuum and/or pressure technique.

C. Fixture/Luminaire Internal Wiring

1. Provide wiring between Light Emitting Diode LED source chipset lampholders and associated operating and starting equipment. Provide LED driver inside lighting fixture.
2. Wire insulation for Light Emitting Diode LED drivers shall be rated and U.L. listed for the igniter pulse voltage.

D. LED Chipset and Supports

1. Light Emitting Diode LED Light source shall be used as recommended by lamp manufacturer.
2. Provide LED Chipset sockets suitable for specified LED light source, and position the LED light source in optically correct spacing and relationship to lenses, reflectors, filters, and baffles.

2.04 LIGHTING STANDARDS (SUPPORT POLES, POLE MOUNTED LIGHTING FIXTURES AND LUMINAIRES)

A. General

1. Lighting poles, pole bases, pole arms, lighting fixtures (luminaires), supports with all lighting pole attachments and anchors shall be designed and constructed to withstand not less than 100 mile per hour steady horizontal wind loading and 130 mile per hour horizontal wind gust loading, without any damage to the lighting standards.
2. Provide tamper-resistant "hand-hole" and cover on the pole, for access into wiring terminations inside the pole. Provide ground "lug" attachment for equipment bond conductor.
3. Provide factory applied weather protective base undercoat and final finish on all exposed and internal components. Color as indicated or as selected by OWNER'S Representative.

B. Base Plate

1. Provide a base plate at the bottom of each pole to attach and secure the pole to the pole anchor bolts. The base plate shall be permanently attached to the bottom of the pole.

C. Anchors

1. Anchor bolts shall be threaded the entire bolt length, not less than four (4) bolts for each pole equally spaced around the pole base. Provide a minimum of two threaded nuts for each anchor bolt. Install a nut on the

top and bottom sides of each base plate anchor bolt location. Not less than three (3) threads shall be exposed after pole is installed and leveled.

PART 3 EXECUTION

3.01 LIGHT FIXTURE INSTALLATION

A. General

1. The CONTRACTOR shall verify actual ceiling and wall construction types as defined on the Architectural drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The CONTRACTOR shall verify depth of all recessed lighting fixtures with Architectural drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall be reported to the OWNER'S Representative prior to release of order to the supplier of the fixtures.
2. On acoustical tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four corners or at the center of the joints of two tiles.
3. The CONTRACTOR shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the OWNER'S Representative.
4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the site plan and floor plan electrical drawings. The voltages shown on the fixture schedule are for generic fixture information only.
5. Install and connect lighting fixtures to the circuits and control sequences indicated on the drawings and to comply with respective manufacturer's instructions/recommendations.

B. Lighting fixtures installed in ceiling support grids - suspended lay-in "T-bar" and concealed spline ceilings.

1. Provide two seismic clips at opposite ends of each recessed light fixture, the clip shall connect to the ceiling grid main runners and the light fixture. The light fixture with seismic clips and ceiling grid runner connections shall resist a horizontal seismic force equal to the total weight of the light fixture assembly.

2. Each light fixture weighing 40 pounds or less and where the respective ceiling grid system is "heavy duty" type, shall be suspended directly from the ceiling grid or shall be suspended independent of the ceiling grid support system as approved by the AHJ. Each light fixture weighing more than 40 pounds or where the ceiling grid system is not a "heavy duty" type, shall be supported independent of the ceiling grid and independent of ceiling grid support system.
3. Each light fixture supported independent of the ceiling grid system shall be supported with a minimum of four taut independent support wires, one wire at each fixture corner.
4. Each light fixture supported directly from the ceiling grid or ceiling grid support system shall be additionally connected with a minimum of two independent slack safety support wires. One wire at each opposite diagonal fixture corner. Each 3 ft. x 3 ft. and larger light fixture shall be supported in the same manner, except provide a minimum of four independent slack safety wires, one at each fixture corner.
5. Light fixtures surface mounted to a suspended ceiling shall be installed with a one and one-half inch steel – "C" channel which spans across and above a minimum of two parallel main ceiling grid "runners" and concealed above the ceiling. Each channel or angle member shall be provided with a minimum of two threaded studs for attaching to the fixture housing through the lay-in ceiling tile. Two steel "C" channel members shall be installed for each four-foot (or smaller) fixture. Install the channels within six inches of each end of the light fixture to span a minimum of two ceiling grid parallel main runners. Provide two seismic clips connecting the ceiling grid main runners to each steel – "C" channel. Provide a not less than two (2) taut independent support wires connecting to each channel. Bolt the light fixtures to the threaded studs on the channels or angles, to support the light fixture tight to the ceiling surface.

C. Fixture Supports

1. The support wires for light fixture support shall be 12-gauge steel (minimum). The wires including their building and light fixture attachments shall provide support capacity of not less than four times the weight of the light fixture assembly. Provide additional light fixture support wires and building anchors to meet these requirements, as part of the contract. The support wires shall be anchored to the building structural elements above the ceiling.
2. Suspended fixtures weighing in excess of 40 pounds shall be supported independently of the fixture outlet box. Provide "air craft" (minimum 12 gauge) steel hanger cable for suspended fixtures route cable concealed or in pendant where possible. Each cable attachments shall support four times the weight of the fixture assembly. Securely attach the cable to the building structure.
3. Surface mounted fixtures installed on drywall or plaster ceilings and weighing less than 40 pounds may be supported from outlet box. Provide

structural supports above drywall or plaster ceilings for installation of fixtures weighing more than 40 pounds and secure fixture to structural supports. The use of toggle bolts is prohibited.

D. Recessed Lighting Fixtures - Fire Rated Building Surfaces

1. Lighting fixtures recessed in ceiling or wall which has a fire resistive rating of 1 hour or more shall be enclosed in a fully enclosed backbox (except over fixture lens/diffuser). The material used to fabricate the "enclosed backbox" shall have a fire rating equal to that of the respective ceiling or wall.
2. The space from the fixture to the box enclosure shall be a minimum of 3-inches.
3. The backbox shall be concealed behind the fire rated ceiling and wall finish surface. The light fixture shall be provided with lamp ballast rated for (normal light output) operation in a "high" ambient temperature.

3.02 LAMPS

- A. Light Emitting Diode LED fixtures controlled by dimming equipment shall be operated (aged) for 100 continuous hours without interruption, at 100-percent full lumen output prior to occupancy of the building by the OWNER.
- B. Light Emitting Diode LED fixtures shall be the type and manufacturer as recommended by the dimming system controls manufacturer.
- C. Install all lamps in each light fixture.
- D. Light Emitting Diode LED light fixture use during construction:
 1. All Light Emitting Diode LED lighting fixtures that have been operated (ON) for a total of more than 300 hours prior to final completion of the contract notice of completion.

3.03 LENS AND DIFFUSERS

- A. Lens, diffusers, internal reflectors shall be completely cleaned of all dust, dirt and fingerprints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupancy of the facility by the OWNER.

3.04 LED DRIVERS

- A. LED drivers remote from the lighting fixture, mounted as shown on the drawings and designed for remote operation. Additional wiring and conduit shall be provided whether shown on the drawing or not, between lighting fixture and

remote Ballasts with required quantity of "THHN" wire installed in conduit to operate said fixture(s).

- B. Provide proper type and quantity of conductors with conduit system for proper operation of dimming system, whether or not shown on drawings.

3.05 FLUORESCENT LIGHT FIXTURE TANDEM WIRING CONNECTIONS

- A. The contractor shall provide tandem wiring whether or not shown on the drawing for fluorescent lighting fixtures conforming to all of the following criteria:

- 1.. Light fixtures are recess mounted within 10 ft. of each other; light fixtures are surface mounted or suspended/pendent mounted within 1 ft. of each other.
- 2. Light fixtures are located in the same room.

- B. Provide the tandem wiring connections between respective light fixtures as follows:

- 1. The tandem wiring harness shall be the product of the respective lighting fixture manufacturer.
- 2. The tandem connection shall provide pre-assembled wiring harness connecting two (2) fluorescent lamps in adjacent lighting fixtures with a master lamp ballast, remote adjacent fixture slave lamp.
- 3. The wiring harness shall contain the wiring in flexible steel conduit or enclosed metal raceway/jacket for installation in an air plenum.

3.06 COMMISSIONING LIGHTING FIXTURES (ADDITIONAL REQUIREMENTS)

- A. General

- 1. Verify correct lighting control configurations and operation in each room.
- 2. Simulate normal source power failure by "opening" (turn off) building main service disconnect and verify connections and operation of each emergency lighting fixture.
- 3. Confirm "EXIT" sign directional arrows are visible in each "EXIT" sign.
- 4. Verify light fixture support-hangers, ceiling grid clips and seismic restraints comply with the Contract Documents.
- 5. Remove protective shipping/installation shields on fixtures. Verify fixtures and lamps are clean and free of construction debris. Clean light fixtures found to be contaminated or dirty.
- 6. Setup, program and function test lighting control systems to perform each of the indicated control functions, area/room zones and sequences.

- B. Sample spot-check in each room the following lighting fixture information:
1. LED light source and performance data.
 3. Combined LED fixture certification of performance and compatibility by respective manufacturer.
 4. Verify instructional signage is placed inside each lighting fixture in compliance with Contract Documents.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. See Division 26 Section "Network Lighting Controls" for manual or programmable control systems employing low-voltage control wiring or data communication circuits.
- C. See Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
- D. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.03 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of LED driver for dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 3. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.02 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
2. Glass: Annealed crystal glass, unless otherwise indicated.

2.03 EXIT SIGNS

A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.04 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type, UL listed for LED type lamps.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.05 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable lighting fixtures to provide required light intensities.
- F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.02 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Exterior luminaires with Light Emitting Diode LED and Drivers.
- B. Related Sections include the following:
 - 1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.03 DEFINITIONS

- A. CRI: Color-rendering index.
- B. HID: High-intensity discharge.
- C. Luminaire: Complete Light Emitting Diode LED lighting fixture, including Drivers housing if provided.
- D. Pole: Luminaire support structure, including tower used for large area illumination.
- E. Standard: Same definition as "Pole" above.

1.04 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 - 2. Details of attaching luminaires and accessories.

3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
6. LED Drivers, including energy-efficiency data.
7. Light Emitting Diode LED, including life, output, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

B. Shop Drawings:

1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
2. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
3. Wiring Diagrams: Power and control wiring.

C. Samples for Verification: For products designated for sample submission in Exterior Lighting Device Schedule. Each sample shall include lamps and ballasts.

D. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

E. Qualification Data: For agencies providing photometric data for lighting fixtures.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For luminaires and poles to include operation and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
 - 5. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Globes and Guards: 10 percent of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. In Exterior Lighting Device Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified on the lighting fixture schedule.

2.02 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 8750 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Factory installed Light Emitting Diode LED shall arranged to block light distribution to indicated portion of normally illuminated area or field.

- J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.

- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finishes process and color of pole or support materials.

- M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.

2.03 LED DRIVER FOR Light Emitting Diode LED

- A. Comply with ANSI 8750-2009 and UL 8750 and capable of open-circuit operation without reduction of average lamp life. Include the following features, unless otherwise indicated:
 - 1. LED Driver Circuit: Constant-wattage and high-power-factor type.
 - 2. Minimum Starting Temperature: Minus 22 deg F.
 - 3. Normal Ambient Operating Temperature: 104 deg F.

- A. Light Emitting Diode LED
 - 1. Light Emitting Diode LED: ANSI 8750-2009, CRI 80 (minimum), color temperature 4000K, and average rated life of 100,000 hours, minimum.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION

- A. Install Light Emitting Diode LED's light source and driver in each luminaire.

- B. Fasten luminaire to indicated structural supports.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming.

3.02 POLE INSTALLATION

- A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
 - 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 - 3. Trees: 15 feet.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 - 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 - 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 - 3. Install base covers, unless otherwise indicated.
 - 4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Dig holes large enough to permit use of tampers in the full depth of hole.
 - 2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- G. Raise and set poles using web fabric slings (not chain or cable).

3.03 CORROSION PREVENTION

- A. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 GROUNDING

- A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole, unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.
 - 2. Install grounding conductor and conductor protector.
 - 3. Ground metallic components of pole accessories and foundations.

3.05 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 - 1. Verify operation of lighting controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
 - a. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
 - b. IESNA LM-64, "Photometric Measurements of Parking Areas."
 - c. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.06 DEMONSTRATION

- A. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 27 20 00

ELECTRONIC NETWORK SYSTEMS INFRASTRUCTURE (Computer/Data, Telephone/Voice, Audio/Video, TV and Multimedia)

PART 1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other specifications sections and drawings for related work required to be included as work under Division 26.
 2. General provisions and requirements for electrical work.
- B. Provide electronic network systems infrastructure for the following systems:
1. Computer Data Networks
 2. Telephone and Intercom Voice Communications
 3. Other special systems described in the contract documents.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Drawings Submittals
1. Drawings shall be submitted on reproducible sepias and Autocad® Version 2.2 (or later revision) data files on CD/DVD-ROM disk, WINDOWS®-XP/VISTA or Version-7 format.
 2. Submit redrawn building floor plan for each building area, same scale as the contract drawing.
 3. Plans shall show walls, doors, windows, furniture, infrastructure, outlets and network systems equipment locations. Show point-to-point interconnecting cables, pathways, conduit, conduit sizes, and circuit types, along with circuit identification names, numbers, and quantities between all components.
 4. Provide scaled elevation drawings of each equipment rack, terminal blocks, terminal backboard and terminal room/closet showing location and arrangement of each equipment component, outlet and cable training provisions, with estimated weight of each complete assembly.

5. Submit block wiring diagrams showing major system components, outlets, equipment racks, terminal blocks, signal loss with interconnecting circuit conductors, splices, portable patch cords and connectors. Riser type diagram shall be provided if the building has more than one floor level, with information shown on riser diagram corresponding for each respective floor.
- B. Submit manufacturer's standard catalog data for each component. The submittal shall be arranged in the order of the Specification and shall list the specification paragraph number, the name, the proposed model and manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure. The manufacturer's data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of items. The data sheet shall completely describe the proposed item. Where modification to the equipment is necessary to meet the operational requirements of the contract documents, the brochure shall include complete mechanical and electrical shop drawings, detailing the modification. The brochure shall include a listing of the outlet rough-in requirements for every device and equipment item. The applicable symbol which illustrates that rough-in item on the job plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by field personnel. Submit elevation and dimensional information.
- C. Performance Calculation:
1. Provide engineered calculations showing the Passive Cable System Signal Attenuation losses of the proposed installed system. The intent is not to require calculations for every system segment, port and outlet. The intent is to require engineered calculations for proposed typical worst case port to port; head end to farthest distance outlet and patch port to outlet signal attenuations.
 2. Provide calculations for a minimum of twenty-five (25) complete channel/circuit paths. The calculations shall include attenuation insertion losses for each system component including individually itemized cable-fiber/wire; outlet, termination, connector, electronic component (if any), coupler and patch cord along the entire path from the head end equipment to the end use outlet.
 3. The calculations shall serve as the basis for verifying the system performance with the system testing specified in the Contract Documents.
- D. Provide proposed nameplate and outlet identification/color coding system. Indicate proposed identification naming sequence and methods, itemized for review.
- E. Submit manufacturer certified test reports showing test documentation for the proposed material that the material meets or exceeds the performance standards defined in the contract documents. The testing and results shall reflect worst case per-

formance based on a minimum of ten samples. Tests shall be certified by a Nationally recognized independent test lab (i.e., ETL, UL, etc.). The manufacturer shall certify in writing the material has been manufactured and tested to comply with the requirements defined in the contract documents.

- F. Submit three (3) samples of each of the following, fully assembled with 24-inches of cable type connected:
1. Copper wire outlet and connector, with each type of specified inserts.
 2. Copper cables and patch cords, each type.
 3. Fiber optic cables and patch cord each type.
 4. Mechanical splice - fiber optic.
 5. Fusion splice - fiber optic.
 6. Fiber optic outlet and connector each type.
 7. Fiber optic cable connector each type of termination, with interconnection coupler.
 8. Patch panel each type.
 9. Coverplate each type.

1.03 APPLICABLE STANDARDS

- A. The equipment shall be UL listed, labeled, and approved for the application shown in the contract documents.
- B. The complete system material, equipment, testing, installation and workmanship shall comply with the mandatory requirements and the guideline/recommendation requirements of the following latest published version, supplements, latest revision including addendums and TSB. Both the mandatory and advisory criteria shall be included as requirements of the Contract Documents:
1. TIA-526 Optical Power and loss measurements – multimode and single mode fiber.
 2. ANSI/TIA/EIA-568C Commercial Building Telecommunications Standards.
 3. ANSI/TIA/EIA-569B Commercial Building Standards for Telecommunications Pathways.
 4. ANSI/TIA/EIA-570A Residential Telecommunications Standard.

5. ANSI/TIA/EIA-598B Optical Fiber Cabling Color-coding.
 6. ANSI/TIA/EIA-606A Administrative Standard for Commercial Telecommunications Infrastructure.
 7. ANSI/TIA/EIA-607 Commercial Buildings Grounding and Bonding Requirements for Telecommunications.
 8. FCC – FYU/FT6.
 9. ISO/IEC-11801
 10. National Electrical Code (NEC) and California Electrical Code (CEC) including Articles 770 and 800 with ETL verified testing and local code jurisdictions.
 11. NECA/NEIS, National Electrical Contractors Association, National Electrical Installation Standards:
 - a. 301 – Standard for Installation and Testing for Fiber Optic.
 - b. 568 – Standard for Installing Building Telecommunications Bonding and Grounding.
 - c. 607 – Telecommunications
 12. Manufacturer's recommendations for the respective equipment.
- C. The entire completed Electronic Network Systems Infrastructure shall be tested and provide electronic data/network and telephone/voice multi-channel communications latest revisions, standards and addendums, for the following protocols:
1. IEEE 802.3/ETHERNET:
 - a. 10Mbps 10Base-T, 100Mbps 100Base-Tx, and 1000Mbps (1Gbps) 1000Base-Tx for copper wire; 100-meter communications pathway distance.
 - b. 10Mbps 10Base-F1, 100Mbps 100Base-FX, 1000Mbps 1000Base-Lx-Sx and 10,000- Mbps (10Gbps) for fiber optics; 550-meter communications pathway distance, OM4 standard for multimode and OS2 for single mode.
 - c. IEEE-802.3 for Power Over Ethernet-Plus (POE Plus).
 2. FDDI - Distributed data interface on fiber or copper wire, 100Mbps.

3. 100VG - AnyLAN
 4. EIA Serial and Bi-directional RS-232 and RS-485m including Star-Hub repeaters
 5. ANSI - TPPMD 55Mbps, 155Mbps and 622Mbps Asynchronous Transfer Mode - ATM.
- D. The complete telephone/voice infrastructure system shall be suitable for the telephone/voice analog and digital communications and VOIP protocols. The system shall be compatible with the telephone/voice equipment installed as part of the contract.
- E. Installation of all infrastructure equipment, devices, splices, terminations, cables, outlets, etc. shall comply with manufacturer's recommendations.

1.04 EQUIPMENT QUALIFICATIONS

A. Equipment

1. The supplier of the equipment shall be the factory authorized distributor and service facility for the brands of equipment and material provided.
2. Network systems infrastructure equipment and materials shall all be the product of one of the individual same manufacturers as follows. Typical unless specifically described otherwise:

AMP/Tyco – NetConnect series; or Siemen – ConvergeIT series; or Belden – 10GX series.

B. Installation Certification

1. Work and material for cables, cable terminations, outlets and related components for infrastructure systems shall be performed by certified installers. The installer shall be certified by the respective product manufacturers.
2. The manufacturers of the indicated work and material shall provide an installer education/training and certification program for the supplied products.
3. The installers performing the Contract work for the indicated products shall have attended and successfully completed each of the respective manufacturer's installation training education programs for the specified products.

Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved by the OWNER'S REPRESENTATIVE prior to initiating any related contract work.

Contract material installed and work performed by installers not complying with these requirements shall be removed. Removal of work and material not in compliance with these requirements shall be done at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions. New material and work required to replace the non-complying removed work and material shall be provided at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions.

C. Extended Material and Performance Warranties

1. In addition to the warranty requirements described elsewhere in the contract documents, provide the following extended material and performance warranties. The warranty period shall be for not less than 15-years from the Contract Notice of Completion.
2. Warranty scope includes materials and performance for network cables and terminations, network workstation plug-in outlets, and patch panel plug-in outlets, cable splices and connectors.
3. Repair or replace the defective material with new material at the project premise, to comply with the performance standards outlined in the contract documents during the warranty period.
4. Submit seven (7) copies of proposed warranty statements, with shop drawing submittals.

1.05 ABBREVIATIONS

<u>Abbreviation</u>	<u>Terminology</u>
ACR	Attenuation to Cross Talk
AHJ	Authority Having Jurisdiction
Backbone	Interconnections between MDF and IDF lo-
cations dB	Decibel
dBm	Decibel referenced to a milliwatt
Demarc	Demarcation location where operational con-
	trol change or ownership change occurs
ft.	Feet
GHz	Gigahertz
Horizontal Connection,	Circuit Interconnections between individual workstation
	outlet and/or Horizontal wiring location to respective IDF
	or MDF equipment rack patch panel.
IDF	Intermediate distribution frame (horizontal or ver-
	tical cross
	Connect) for an individual building area/floor
KM	Kilometer-IKM

kpsi	1000 pounds per square
inch m	Meter = 39.37 inches
Mbps	Megabits per second
MDF	Main distribution frame (central/main cross connect) for multi- building site or for a single individual building
Mhz	Megahertz
mm	Millimeter = 10^{-3} meter
NEXT	Near end cross talk
nm	Nanometer = 10^{-9} meter
	Picofarad = 10^{-12} farad
RTDE	Equipment rack mounts fiber optic termination distribution enclosure, with fiber optic patch panel
RMSE	Equipment rack mount fiber optic enclosure, splice only, (without patch panel)
STP	Shielded twisted pairs copper wire
ScTP	Shield Screened twisted pairs copper wire
Trunking-Cable	Individually insulated twisted pair copper wire cable, consisting of 24-pair or more of conductors inside a common cable jacket. Terminate and connect to common terminal-block location at each end of the trunking-cable.
um	Micrometer = 10^{-6} meter
USE	Universal splice enclosure
UTP	Unshielded twisted pairs copper wire
VOIP	Voice communications over internet protocol
WGNA	Wide Band Gigabit Networking Alliance
Workstation where or Workstation location	Spaces remote from the MDF/IDF terminal room/closet, occupant interacts with the electronic systems infrastructure equipment connection device
WMIC	Wall mount fiber optic cable interface cabinet

1.06 MATERIALS AND METHODS

- A. Material and labor not complying with the contract documents shall be removed by the CONTRACTOR from the project site. Material and labor complying with the contract documents shall be provided.
- B. All the cost to remove deficient work and material, provide work and material complying with the contract documents and the direct, indirect, incidental damages and contract delays resulting from complying with these requirements shall be the sole responsibility of the CONTRACTOR and shall be included in the bid price.
- C. System Performance Requirements
 1. The work, performance and type of materials provided as part of the contract shall comply with the following ANSI/TIA/EIA-568C and related standards for all Electronics Network Systems Infrastructure work and materials described in the specifications and shown the drawings:
 - a. Computer/data network systems: Category-6.

- b. Telephone/intercom voice systems: Category-6.
2. The Electronic Network Systems Infrastructure system shall be based on “star-topology” for MDF to IDF backbone connections and workstation outlet to MDF/IDF horizontal connections.

PART 2 - PRODUCTS

2.01 FIBER OPTICS CABLES

A. General

1. Operating temperature range 20-degrees centigrade through +60 degrees centigrade. Cables shall be flame retarding.
2. Electronic network systems infrastructure cables that are not installed inside conduit raceways. Electronic network systems infrastructure cables that are installed in concealed spaces including plenums and non-plenums; access floors, ceiling spaces, walls, floor, etc., and/or installed without continuous raceways. The cable insulation and jacket shall be listed and labeled “limited combustible cable” (LC or LCC) and shall comply with the latest published revision of all of the following additional requirements.
 - a. Limited combustible “FHC-25/50” per UL-2424.
 - b. NEC/CEC;CMP, additional listing/labeling where the install location is an environmental air plenum, “FHC-25/50-CMP”.
 - c. NFPA-90A; ceiling cavity plenums, wall cavity spaces and raised floor cavity plenums, limited-combustible.
 - d. NFPA-5000; defines combustible material including wire and cable.
 - e. NFPA-75 computer rooms and electronic equipment room.
 - f. NFPA-13; spaces containing “limited combustible loading”.
 - g. Shall qualify as 100% recyclable materials disposal.
3. All fibers in a multi-fiber cable shall be fully operational within the performance characteristics specified prior to and after the cable is installed. The use of spare fibers in the cable to compensate for defective fibers is not permitted. Defective cables shall be removed and replaced with fully functional cables at no additional cost to the contract.

4. Cables shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with specified requirements. ANSI/TIA/EIA-568C including related standards, amendments and TSB.
5. Each fiber shall be individually identified with factory color coding or factory imprinted label.
6. Fiber optic cable shall be a product of the same manufacturer, including portable patch cables.
7. The outer cable jacket shall be imprinted with date, manufacturer's model and catalog number and AHJ listing identification.
8. Cables installed in raceways or conduits below grade, through in-grade manholes or pullboxes shall be rated for installation in water/wet locations.
9. Cables containing less than six (6) fiber strands shall be provided with a color-coded outer jacket (red or orange).
10. Multimode (50/125)
 - a. 50/125-fiber optic cables optical fibers, graded index multimode optical glass fibers, 50.0- micron fiber core and 125-micron fiber cladding, 0.2 numerical aperture. Optical fibers shall be 100kpsi proof tested, with maximum 0.7-micron flaw size for dual operation at 850nm and 1300nm wavelengths.
 - b. Minimum bandwidth:

@ 850nm-wave length	500Mhz per KM length
@ 1300nm-wave length	500Mhz per KM length
 - c. Maximum attenuation:

@ 850nm-wave length	3.4dB @ 1 KM length
@ 1300nm-wave length	1.4dB @ 1 KM length
11. Single mode:
 - a. Fiber optic cables optical fibers, (8.3/125) single mode optical glass fibers, 8.3 micron core fiber and 125-micron fiber cladding, 0.11 numerical aperture. Optical fibers shall be 100kpsi proof tested, with maximum 0.7 micron flaw size. For operation at 1310nm and 1550nm wave lengths.
 - b. Maximum attenuation:

@ 1310nm- wave length	0.5dB @ 1 KM length
@ 1550nm - wave length	0.4dB @ 1 KM length

- c. Maximum dispersion
 - @ 1310nm - wave length 2.8ps/nm KM length
 - @ 1550nm - wave length 18.0ps/nm KM length

B. Loose Tube Gel-filled Cables

1. Multiple, loose tube buffer tubes, gel-filled. Each buffer tube shall contain the same quantity of optical fibers, but not more than twelve (12) optical fibers in each buffer tube.
2. Buffer tubes shall be cabled around a central dielectric strength member. The central strength member shall be centered along the length of the cable.
3. Aramid yarn, non-optical, strength fibers shall extend continuously along the length of the cable.
4. The cable interstitial spaces shall be flooded to inhibit water migration, with non-flammable water blocking gel.
5. Each optical fiber shall be individually UV cured acrylate coated, 250-micron diameter coating over fiber cladding.
6. A seamless black polyethylene outer layer jacket shall envelope the entire cable.
7. The cable shall be fungus resistant, UV resistant, and moisture resistant for installation indoors with or without an enclosed raceway and outdoors in underground enclosed raceway/ conduit and manholes/pullboxes continuously flooded with water.

C. Indoor/Outdoor Cables

1. The cable shall be fungus resistant, UV resistant, and moisture resistant for installation indoors with or without an enclosed raceway and outdoors in underground enclosed raceway/ conduit and manholes/pullboxes continuously flooded with water, and in conduits exposed to the sun.
2. Each optical fiber shall be primary coated with 500-micron uniform acrylate tight buffered and with elastomeric uniform 900 micron diameter tight buffered, secondary coating. Aramid yarn strength member elements shall be tensioned and symmetrically and uniformly distributed around the fibers, along the length of the cable.
3. A overall cable jacket uniformly extruded directly around and mechanically interlocked with the optical fibers/strength members. The extruded jacket shall form internal helical cusped ridges that interlock with the optical fibers

and strength members. The interlocking jacket shall not allow cable fibers to move axially within the cable jacket.

4. Cables containing more than twenty-four (24) optical fibers shall be constructed with sub- cable fiber bundles. Each sub-cable bundle shall contain equal quantities of optical fibers, with a separate PVC jacket around each sub-cable. Sub-cable and sub-cable jacket construction shall match the overall cable requirements and jacket requirements.
5. The cable shall be UL listed and comply with NEC and CEC and NFPA requirements for each installation location shown in the Contract Documents. ETL tested and certified to comply with or exceed specified requirements.
 - a. NEC/CEC - OFNR (Vertical Riser Type Locations) OFNP (UL FHC-25/50 LC Plenum Type Locations and locations where not continuously enclosed inside conduits for entire cable length).
 - b. NEC/CEC - OFNG (Where continuously enclosed inside conduits for entire cable length).

D. Tight Buffered Cables

1. Each optical fiber shall be coated, 900-micron diameter uniform coating, with uniform tight buffering over the coating, uniform dielectric strength member surrounding the buffering coating and an overall jacket around each optical fiber assembly.
2. Individual multiple optical fiber assemblies shall be symmetrically arranged around a central dielectric strength member. The central strength member shall be centered along the length of the cable.
3. A dielectric strength member shall surround the fiber assemblies.
4. An outer dielectric jacket shall envelope the entire cable.
5. The cable shall be UL listed and comply with NEC and CEC and NFPA requirements for each installation location shown in the Contract Documents. ETL tested and certified to comply with or exceed specified requirements.
 - a. NEC [CEC] - OFNP (UL FHC-25/50 LC Plenum type locations and locations where not continuously enclosed inside conduits for entire cable length).

2.02 COPPER WIRE CABLES (TWISTED PAIRS)

A. General

1. Conductors shall be copper wire, individually insulated and color-coded, with multiple conductors arranged in twisted pairs.
2. An overall non-conductive jacket shall encase the copper wires and any shielding (where shielding is specified) shall also be encased by the jacket.
3. Cables shall be UL listed, complying with NEC National Electrical Code, National Fire Protection Agency and NFPA requirements for each installation location shown. ETL tested and certified to comply with or exceed specified requirements.
 - a. NEC [CEC] - MPP/CMP (Plenum type locations and locations where not continuously enclosed inside conduit).
 - b. NEC [CEC] - MPR/CMR (Vertical riser type locations).
 - c. ANSI/TIA/EIA-568C; including related standards, amendments and TSB.
4. Electronic network systems infrastructure cables that are not installed inside conduit raceways. Electronic network systems infrastructure cables that are installed in concealed spaces including plenums and non-plenums; access floors, ceiling spaces, walls, floor, etc., and/or installed without continuous raceways. The cable insulation and jacket shall be listed and labeled "limited combustible cable" (LC or LCC) and shall comply with the latest published revision of all of the following additional requirements.
 - a. Limited combustible "FHC-25/50" per UL-2424.
 - b. NEC/CEC; CMP, additional listing/labeling where the install location is an environmental air plenum, "FHC-25/50-CMP".
 - c. NFPA-90A; ceiling cavity plenums, wall cavity spaces and raised floor cavity plenums, limited-combustible.
 - d. NFPA-5000; defines combustible material including wire and cable.
 - e. NFPA-75 computer rooms and electronic equipment room.
 - f. NFPA-13; spaces containing "limited combustible loading".
 - g. Shall qualify as 100% recyclable materials disposal.
5. Cables installed in air plenums, air-handling spaces and cables installed without raceway or conduit shall also be UL listed and labeled for installation in air plenums.

6. The outer cable jacket shall be imprinted with date, manufacturer's model and catalog number and agency (AHJ) listing identification.
7. Cables installed in raceways or conduits below grade, through in-grade manholes and pullboxes shall be rated for installation in water/wet locations.
8. Copper wire Electronic Network Systems Infrastructure cable shall be a product of the same manufacturer, including portable patch cables.
9. The outer jacket of cables with less than 9-pair of conductors shall be color coded. The jacket color shall be different for each system type; multimedia; telephone/voice; computer/ data network; and fiber cable jackets.
10. 300-volt RMS insulation material for each data conductor shall be the same material; shall be the same electrical characteristics and shall be the same dielectric constant, for all data conductors contained within the respective common cable jacket, along the entire installed length of the cable. Data cables employing differing insulation materials for individual data conductors contained within a common cable jacket are not acceptable and shall not be provided.
11. Propagation and "Skew" Rate
 - a. Skew rate (nominal velocity of propagation delay) between any twisted pair in a combination of 4-twisted pair conductors grouped in the same cable, shall not exceed 35 nano seconds between any wire pair contained in the conductor group, and as required by the cable Category rating, over a cable length of 328-feet (100 meters), for all frequencies up to the cable maximum frequency rating.
 - b. Nominal velocity of propagation, 70% of the speed of light.
12. Copper wire cables with more than 25-twisted pairs of conductors shall be constructed with 25-pair binder groups of conductors. The cable binder groups shall be enclosed in colored binders and assembled to form a single cable. The twisted pair/binder groups shall be enclosed with multi-layer dielectric protective sheaths underneath a cable jacket enclosing the entire cable assembly. A corrugated metal 100% shield shall be provided under the cable jacket enclosing all conductors.

B. Category-5E Computer/Data Enhanced Cables for Trunking Cable - UTP

1. Category-5E cables shall be tested and shall pass ANSI/TIA/EIA test recommendations for Category-5E Trunking Cables.
2. Operational characteristics:

- a. Wire size 24AWG solid copper (24AWG stranded copper for patch cables)
- b. Quantity of twisted pairs patch cables) as indicated but in no case less than 25-twisted pairs
- c. Impedance 100 OHM \pm 15%, 3-100MHz
- d. Maximum Signal Attenuation per 300 feet (100 meters)
 - 6.3dB @ 1MHz
 - 13dB @ 4MHz
 - 18dB @ 8MHz
 - 20dB @ 10MHz
 - 25dB @ 16MHz
 - 28dB @ 20MHz
 - 32dB @ 25MHz
 - 36dB @ 31.25MHz
 - 52dB @ 62.5MHz
 - 67dB @ 100MHz
- e. Mutual Maximum capacitance of Any Pair
14pf/feet
- f. Worst Pair "NEXT" Loss Per/328-feet
(100 meters)
 - 62dB @ 1Mhz
 - 53dB @ 4Mhz
 - 48dB @ 8Mhz
 - 47dB @ 10
 - 44dB @ 16Mhz
 - 42dB @ 20Mhz
 - 41dB @ 25Mhz
 - 40dB @ 31.25Mhz
 - 35dB @ 62.5Mhz
 - 32dB @ 100Mhz

C. Category-6 Computer/Data Cables – UTP

- 1. Category-6 cables shall be tested and shall pass the ANSI/TIA/EIA test recommendations for Category-6.
- 2. Operation Characteristics:
 - a. Wire size 23AWG solid copper (23AWG stranded copper for portable patch cables)

- b. Quantity of twisted pairs as indicated but in no case less than 4-twisted pairs
- c. Impedance 100 OHM \pm 15%, 1-250Mhz
- d. Maximum Signal Attenuation per 328-feet (100 meters)
 - 2.0dB @ 1Mhz
 - 3.8dB @ 4Mhz
 - 5.3dB @ 8Mhz
 - 6.0dB @ 10Mhz
 - 7.6dB @ 16Mhz
 - 8.5dB @ 20Mhz
 - 9.5dB @ 25Mhz
 - 10.7dB @ 31.25Mhz
 - 15.4dB @ 62.5Mhz
 - 19.8dB @ 100Mhz
 - 29.0dB @ 200Mhz
 - 32.8dB @ 250Mhz
- e. Mutual Maximum Capacitance of Any Pair 5.0nF/100m
- f. Worst Pair "NEXT" Loss Per/328-feet (100 meters)
 - 74.3dB @ 1Mhz
 - 65.3dB @ 4Mhz
 - 60.8dB @ 8Mhz
 - 59.3dB @ 10Mhz
 - 56.2dB @ 16Mhz
 - 54.8dB @ 20Mhz
 - 53.3dB @ 25Mhz
 - 51.9dB @ 31.25Mhz
 - 47.4dB @ 62.5Mhz
 - 44.3dB @ 100Mhz
 - 39.8dB @ 200Mhz
 - 38.3dB @ 250Mhz

2.03 FIBER OPTIC FIBER SPLICES

A. General

1. Fiber optic cable splices shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568B including related standards, amendments and TSB.
2. Fiber optic splices shall be the products of the same manufacturer.

B. Mechanical Splice

1. Mechanically splice each fiber with a splice suitable for use with the type of fiber optic fibers.
Re-enterable and reusable splice. Splice shall be recommended as compatible with the optical fibers by the manufacturer. Splice shall not require the use of adhesives. Splice shall provide integral strain relief.
2. Performance requirements after installation:
 - a. Operating temperature range minus 20-degrees centigrade through plus 60-degrees centigrade.
 - b. Loss variation over temperature range, 0.05dB or less at specified wave lengths.
 - c. Insertion loss, 0.3dB or less at specified cable wave lengths.
 - d. Reflection (return loss), -40dB at specified cable wave lengths.

C. Fusion Splicing

1. Fusion splicing shall be performed with equipment providing the following features:
 - a. Cleaving and cleaning optical fiber.
 - b. Integral splice optimization verification system with local injection and detection.
 - c. Projection screen optics and fiber core alignment system.
 - d. Fiber cleaning/stripping.
 - e. Cleaning fiber ends and fusing of fiber together with an electric arc.
2. Fusion splice insertion loss as measured at the completion of the splice shall be less than 0.1dB at specified cable wave lengths.

2.04 FIBER OPTIC FIBER CONNECTORS AND INTERCONNECTION COUPLERS

A. General

1. The connectors and interconnection couplers shall be compatible, maintain the same performance Category rating and be compatible with the corresponding fiber-optic cable type attached to the connectors.

2. Fiber optic cable connectors and interconnection couplers shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements. Connectors and couplers shall comply with ANSI/TIA/EIA-568C, related standards, amendments, TSB, and Fiber Optic Connector Intermate Standard (FOCIS) documentation.
3. Fiber optic connectors and couplers shall be the product of the same manufacturer.
4. Shall be UL listed and comply with UL94V-0.
5. Color code connectors for fiber optic cables to match the respective fiber optic strand/jacket color.

B. Multimode Fiber Optic Fiber Connectors

1. LC – Small Form Factor (SFF) termination connector:
 - a. Ceramic oxide 1.25mm ferrule. Mechanical durability not less than 500-mating cycles.
 - b. Insertion loss of mated connector shall be less than 0.3dB at specified wavelengths.
 - c. Strain relief boot, long boot type unless indicated otherwise, short or angled boot type to match the connector installation application. Provide duct cover cap for each connector.
 - d. Locking type to automatically align mating fibers in the fiber cable and prevent accidental rotation and pullout.

2.05

FIBER OPTIC FIBER INTERCONNECTION COUPLERS

1. Interconnection couplers shall be “like-to-like” compatible, and shall provide "plug-in" coupling of two fiber optic cable connectors terminated with fiber optic fibers front-to-rear "in-line" together. The coupler shall provide interlocking, automatic optical self-alignment of two mating fiber optic connectors.
2. The centerline to centerline spacing of the interconnection couplers shall allow removal and insertion of portable patch cords, fiber cable connectors for both “single” and “duplex” type fiber adapter connectors without interfering with adjacent connectors.
3. Patch panel mounted interconnections couplers shall be factory pre-mounted to a modular nominal 0.09-inch thick metal panel, couplers aligned and anchored on the plate.

- a. The metal panel shall be predrilled for standard EIA mounting in high-density 19-inches wide metal patch panel frames.
4. Interconnection couplers in workstation outlets shall be installed in outlet boxes with cover plates.
5. Provide removable dust caps for the front side of each coupler.

2.06 COPPER WIRE OUTLET CONNECTORS

A. General

1. Connectors shall comply with FCC part 68 Subpart F for gold plating.
2. Connectors shall be UL listed and shall comply with UL94V-0.
3. Provide a removable blank dust cover for each plug-in outlet insert. The dust cover shall protect the insert from contamination until a workstation or patch cord is "plugged" into the outlet.
4. Copper wire outlet connectors shall be color coded to distinguish telephone/voice separately from computer/data. The outlet coverplate shall be engraved to identify telephone/voice, computer/data and other infrastructure outlets separately.
5. Copper wire outlet connectors shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.
6. Copper wire outlet connectors shall be the product of the same manufacturer.

B. Universal Outlet Connector (for twisted pair Copper Wire Premise/Workstation Wiring and copper wire patch panels).

1. General

- a. Connections for twisted pairs copper conductors shall provide a universal outlet connector between the building premise copper wire, and plug-in workstation locations. Patch panel/equipment plug-in connectors. The connector components shall assemble with "snap-in" spring loaded retainers to prevent dislocation during insertion or removal of external plug-in devices.

- b. The contacts shall be gold plated with a 250-insertion/withdrawal cycle rating.
 - c. Unless specifically noted otherwise the universal outlet connector shall comply with ANSI/TIA/EIA-568C; related standards, amendments, and TSB.
 - d. Operational characteristics shall match or exceed and shall be compatible with the respective twisted pairs cable.
 - e. Each universal outlet connector shall consist of three major components.
 - 1) Universal edge connector assembly.
 - 2) Plug-in adapter inserts.
 - 3) Connector housing.
 - f. Provide snap-in blank removable insert covers for connector installed without plug-in adapter inserts.
2. Universal edge connector:
- a. Insulated assembly shall connect to the premise copper wire. The connectors shall be multiple plug type connector contacts, one contact (total of 8 contacts) for each individual premise wire connection interconnected to the individual wire terminations.
 - b. Connector shall provide insertion of individual insulated copper wire, gas tight, 110-style punch down/displacement termination, for 22-26AWG insulated premise wire.
 - c. The edge connector assembly shall provide termination of eight (8) separate wire conductors, twisted or untwisted pairs, solid or stranded, shielded or unshielded, with color codes and numbered identification of each contact. Integral cable/conductor strain relief to prevent pullout of terminated premise wire conductors.
3. Plug-in adapter inserts:
- a. Plug-in adapter inserts shall be internally factory connected to the universal edge connector assembly to adapt the universal connector to the specific outlet type configuration (i.e. "RJ" style computer/data, telephone/voice, (multimedia) modular jacks, etc.)

- b. Inserts shall be certified to match premise wire type connected to the universal edge connector.
 - c. Inserts shall provide correct pin-to-pin connections, electrical and mechanical matching characteristics for the specific equipment connected to the respective outlet.
 - d. Inserts for different infrastructures shall be color coded with different colors from each other, for system identifications.
 - e. Plug-in adapter insert type:
 - 1) Computer/data network systems:
 - a) ANSI/TIA/EIA-568C, female modular jack 8-position/contact "RJ-45" style, keystone, "snap-in" mounting.
 - 2) Telephone/intercom voice systems:
 - a) ANSI/TIA/EIA-568C female modular jack 8-position/contact RJ-45, keystone, "snap-in" mounting.
4. Connector housing:
- a. Connector housing shall contain the universal edge connector assembly and the plug-in adapter inserts in a rigid assembly. Connector housing shall provide integral cable strain relief for the premise wiring connection.
 - b. The connector housing shall mount to a metal panel, metal device cover plate or plastic device cover plate with spring loaded snap-in retainers. Nominal depth of connector housing behind the mounting panel and/or device cover plate shall not exceed 1.625 inches including premise wiring termination depth requirements.

2.07 FIBER OPTIC FIBER DISTRIBUTION ENCLOSURES

A. General

- 1. Fiber optic fiber distribution enclosures shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/ TIA/EIA-568C including related standards, amendments and TSB.
- 2. Fiber optic fiber distribution enclosures shall be the product of the same manufacturer.

- B. Equipment Rack Mount Fiber Optic Termination Distribution Enclosure – RTDE
1. The RTDE enclosure shall mount in an EIA standard 19-inches wide enclosed or open frame equipment rack assembly. The RTDE enclosure shall be metal, painted finish, manufacturers standard color.
 2. The RTDE shall provide the following self-contained functions internal to the RTDE assembly.
 - a. Fiber cable termination.
 - b. Fiber cable "pig-tail" splicing.
 - c. Fiber cable patch panel.
 - d. Fiber cable management, training and strain relief.
 - e. Individual fiber and patching port identification numbers, color-coding of incoming trunk and out-going distribution fiber ports.
 - f. Plug-in fiber optic interconnection couplers for port to port patching with portable fiber optic patch cords.
 3. Fiber splice drawers:
 - a. Horizontal sliding metal drawers adjustable to approximately 30 degree angle when fully open, and removable for easy access. Each drawer shall contain two (2) fiber optic splice trays with tray holders.
 - b. Drawers shall stack vertically one above the other in the RTDE and allow sufficient slack in all fiber cables for removal of the drawer and splice trays.
 - c. Provide one sliding drawer and two (2) splice tray assemblies for each group (twenty-four (24) individual fibers or fewer fibers per group) of fiber optic fibers terminated in the equipment rack, but in no case provide not fewer than two (2) sliding drawers with splice tray assemblies in each RTDE.
 4. Fiber cable patch panel
 - a. Metal panel shall provide a patch port for each fiber consisting of metal panel mounted fiber optic interconnection couplers for each fiber optic fiber indicated to be terminated at the RTDE.

- b. The fiber optic fiber interconnection coupler shall be provided to match and be compatible with the fiber cable connectors. Quantity shall match quantity of terminated fibers, unless indicated otherwise on the equipment rack schedules.
 - c. Nominal panel thickness 0.09 inches.
 - d. Provide a minimum of sixteen (16) unused spaces for additional couplers in the patch panel.
5. Nominal height of the RTDE shall not be exceeded, as follows:

<u>Quantity of Patch Ports</u>	<u>Quantity of Splice Drawers</u>	<u>Nominal Height</u>
24	2	11 inches
48	2	11 inches
72	3	14 inches
144	6	28 inches

- C. Equipment rack mount fiber optic, splice only (for use only where fiber patch panel is not required) enclosure - RMSE
- 1. The RMSE enclosure shall mount in an EIA standard 19-inches wide enclosed or open frame rack assembly. The enclosure shall be metal, painted finish, manufacturer's standard color.
 - 2. The RMSE shall provide the following self contained functions internal to the RMSE assembly:
 - a. Fiber cable splicing for "thru splicing" of fiber optic cables where the cables do not terminate in the equipment rack.
 - b. Fiber cable management, training and strain relief.
 - 3. Fiber splice drawers
 - a. Horizontal sliding metal drawers adjustable to approximately 30 degree angle when fully open and removable for easy access. Each drawer shall contain two (2) fiber optic splice trays with splice tray holders.
 - b. Drawers shall stack vertically one above the other in the RMSE and allow sufficient slack in all fiber cables for removal of the drawers and splice trays.
 - c. Provide one sliding drawer and two fiber optic splice tray assemblies for each group (24 individual fibers or fewer fibers per group) for fibers optic fiber routed through but not terminated

in the equipment rack, but in any condition provide not fewer than two (2) sliding drawers with splice tray assemblies in each RMSE.

4. Nominal height of the RMSE shall not be exceeds, as follows:

<u>Quantity of Thru Splices</u>	<u>Quantity of Splice Drawers</u>	<u>Nominal Height</u>
24	2	4 inches
48	2	4 inches
72	4	8 inches
96	4	8 inches

2.08 COPPER WIRE PATCH PANELS

A. General

1. Copper wire patch panels shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.
2. Copper wire patch panels shall be the product of the same manufacturer.

B. Equipment Rack Mounted Patch Panel

1. Standard EIA 19-inches wide metal panel, manufacturers standard color. Prepunched for copper wire outlet connectors. Panel shall mount on an EIA standard 19-inches wide enclosed or open frame equipment rack assembly. Nominal twenty-four (24)-copper wire outlet connectors in a horizontal row, quantity of rows as required for total quantity of connectors. Provide not less than two (2) spare empty rows for future copper wire outlet connectors.
2. The patch panel shall provide the following self contained functions.
 - a. Copper wire cable termination including conductor/shield termination and strain relief.
 - b. Plug-in copper wire outlet connectors for port to port patching with copper wire portable patch cords.
3. Patch panel height shall be based on the quantity of copper wire outlet connectors described plus the specified space for future outlets and shall not exceed the following dimension height:

<u>Outlet Quantity</u>	<u>Nominal Patch Panel Height</u>
48-patch ports in each patch panel	shall not exceed 3.5-inches for each 48 port panel

4. Horizontally mounted, cable support metal bracket shall be provided for 48-outlet/connector groupings between fiber and copper wire. The brackets shall be bolted to the equipment rack located at the backside of the patch panel; the brackets shall support and provide strain relief for each incoming copper wire cable connecting to the patch panel left-right cable entrance pathway.
5. The copper wire connector installed in the patch panel shall be the same configuration, manufacturer and type as the corresponding copper wire connector provided in the remote workstation outlet locations connecting to the respective patch panel outlet, unless indicated otherwise.

2.09 EQUIPMENT RACK

A. General

1. An equipment grounding bus, nominal 19-inches long, UL labeled as a ground terminal bus, shall be provided on each equipment rack. The ground bus shall be bolted to the rack main metal frame member with 1-inch standoff non-insulating bolts. Provide a minimum of ten (10) drilled and tapped bolt holes in the ground bus with ground lug bolts, for connection of equipment grounding conductors to the ground bus, size to accept ground conductors #14-#4AWG.
2. Vertically mounted, cable management metal rings (aluminum or stainless steel) shall be provided full height, continuously along the front and rear of each vertical rail of the equipment rack. The rings shall be bolted to the equipment rack. The rings shall train and dress portable patch cords connecting between outlet connectors located in the equipment rack or in adjacent equipment racks.
3. Provide horizontal cable management panels with multiple cable training rings on each panel (not less than five (5) rings for each panel). Management panels (for up to twenty-four (24) outlet grouping) nominal 19-inches wide by 1.75-inch high by 3-inches deep and/or (for up to 48 outlet groupings) 3.5-inches high by 3-inches deep, for EIA rack installation. Rings shall provide horizontal routing and support by grouping portable patch cords connecting between patch ports in the same equipment rack or adjacent racks. Patch cords shall be grouped and bundled with “Velcro” tie wraps and shall not overlap patch fields or rack mounted equipment.

The panels shall be installed on both the front and rear of the equipment racks, mounted both above and below horizontally between groups of patch ports as follows:

- a. One cable management panel (front and rear of rack) for each group of 48-fiber optic outlet patch ports adjacent to copper wire patch panel.

4. The entire rack assembly including any support arms shall comply with seismic earthquake structural standards at the install location.
 - a. The assembly shall provide support for the weight of the equipment installed on the rack, but in no case less than 500 pounds of equipment, plus the weight of the rack and connecting cables. A 2.0 times safety factor shall be included in the equipment rack assembly structural design.
 - b. Mini-equipment racks shall be rated for not less than 200 pounds of equipment, plus a 2.0 times safety factor shall be included in the mini-equipment rack.
5. Provide Transient Voltage Surge Suppressor with RF Suppressor (TVSS) and Power Distribution Unit (PDU). 120-volt 1-phase, 20-ampere 60Hz AC plug horizontal strip, mounted in each equipment rack. Each unit shall contain not less than eight (8) "plug-in" on the rear of the TVSS and not less than two (2) plug-in on the front of the TVSS protected outlet plugs.
 - a. Provide two (2) TVSS/PDU units in each equipment rack, to supply "dual-corded" equipment.
6. Provide pre-drilled mounting holes the entire length of equipment vertical mounting frames, EIA-310D 19-inches (nominal) wide standard spacing for indicated equipment. Racks shall provide 17.75-inches (nominal) equipment horizontal mounting space between vertical rails.
7. Provide all floor standing equipment racks with wall bracket support arms extending from the stationary portion of the rack to adjacent wall. Provide "dual-rail arm" cable "runway tray", horizontally from each equipment rack, to the wall directly behind the equipment rack
 - a. The tray shall extend from and bolt to the top of the equipment rack "fixed" top rail.
 - b. The tray side rail arms shall be a minimum of 6-inches deep, with "ladder" type rungs spanning horizontally between the side rail arms. The rail arms shall be parallel with each other. The rail-to-rail arm spacing shall be the same as the equipment rack width.
 - c. The rungs shall be spaced not more than 6-inches on center between the side rails, along the length of the side rail arms. The rungs shall have a minimum cable bearing surface of not less than 0.75 inches, lengthwise along the tray.

- d. The runway tray shall support a minimum of 200 pounds per linear foot live conductor/cable loading, with not more than 0.25-inch deflection at mid-span.
 - e. Provide a continuous horizontal support “C” channel along the wall behind the equipment racks and bolt the dual-rail arm cable runway tray to the channel at the wall. The channel elevation on the wall above the finish floor shall support the runway tray horizontally (± 0.2 inch), from the equipment rack to the wall.
 - f. Equipment racks shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568B including related standards, amendments and TSB.
 - g. The wall mounted horizontal support channel shall be securely through bolt to wall structural member, a minimum of 16-inches on center. The horizontal support channel shall extend a minimum of 6-inches past each side of the runway tray. Support channels as manufactured by Unistrut-P1001C series; or B-Line; or Kindorf.
- 8. Provide a copper ground – bus for equipment bonding, in each equipment pack.
 - 9. Equipment racks shall be manufacturer’s standard rust inhibitor primer. Manufacturer’s standard color-finish paint over primer, unless noted otherwise.
- B. Fixed Position Floor Standing Open Frame Equipment Racks (indoor locations only):
- 1. Floor mounted self-supporting rack, nominal 78-inches of usable mounting frame height for equipment.
 - 2. Bolted or welded hot dip galvanized steel or gold irradiate finish aluminum support frame. Hardware shall be stainless steel.
 - 3. Open frame rack construction, fixed, non-swing gate.
 - a. “Two-post” style for equipment racks not designated as containing UPS equipment nor server equipment.
 - b. “Four-post” style for equipment racks designated as containing UPS equipment and/or server equipment.
 - 4. Open frame equipment racks as manufactured by APC/Schneider; or B-Line; or Saunders; or Hendry.

C. Mini-Equipment Racks Sectional – Surface Wall Mount (Indoor Locations Only)

1. The mini-equipment rack shall be fully metal enclosed, tamper resistant, wall surface mounted, multiple section construction. The rack shall consist of three (3) sections; a fixed wall mounting pan; a hinged center section and a hinged door. The rack shall provide a minimum of 30-inches clear internal depth for mounting of equipment inside the rack. Provide brackets inside the pan for stress relief, training/lacing, support of cables.
2. The mini-equipment racks nominal dimensions shall be as follows:
 - a. Overall depth 33-inches.
 - b. Overall width 22-inches.
 - c. 24-inches minimum over all height, for termination of up to a quantity of 144-copper wire workstation patch panel outlets and up to a quantity of eighteen (18) individual fiber strands, combined into a mini-equipment rack.
 - d. 30-inches minimum overall height, for termination of up to a quantity of 192-copper wire workstation patch panel outlets and up to a quantity of eighteen (18) individual fiber strands combined, into the mini-equipment rack.
 - e. 48-inches minimum overall height, for termination of up to quantity of 288-copper wire workstation patch panel outlets and up to a quantity of eighteen (18) individual fiber strands combined, into the mini-equipment rack.
3. Fixed wall, surface mounted pan section, nominal 3-inches pan depth, metal enclosed on all sides and back, open front; shall anchor the rack to the wall; provide support for the hinged center rack section and provide knock-outs for side/top/bottom and rear conduit/raceway entrances.
4. Center section, metal enclosed on all sides, open front and rear, nominal 18-inches depth, full height and width hinged attachments to the pan-section, to provide hinged 90 degrees open- close operation of the center section on the pan and allow access to the front and rear of equipment and terminations mounted inside the center section. Two (2) internal vertical, front mounted, pre-drilled equipment mounting frame rails. Self-locking with release latch accessible from inside cabinet.
5. Front access door section, metal, full height and width hinged 90 degree open-close operation attached to the center section. The door shall allow for nominal 3-inches minimum of interior projections extending from the front face of the internally mounted equipment located behind the front

access door when the access door is in the closed position. Smoke/ gray impact resistant, tamper resistant see-through windows in the door front. Key-locking front of door exterior access.

6. Minimum sixteen (16) gauge metal, fully welded construction; Manufacturer's standard rust inhibitor "prime" base coating, with "finish" color black or as selected by Architect. The equipment racks shall provide support for the weight of the equipment installed in the rack, but in no case less than 200 pounds of equipment plus the weight of the rack and connecting cables.
7. Provide two (2), 120 volt 60Hz AC motor direct driven air ventilation, "muffin" style, nominal 4 inches square, exhaust air fans. Flush mount fans in the top of each equipment rack. The fans shall be low speed, low noise type with wire guards to prevent accident contact with the fan blades. The fan motor shall be high impedance, self protecting type motors. Provide "SO" cord with plug caps to connect from the fans to the 120-volt plug-strip inside the equipment rack.
8. Provide cooling air intake louvers with removable air filters and air filter holder, mounted in the bottom of the rack. The louver shall be protected with internal screening to prevent the intentional insertion of foreign objects into the housing.
9. The mini-equipment rack shall be easily convertible in the field, to allow for "left" or "right" center section and/or door section hinge operation. Provide a minimum of two (2) key-locks on each hinged section to prevent unauthorized access into the unit. Provide gasketing on all "mating" cabinet interfaces to insure proper cooling airflow through the air filters.
10. Mini-equipment racks as manufactured by Hoffman/Pentair; or Middle Atlantic Products Inc.; or B-Line.

D. Plug Strip Transient Voltage Surge Suppressor (TVSS)

1. General

- a. Self contained unit combining plug-in TVSS strip and power distribution unit PDU. Rated 20 ampere, nominal 120 volt +10%, 60Hz, AC, 2400 watts full continuous load or 20 ampere, nominal 208-volt $\pm 10\%$, 60Hz, AC, 4800-watts full continuous load. Note: 120- volt or 208-volt ratings as indicated on the Drawings.
- b. Internal 20 ampere resettable overload protection circuit breaker. Red illuminated on-off switch. Nine foot, 12AWG three (3) conductor grounded, high abuse heavy duty jacketed AC, line cord with cap. Multi-outlet receptacles, suitable for use with the following types of plug in loads; data processing equipment, audio/video

equipment, test instruments, medical equipment, photo graphic equipment and “switching type” power supplies.

- c. Protected outlet shall be 120-volt NEMA 5-15R 15 ampere, or 20 ampere 120-volt NEMA 5-20R AC 60Hz receptacles; or for 208-volt, NEMA 6-15R 15 ampere or 208-volt NEMA 6-20R 20 ampere receptacles as applicable for connected equipment loads. Provide not less than eight (8) protected outlet plugs on each unit. Each individual or group of two (2) receptacles (duplex) shall be connected to separate protected load isolated filter banks.
- d. Each duplex shall be isolated from the other output receptacles, minimum isolation of 25dB at 1MHz line to line, line to neutral, line to ground and neutral to ground.
- e. Non-blocking plug-in locations/orientation, for plug-in self-contained “power-brick”, equipment power supplies.
- f. As manufactured by Libert; or TRIPP LITE.

2. Operation

Self-contained RFI and EMF shielded housing with mounting slots for temporary mounting of the unit. Protected outlet receptacles shall supply over current protected and filtered, electrical line voltage power to the connected equipment. Line noise RFI and EMI interference filtering suppression, transient voltage surge and spike protection shall occur in all three (3) modes of operation line to ground, line to neutral and neutral to ground rated as follows:

- a. 13,000 ampere, 210 joules (watt-seconds) peak withstands capacity.
- b. Transient response time less than five (5) nano seconds.
- c. 140-volt AC RMS initiate spikes suppression 330 volt maximum let through.
- d. RFI and EMI Suppression-Provide spectrum analysis test dB attenuation reports showing RFI filtering over specified frequencies.
- e. Diagnostic indicator lights located on the TVSS housing shall provide alarm alert for each of the following conditions:
 - 1) Loss of AC power.
 - 2) Damage, malfunction in the TVSS suppression circuits.
 - 3) Improper AC electrical outlet wiring.
- f. Self contained metering and communications

- 1) Ampere-meter demand load meter to monitor plug-in demand load.
 - 2) Digital Fast Ethernet LAN RJ-45 communications port for Ethernet SNMP network monitoring of electrical status. Multi-user site wide software license, compatible with PC-computer and IP-WEB HTTP protocols.
- g. Standards Testing, Listing and Certification Compliance:
- 1) IEEE 587A and B compliance.
 - 2) UL 1449 transient voltage surge suppressers.
 - 3) UL 1363 temporary power taps.
 - 4) UL 1283 electromagnetic interference filters.
3. Rack Mounted TVSS/PDU
- a. TVSS/PDU units installed in equipment racks shall comply with all of the same performance requirements including as follows.
- 1) EIA/TIA – Equipment rack mount style (19-inches or 24-inches as applicable).
 - 2) Minimum of two (2) front mounted outlets and not less than six (6) rear mounted outlets.
 - 3) Position in each equipment rack as directed by Owner’s Representative.
- E. Power Distribution Unit (PDU)
1. General
- a. Self contained unit combining main circuit breaker, multiple plug-in individual circuit breaker branch protection load receptacles, PDU metering status monitoring and network communication. All PDU components self-contained in a NEMA-1 metal enclosure.
- b. Non-blocking plug-in locations oriented for plug-in self contained “power-brick” equipment supplies.
- c. Standards Testing
- 1) UL 60950-1 Information Technology Equipment.
 - 2) CAN/CSA-C22.2 No.60950-1-03 Information Technology Equipment.
 - 3) FCC, Title 47, Part 15 Subpart B for Class B operation as defined by ANSI Standard C63.4
 - 4) ROHS Complaint
 - 5) ISTA Procedure 1A and 2A

- d. Provide two (2) PDU units in each equipment rack, to supply two (2) TVSS units in each equipment rack.
- e. Shall be a product of the same manufacturer as the TVSS unit. As manufactured by Liebert; or TRIPP LITE.

2. System Description

- a. Remote monitoring and/or control capabilities for power distribution at each load/ equipment rack level. For data/network equipment line voltage plug-in and TVSS line voltage plug-in electrical distribution.
- b. PDU shall meter and monitor electrical attributes of an individual Rack PDU, including real-time remote and local display of monitoring of aggregate and branch electrical parameters (status, thresholds, alarms) including voltage, ampere, and kW. Rack equipment PDU and Branch load monitoring and control.
- c. Self contained metering and communications
 - 1) Local display ampere-meter demand load meter to monitor plug-in demand load and total PDU load.
 - 2) Digital Fast Ethernet LAN RJ-45 communications port for Ethernet SNMP and IP network monitoring of electrical status. Multi-user site-wide software license, compatible with PC-computer and IP-WEB HTTP protocols.
 - 3) Provide network array-interface for connection of multiple PDU units positioned in the same location.
- d. Nine foot input power (heavy duty high abuse) cord with appropriate conductors and input NEMA plug-in connection. Provide input overload protection with Hydraulic-Magnetic main input circuit breaker. Provide load output NEMA plug-in branch connection with overload circuit breaker protection for each load receptacle.
- e. Equipment rack mounting horizontal position form factor.

3. Electrical Power ratings shall be as follows and as additionally indicated on drawings. Refer to drawings for twist-lock verses straight-blade configurations.

- a. Single main input circuit breaker 30 ampere 208/120 volt 1-phase 4-wire grounded 60Hz AC.
- b. Branch load circuit breakers with a single plug-in receptacles for each load circuit breaker. Balance loads on each circuit phase.

- 1) Three (3), 20 ampere 1-pole circuit breaker and three (3) 120-volt NEMA 5-20R receptacles. Also provide matching cap.
 - 2) Two (2), 20 ampere 2-pole circuit breaker and two (2) 208-volt NEMA 14-20R receptacle. Also provide matching cap.
 - 3) One (1), 30 ampere 2-pole circuit breaker and one (1) 208-volt NEMA 14-30R receptacle. Also provide matching cap.
 - 4) Additional circuits and receptacles as indicated on drawings.
4. PDU units installed in equipment racks shall comply with all of the same performance requirements including:
 - a. EIA/TIA – equipment rack horizontal mount style (19-inch or 24-inch) as applicable. b. Position in each equipment rack as directed by OWNER’s Representative.
 5. Provide two (2) Category-6 4-pair UTP 15-foot long portable patch cable connects, PDU to respective network patch panel port.

2.10 WALL MOUNT FIBER OPTIC CABLE INTERFACE CABINET (WMIC)

A. General

1. Metal (14 gauge) enclosure, with full height hinged metal door. Door shall be pad-lockable.
Nominal size 12-inches deep by 18-inches wide by 36-inches high. Enclosure shall mount directly on the wall.
2. WMIC shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.
3. Interface cabinets shall be the product of the same manufacturer.

B. The WMIC shall provide the following self contained functions internal to the WMIC enclosure.

1. Fiber cable splicing for "through splicing" of non-UL listed fiber optic cables, where the cables do not terminate in the building.
2. Fiber cable management, training and strain relief.
3. Transition from non-UL flame spread listed fiber optic cable, to UL flame spread listed fiber optic cables where the cables terminate in the building.

C. Cable routing rings shall organize optic fibers in a 360-degree loop inside the WMIC housing and provide cable strain relief.

D. Fiber Optic Splice Trays

1. Provide fiber optic cable splice trays.
2. Tray holders shall provide mounting and support for each splice tray.
3. Provide two (2) splice tray for each group (twenty-four (24) or less fibers per group) fiber optic fibers routed through the WMIC, but in no case provide not less than four splice trays in the WMIC.

2.11 SPLICE TRAY FIBER OPTIC FIBERS

A. General

1. Trays shall be suitable for installation in USE, WMIC, RMSE and RTDE enclosures.
2. The trays shall be the product of the same manufacturer as the respective enclosures.
3. Splice trays shall be UL listed, complying with national Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.

B. Splice Trays

1. A metal or non metal splice tray shall provide space for up to twenty-four (24)-splices of individual fiber cable single mode and multimode optical fibers. The trays shall provide individual splice holder inserts for each splice to adapt the tray for mechanical or fusion splices, with or without splice sleeves.
2. The tray shall incorporate integral fiber tie down clamps, fiber routing rings, provide strain relief and two full 360 degree fiber loops around the tray perimeter with sufficient slack fiber for removal of the tray for access and splicing of the fiber cable. The tray shall insure the minimum bending radius of the optical fibers is not violated.
3. Provide a removable clear plastic tray top cover for each tray, to protect and isolate the fibers.

2.12 WORK STATION OUTLETS

A. General

1. Engrave outlet cover plates with the port number corresponding to the port number at the respective terminal block, patch panel, or head-end equipment.

2. The outlet cover plates shall be factory prepunched and formed to accommodate the installed outlet connector with attachment screws.
 3. Workstation outlets shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.
 4. Work station outlets shall be the product of the same manufacturer.
- B. Computer/Data Workstation Copper wire Outlets
1. The outlets shall be the same configuration and type as the corresponding connector provided in the copper wire patch panel outlet, unless noted otherwise.
 2. ANSI/TIA/EIA-568C, and related standards, addendums and TSB.
 3. The copper wire outlet connectors for twisted pair wire connections in computer workstation outlets shall be universal outlet connector RJ-45 type.
 - a. RJ-45 type
- C. Telephone/Voice Handset Twisted Pair Wire Connection Work Station Outlets
1. The copper wire outlet connectors provided in telephone/voice handset outlets, shall be universal outlet connector type, unless noted otherwise, ANSI/TIA/EIA-568C and related standards, addendums and TSB.
 - a. RJ-45 type
- D. Fiber Optic Workstation Outlets
1. The fiber optic outlet connectors workstation outlets shall be fiber optic fiber interconnection couplers, installed in universal outlet connectors. Provide one (1) coupler for each fiber connecting to the outlet, but in no case less than the following for each outlet and as shown on the Drawing:
 - a. Computer workstation data network- two (2) couplers and fiber connectors.
 - b. Data network server - four (4) couplers and fiber connectors.
 2. The universal outlet connector housing and cover plates shall be the same as copper wire outlet connectors, except with adapters for fiber optic interconnection couplers, for the fiber optic fibers plug-in connectors.
 3. The centerline-to-centerline spacing of the interconnection couplers shall provide for "plug-in" insertion of "single or duplex" fiber connectors.

4. Color-code and identify the "in"-receiving and "out"-transmitting position for each interconnection coupler.

E. Outlet Boxes

1. Wall mounted
 - a. Flush or surface wall mounted outlet box as indicated on the drawings, but in no case less than 4.69 inches by 4.69-inches by 2.125-inches deep.
 - b. 2-gang wide extension ring for outlet box to extend outlet flush with finish surface, or as noted on the drawings.
 - c. 2-gang wide cover plate or as noted on the drawings.
2. Pedestal Mounted "Poke-Thru".
 - a. Shall combine a computer/data and a telephone/voice copper wire universal outlet connector in a duplex outlet in the pedestal/poke-thru outlet.
3. Inside flush floor boxes and other locations where indicated in the contract documents.

F. Multioutlet Raceway Work Station Outlets

1. Copper wire outlet:
 - a. Where copper wire connection is indicated for the workstation outlet, provide one universal outlet connector for each outlet.
 - b. Each universal outlet connector shall be single connector housing type.
 - c. Provide a rectangular cutout and metal device plate in the raceway sized to outlet manufacturer's recommendations. The workstation copper wire outlet shall mount a modular faceplate kit with outlet bezel and faceplate sized to match the workstation outlet.
 - d. Offset the location of outlets for electronic network systems 6 inches in the raceway from other outlets, do not "stack" outlets one above the other in the raceway.
2. Fiber optic outlet:

2.12 PORTABLE PATCH CORDS

A. General

1. Provide portable patch cords for all copper wire and fiber optic cable infrastructure outlets:
 - a. For interconnecting electronic network equipment to electronic network workstation outlets.
 - b. For interconnecting equipment rack patch panel outlet patch locations with each other.
 - c. For interconnecting patch panel outlets equipment rack mounted hubs, switches, routers etc.
2. Patch cords shall be factory assembled tested and certified with factory terminated plugs at each end. Field terminated portable patch cords shall not be permitted. Terminated plugs shall incorporate integral bending radius limiting molded “boots” and strain relief. Patch cord assemblies shall be rated for "heavy duty", “high-abuse” service.
3. Patch cords shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements. ANSI/EIA/T1A-568C, related standards, addendums and TSB.
 - a. NEC and CEC - OFNG/OFN for fiber optic portable patch cords.
 - b. NEC and CEC - MPP/CMP/CMR/CMG/MPG for copper wire twisted pair portable patch cords.
4. Patch cords which are not installed shall be delivered to the OWNER in cardboard boxes.

The patch cords shall be neatly bundled and tied together. Mark each box with quantity and type of cords contained in the box.
5. Patch cords shall comply with the same cable communication Category-6 performance requirements, protocol requirements and testing requirements as the respective infrastructure cables and outlets to which the patch cords are intended to be connected (plug-in).
6. The outer jacket of each portable patch cord shall be imprinted with date, manufacturer’s model and catalog number, and AHJ listing identification.
7. Provide a permanent, visible, factory applied identification number on each end of each patch cord. The identification number shall be the same on each end. However, the numbers shall sequentially on each patch cord and shall be unique and not duplicated on other patch cords. Permanently apply the identification numbers on jacket or connector.

8. Portable patch cord shall be manufactured by Gruber Communications Products; no other portable patch cable manufacturer is acceptable to the OWNER.

B. Copper Wire Portable Patch Cords

1. Computer/data and telephone/voice patch cords, general:
 - a. "Male" eight (8) positions modular "RJ" male style jacks install on each end of the patch cord cable. The jack shall be provided with a rear "bubble boot" to prevent the plug tab from snagging when pulled backwards through adjacent wiring.
 - b. Patch cord cable shall be UTP to match premise wiring, 4-pair twisted, stranded copper individually insulated wires, thermoplastic jacket over all the wires and shield.
 - c. Connectors shall comply with FCC 68.5 and Part 68 Subpart F.
 - d. Connectors UL listed and shall comply with UL-94V-O.
 - e. Contacts gold plated with not less than a 750 insertion/withdraw cycle rating.
 - f. Provide RJ-45 connector feed patch cord cables for both computer/data and telephone/voice copper wire patch cords.
2. Portable patch cord quantities and lengths for connecting port-to-port equipment rack patch panels. Typical for computer/data and telephone/voice.
 - a. Patch cord quantity: Provide one (1) complete patch cord assembly for each copper wire workstation outlet port in the equipment rack patch panels. One-to-one straight through pin-to-pin wiring. Additional spare not required by OWNER. Cable jacket color shall be blue:
 - b. Provide the following lengths of copper wire patch cables for copper wire equipment rack patch panel outlets.
 - 1) 1 foot long - 95% of total quantity
 - 2) 4 feet long - 5% of total quantity
3. Portable patch cord quantities and lengths for connection from workstations equipment to equipment workstation outlets. Typical for computer/data and telephone/voice.

- a. Patch cord quantity: Provide one complete patch cord assembly for each copper wire workstation outlet located remote from the equipment rack patch panels. Provide additional spare patch cords, quantity equal to 15% of the total quantity of patch cords provided for each copper wire workstation outlets. Cable jacket color shall be blue.
 - 1) Network outlet segments the pin-to-pin patch cord wiring configuration and jacks shall be compatible with the network interface card, and workstation outlet.
 - 2) Telephone outlet segments the pin-to-pin patch cord wiring configuration and jacks shall be compatible with the telephone interface protocol and workstation outlet.
- b. Provide the following lengths of copper wire patch cables for copper wire workstation outlets. The patch cords shall provide internal cross-over wiring to conform the pin-to-pin connections required between the workstation outlet and the communications protocol interface card installed in the respective workstation equipment:
 - 1) 8 feet long - 30% of total quantity
 - 2) 15 feet long - 70% of total quantity

4. The OWNER will furnish additional portable patch cords for modification, installation, and connection of patch panels to trunking cables by the CONTRACTOR.

C. Fiber Optic Portable Patch Cords

1. General

- a. Provide fiber optic fiber connectors installed on each fiber end of the patch cord cable.

The fiber optic portable patch cord shall be “duplex” with two fiber strands type, for each patch cable. The “LC” connector shall be mechanically and optical compatible with the respective connecting patch panel couplers and network work equipment couplers.

- b. The entire patch cord assembly total insertion loss shall be less than 1.0dB at the specified operating wavelengths.
- c. Operating temperature range 30 degrees centigrade through +60 degrees centigrade. Cables shall be flame retarding.
- d. Each fiber shall be individually identified with factory color coding and factory imprinted label. The outer cable jacket shall be imprinted with date, manufacturer's model and catalog number,

along with agency listing identification. The cable jacket color shall be yellow standard color.

- e. All fiber optic patch cord cable shall be a product of the same manufacturer.
 - f. Optical fiber shall be coated, 900 micron diameter uniform coating, with uniform tight buffering over the coating, uniform dielectric strength member surrounding the buffering coating and an overall jacket around each optical fiber assembly.
 - g. A dielectric strength member shall surround the fiber assemblies.
 - h. An outer dielectric jacket shall envelope the entire cable.
 - i. The cable shall be UL listed and comply with NEC and NFPA requirements for each installation location shown in the Contract Documents.
 - j. Patch cord quantity and length
 - 1) Patch cord quantity: Provide one complete patch cord assembly for each fiber optic patch panel outlet in the equipment rack.
 - 2) Provide one complete patch cord assembly for each computer workstation fiber optic outlet remote from the patch panel.
 - 3) Provide additional spare patch cords, quantity equal to 25% of the total quantity of patch cords provided.
 - k. Provide the following quantities and lengths of fiber optic patch cords.
 - 1) 3 feet long - 40% of total
 - 2) 6 feet long - 30% of total
 - 3) 10 feet long - 30% of total
2. Multimode patch cords
- a. Patch cord cable shall be fiber optic cable with equal or better characteristics as the premise fiber optic cables.
3. Single mode patch cords:
- a. Patch cord cable shall be fiber optic cables with single mode optical glass fibers, and with equal or better characteristics as the premise fiber optic cables.

2.13 CIRCUIT PROTECTORS

A. General

1. The circuit protectors shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements, ANSI/TIA/EIA-568C including related standards, amendments and TSB.

B. Circuit Protectors

1. Cables containing non-dielectric electrical conducting components entering from the exterior of the building shall be provided with individual circuit protectors combining both lightning circuit protection and TVSS circuit protection on each circuit conducting component, as required in NEC and CEC Articles 770 and 800.
2. Install circuit protectors in the respective backboard/equipment rack where copper wire conductors terminate, connect each protector to room/closet ground bus equipment with #10AWG green insulated bond/ground copper conductors.

2.14 TRUNKING CABLE TERMINAL BLOCKS

A. General

1. Terminal blocks Type 110, shall consist of wiring blocks, connecting blocks, direct wire/patch cord cross connection and designation strips. Arrange in unitized, modular, vertical mounting sections, for trunking cable Category – 5E.
2. Completely 100% front accessible for cross connections, terminating conductors, training, and fanning of cables. Rear access for any reason shall not be permitted.
3. Terminal blocks shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified requirements. Terminal blocks and connections performance shall comply with ANSI/TIA/EIA-568C and related standards, addendums and TSB and shall comply with and be listed under UL 1863. Category rating shall match the cables connecting to the patch panel.
4. The trunking cable terminal blocks shall provide cross connection of four (4) pair premise copper wiring outlets to multiple copper wire trunking cable feeder cables and external free standing equipment.
5. Each full height vertical section terminal block assembly shall terminate a minimum of 300 pairs (including specified spares for future construction phases) of trunking cable conductors, plus associated cross connection wiring and patch cords in a nominal 20-inches wide space. Provide multiple vertical sections of terminal block assemblies adjacent to each other, total

- quantity as required for quantity of conductor pairs and feeder cable pairs shown on the drawings and requirements, plus specified spares.
6. Each terminal block vertical section assembly shall provide not less than 15% of spare unused conductor pair terminals for future connections.
 7. Provide a common ground bus in each terminal block section with a minimum of six (6) ground conductor termination positions, #10AWG through #6AWG.
 8. Terminal blocks shall be the product of the same manufacturer.

B. Wiring Blocks

1. One piece molded, die-electric thermoplastic blocks. The wiring block shall support and secure all the components of the terminal block assembly, and provide cable/conductor training and organization.
2. Fire retardant complying with UL 94V-0.
3. Standoff type support legs for mounting to backboard with pre-drilled anchor holes.
4. Non-conductive electrically quiet front assembly.
5. Horizontal index strip rows, for termination of not less than 25-conductor pairs on each row.

Color-coded and marked in groups of four pairs or five pairs to match connecting cables.
6. Removable retainers at the ends of each horizontal connecting block index strip row, shall support cross connect wires at corner turns.
7. Distribution rings shall retain cross connect wire horizontal routing between terminations.
8. A full width, horizontal trough between each 100-pair wiring block shall provide a path for patch cord training and retention.

C. Connecting Blocks

1. Connecting blocks shall provide gas tight conductor electrical connections with conductor insulation displacement punch down slots, for insertion onto the telephone/voice wiring block index strips.

2. Connecting blocks shall electrically connect one-to-one between each conductor terminated at the wiring block index strips, and each cross connect/patch cord conductor terminated/ connected to the opposite front side of the connecting block.
3. Both sides of the connecting blocks shall terminate pairs of UTP 22-26AWG stranded or solid copper wire individually insulated conductors. The front side of the connecting blocks shall also provide "plug-in" connections for portable patch cords, 110-style "plug-in" connectors.
4. Connection blocks shall be 4-pair insulated copper conductor type.
5. Provide insulated, removable termination caps for each connector block.
6. Connector blocks shall be marked to indicate tip and ring conductors and to indicate polarization.

D. Designation Strips

1. Designation strips shall provide retention of interchangeable labels. The labels shall show circuit identification of each terminated conductor pair.
2. The designation strips shall mount on the center and outside positions of the wiring block.

E. Trunking Cable Cross Connection

1. The cross circuit connection between incoming and outgoing feeder cables and outlet wiring shall be provided in the terminal block assembly.
2. The cross connection wiring shall terminate incoming and outgoing circuit conductors between respective connecting blocks.
 - a. Direct connect cross connection shall provide internally wired one-to-one conductor twisted pair cross connection. Cross connection of each 4-pair outlet cable to corresponding 4-pairs of the device feeder cable and cross connection of feeder to feeder trunking cables, as applicable.
 - b. Patch panel cross connect, 110-terminal connector style, plug-in. One, two, three or four twisted pair, 110-connector type portable patch cords will be furnished by the OWNER for CONTRACTOR modification, install and connect.

PART 3 - EXECUTION

3.01 NETWORK CABLE TESTING AND COMMISSIONING (ADDITIONAL REQUIREMENTS)

A. General

1. In addition to the testing recommended in ANSI/TIA/EIA-568C and related standards, amendments and TSB. End-to-End test 100% of all individual optical fiber, individual copper wire conductors, each outlet and each connector in all terminated and un-terminated cables, portable patch cord, outlets and patch panels provided in the contract, shall be tested after installation as a complete channel pathway installation, splicing outlets and termination is completed, including the following tests;
 - a. Each circuit insertion loss.
 - b. Each circuit NEXT (Pair-to-Pair) loss.
 - c. Each circuit NEXT loss (Power Sum) PS.
 - d. Each circuit ELFEXT loss (Pair-to-Pair).
 - e. Each circuit ELFEXT loss ((Pair-to-Pair).
 - f. Each circuit ELFEXT loss (Power Sum) PS.
 - g. Each circuit return loss (RL).
 - h. Each circuit propagation delay.
 - i. Each circuit propagation delay-skew.
2. The test equipment and (tester) shall comply with the accuracy requirements for field testers as defined in the ANSI/EIA/TIA standards for the specific cable type. The tester including the appropriate interface adapter shall meet the specified accuracy requirements. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The tester shall be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.
3. The Pass or Fail condition for the channel pathway link-under-test is determined by the results of the required individual tests (ANSI/EIA/TIA) any Fail result yields a Fail for the link- under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass. A Pass or Fail result for each parameter is determined by comparing the measured values with the ANSI/EIA/TIA test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field test. The field

test manufacturer shall provide documentation as an aid to interpret results marked with asterisks.

4. Provide all test equipment, certified testing personnel, and setups. Shall comply with ANSI/EIA/TIA and equipment manufacturer's recommendations and standards of practice.
5. Provide six (6) copies of all test reports, bound in three (3) ring binders and three (3) copies digital CD/DVD format using Adobe Portable format software, to Owner's Representative.
6. The CONTRACTOR shall repair or replace equipment, cables, outlets, connectors, splices, terminations, etc. identified during testing as not complying with the contract documents, without additional cost to the contract. Retest all replaced or repaired components at CONTRACTOR'S expense.

B. Twisted Pair Copper Wire Testing

1. Channel insertion loss (dB).
2. Channel near-end cross-talk NEXT loss (dB).
3. Channel equal-level far-end cross-talk ELFEXT (dB).
4. Channel return loss (dB).
5. Channel power sum PSACR (dB).
6. Channel propagation delay, propagation speed, and delay skew.
7. Channel wire map and circuit length.
8. Channel ring-out test for continuity and correct point-to-point matching terminals.
9. Channel DC resistance and capacitance.
10. Channel attenuation-to-cross-talk ratio ACR.

C. Coaxial Cable Testing

1. Channel full specified frequency spectrum attenuation insertion loss (dB).
2. Channel wire mapping, ring-out and circuit length.
3. Channel propagation delay and propagation speed.
4. Channel impedance and continuity for center conductor and shields.

- D. Fiber Optic Cable Testing, Optical Testing for Each Specified Wave-Lengths for Both laser and LED sources.
1. Channel link insertion losses (dB).
 2. Channel loop-back attenuation (dB).
 3. Channel signature optical time domain reflectometer OTDR, for installation characterization testing (event and attenuation resolution dead zone at specified wavelengths, shall be less than 10-feet).
 4. Channel continuity and correct point-to-point matching terminals.
 5. Channel propagation delay and propagation speed.
 6. Channel fiber optic mapping, circuit length, and tracing.

3.02 FIBER OPTIC CABLE TYPE

A. General

1. Cables shown as fiber optic type shall comply with the following installation locations.
2. Provide matching compatible outlets and terminate all fiber optic cables into matching fiber optic connectors.
3. Provide matching compatible outlets and terminate all fiber optic cables into matching outlet fiber optic connectors.

B. Provide loose tube gel filled or indoor/outdoor type fiber optic cable for any of the following installation location conditions.

1. Inter building (between buildings).
2. In a conduit or raceway located underground below grade.
3. In an exposed outdoor conduit or raceway not located underground or below grade.
4. Do not install loose tube gel filled type fiber optic cable inside a building or exposed on a building without providing rigid steel (RGS) conduit raceway for the loose tube gel filled fiber optic cable along the entire length of the cable inside or on the building located above finish grade.

C. Provide tight buffered or indoor/outdoor type fiber optic cable for any of the following installation location conditions.

1. Intra-building (inside a building) where raceway continuously encloses the cable and the raceway is not located underground, below grade.
 2. In an exposed outdoor conduit or raceway not located underground or below grade.
- D. Provide plenum rated type fiber-optic cable insulation for any of the following installation location conditions. Additionally, Cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.
1. In any air plenum (supply or return) when a conduit or enclosing raceway is not provided for the entire cable length.
 2. Where the cable is installed without a conduit or the cable is not fully enclosed in a raceway along the entire cable length in a building.
- E. Optical Fiber Quantity:
1. The minimum fiber quantities in each fiber optic cable shall be as follows, but in no case less than indicated on the drawings.
 2. Between main IDF (SUB-MDF) in separate buildings and the MDF main terminal rack fiber optic patch bay for the entire site/campus.
 - a. Six (6) optical fibers, multimode and twelve (12) optical fibers, single mode.
 3. Between satellite IDF terminal rack fiber optic patch bays and the main terminal rack IDF (sub-MDF) patch bay located in the same building.
 - a. Six (6) optical fibers, multimode and twelve (12) optical fibers, single mode.
 4. Between a terminal rack patch bay (IDF or MDF):
 - a. To an individual workstation outlet located inside the same building - two (2) multimode optical fibers, (typical only for locations where fiber is specifically shown on the drawings for the specific work station outlet).
 - b. To each network file server outlet location whether or not shown on the drawings, four (4) optical fiber, multimode.
 5. Other locations as indicated on the drawings or described in the contract documents.

3.03 COPPER WIRE CABLE TYPE

A. General

1. Cables shown as copper wire type shall comply with the following installation conditions, unless noted otherwise on the drawings.
2. Provide matching compatible outlets and terminate all copper wire cables into matching copper wire connectors.

B. Cable Types and Quantities - Cable types and quantities shall be as follows unless specifically noted otherwise on the drawings. The following minimum type and quantity of copper wire cables from each individual workstation/device outlet, to the respective terminal equipment patch panel/ bay, (unless specifically noted otherwise), but in no case less than what is shown on the drawings and in no case less than one (1) 4-pair cable to each outlet "Jack" position:

1. Two (2) Category-6, UTP 4-pair cable:
 - a. Each network workstation outlet location.
 - b. Each network "wireless-access-point" outlet location.
2. One (1) Category-6 UTP 4-pair cable, for each telephone handset (instrument) workstation outlet location.
3. Trunking cable (Category-5E):
 - a. Between each separate buildings, 50-pair UTP cable.
 - b. Between each IDF's and/or MDF's in the same building 25-pair UTP cable.

C. Provide plenum rated copper wire cable insulation for any of the following installation location conditions. Additionally, cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.

1. In any air plenum (supply or return) when a conduit or enclosed raceway is not provided for the entire cable length.
2. All locations where the cable is installed without a conduit or the cable is not fully enclosed in a raceway along the entire cable length in the building.

3.04 CABLE INSTALLATION

A. General

1. Cables connecting to equipment racks and terminal blocks shall be installed with not less than 6-feet of slack cable between the equipment

rack/terminal block and terminal backboard. The slack cable shall be coiled and supported on the backboard and/or cable tray.

2. Cables in terminal closets and terminal rooms shall be trained, dressed and racked on the plywood backboards. Provide cable, metal support arms and re-enterable type cable support rings not less than 12-inches on center mounted onto the plywood along the entire length of all cables.
3. Provide separate routing paths on plywood backboards for fiber-optic cables, computer data and copper wire cables and telephone/voice copper wire cables and multimedia, audio/video, TV cables. Provide separate routing paths on plywood backboards for shielded copper wire cables and unshielded copper wire cables.
4. Cables shall be routed parallel to floors and walls. Do not route cables diagonally on backboards.
5. Spare cable slack
 - a. Provide 25-feet of spare cable slack where unterminated cables are specified at terminal backboards.
 - b. Provide a minimum of 18-inches of slack cable in each workstation outlet box and outlet locations.
 - c. Provide 10-feet of cable slack in ceiling above each work station outlet.
 - d. Provide 24-inches of slack in each cable at patch panel locations.
 - e. Coil and "Velcro" wrap slack cable.
6. Provide "horizontal wiring" cables installed from individual computer/data workstation outlets to respective terminal closet/room patch panel. Cables shall be continuous without cutting or splices.
7. Provide "horizontal wiring" cables installed from individual workstation telephone/voice handset outlets to respective terminal closet/room terminal patch panels. Cables shall be continuous without cutting or splices.
8. Provide "backbone" cables installed between MDF/IDF terminal rooms/closets patch panels.

Cables shall be continuous without cutting or splices.

B. Cable Pulling Lubrication

1. Cable pulling lubricants shall be specifically approved by the cable manufacturer. The following lubricants shall be used where approved by the cable manufacturer.
 - a. Slip X -300, American Colloid Co.
 - b. Bishop #45, Bishop Electric.
 - c. MacLube CA51, MacProducts.
 - d. Minerallac H2B, Minerallac Electric.
 - e. Winter grade #7437-PC, General Machine Products.
 - f. Gel-lube 7/5, Cable associates.
 - g. Polywater, A, C, G, American Polywater.
2. Lubricants shall be continuously applied as cable enters raceway.

C. Cable Installation:

1. Do not pull conductors until factory test reports have been submitted and reviewed.
2. Minimum bending radius of fiber optic cables shall not be less than the following. Maximum pulling tension shall not exceed the following. In no case shall the manufacturer's recommendations be violated.

<u>Cable Type</u>	<u>Cable Fiber Quantity</u>	<u>Mini. Bend Radius</u>	<u>Maxi. Pulling Tension</u>
Loose Tube	2-84	9 inches	600 pounds
Loose Tube	86-192	10 inches	600 pounds
Tight Buffered	2-12	5 inches	400 pounds
Tight Buffered	14-24	7 inches	600 pounds
Tight Buffered	26-28	11 inches	1100 pounds
Tight Buffered	48-72	12 inches	1200 pounds

3. The minimum bending radius for copper wire cables shall be 10-times the cable outside diameter. The maximum pulling tension and minimum bending radius shall not violate manufacturer's recommendations.
4. Cables installed in manholes and pullboxes on terminal backboards shall be installed on wall mounted cable support racks.
5. Provide a full 360 degree loop of cable around manhole and pullbox interiors.

6. The attachment of pulling devices directly to the cables shall be with individual split mesh basket grips. Direct connection for pulling cables to cable fibers and copper wires shall not occur. Securely tape cable ends to prevent moisture or pulling compound from penetrating cable.
7. The attachment of the pulling device to the cable basket grips shall be made through a swivel connector.
8. The Contractor shall ensure that the cables are fed straight into the raceway taking care to avoid short bends, sharp edges and cable "cross-overs".
9. All lashings used for temporary bunching of the individual cables shall be removed before the cables enter the raceway.
10. Cables shall be "pulled through" or pulled from a "center of run pull" without splices or terminations and minimize cable rolling tension. Lead out the cables at all manholes, pullboxes and conduits taking care to feed them in again by hand for the next portion of the cable run.
11. For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves etc. shall be used to insure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to insure the minimum possible cable side wall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.
12. Cable lengths over 50 feet shall be machine pulled not hand pulled into and through all raceways. Cables shall be pulled in a continuous, smooth operation without jerking or stop- start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum cable pulling speed shall be greater than 15 feet per minute.
13. Cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to reel). Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullhole during this operation. Cables shall be pulled directly from cable reels.
14. Cables shall be trained or racked in trenches, vaults, manholes and pull boxes with consideration given for the minimum specified bending radius

- of the cable and the possibility of cable movements due to load cycling. The cables shall be racked and supported in such a manner that adequate space is allowed for splicing and the cables shall always be fanned out from the duct or conduit so as not to cross other ducts, conduits or cables. To prevent damage from falling objects or personnel entering the manhole the cables shall not pass directly under the manhole opening.
15. Cable shall be supported in manholes, pull boxes and vaults a minimum of 18-inches on center with cable racks. Provide hot dip galvanized, T-slot racks and support arms. Secure cables to racks with porcelain supports for each cable on the racks. Loosely lash cables to racks. Splices shall be directly supported, on racks. Do not install cables more than one feeder on the same rack hook.
 16. Cables shall be routed the long way around manhole, pullhole, etc. with not less than a full 360 degree loop around the perimeter walls unless noted otherwise.
 17. Existing conductors shall be protected at all times when contract work occurs in the same area, including but not limited to pullboxes, vaults manholes, cable trenches etc. Provide temporary electrical insulating blankets and barriers over existing conductors to reduce the possibility of accidental mechanical damage to existing conductors.
 18. Where cable tray is provided, all cables shall be routed and trained on the cable tray. The cables shall enter the cable tray and route along the tray prior to entering any equipment racks or computer works station outlets.
 19. A dynamometer to measure pulling tension shall be used on all cable runs in excess 200 feet or with more than 180 degrees in bends. The actual pulling tension value shall be calculated and recorded for each pull.
 20. Bends shall not be made in cable splices or terminations.
 21. The portions of cables installed without raceways or cable tray supports shall be installed with metal "J-hook" cable supports.
 - a. The "J-hooks" shall provide multitiered "J" shaped hooks, with wide flat cable support base (0.5-inch wide minimum) and smooth rounded corners, specifically designed for copper wire and fiber optic infrastructure cable support. As manufactured by Erico Inc.
 - b. The individual "J-hook" attachment to the building structure shall be metal, "beam clamp", "hanger rod", clevis hanger styles as applicable for each attachment location.
 - c. Install "J-hooks" not more than 48-inches on center along the entire cable length and within 6-inches of each cable change in direction.

Locations of “J-Hooks” and tension of cables shall insure between 4-inches and 6-inches of cable sag between adjacent hooks. Secure cables to “J-hooks” with re-enterable cable tie wraps. “J-hook” supported cables, bundle cables together with re-enterable tie wraps not less than 12-inches on center along the entire cable length.

- d. Each J-hook shall not support more than twelve (12) individual cables. Provide multiple “tiered” J-hooks for additional cable quantities at each location.
 - e. “Bridle rings” shall NOT be used to support cables.
 - f. Cables shall not lie directly on nor attach to ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.
22. Re-enterable cable tie wraps shall be, “limited-combustible” and air plenum rated, reusable, color-coded. Chemically and mechanically compatible with the respective cables and install locations. Shall allow multiple open-close operations for securing cables.
23. Electronic network cables containing non-dielectric components shall be installed with a minimum separation from other electrical power conductors and equipment as follows:

<u>Equipment Type</u>	<u>Minimum Separation</u>
a. Lighting fixtures	12 inches
b. Electric motors, electric solenoids, electric Heaters	40 inches
c. Transformers	48 inches
d. Circuits over 100 volts to ground, in metallic raceways	5 inches
e. Circuits over 100 volts to ground, in non-metallic raceway or without any raceway	12 inches
f. Circuits over 100 volts to ground, suspended on overhead pole lines	48 inches

D. Movement, Storage, and Handling of Cable:

- 1. Reels of cable shall not be dropped from any height, from trucks or other transporting equipment.
- 2. Lift and move cable reels using following methods:

- a. Crane or boom type equipment-insert shaft (heavy rod or pipe) through reel hubs and lift with slings on shaft, with spreader or yoke to reduce or avoid sling pressure against reel head.
 - b. Fork lift type of equipment may be used to move smaller, narrower width reels. Fork tines should be placed so that lift pressure is on reel heads, not on cable, and shall reach all the way across reels so lift is against both reel heads.
 - c. Reels may be moved short distances by rolling. Reels shall be rolled in the direction indicated by arrows painted on reel heads. Surfaces over which the reels are to be rolled shall be solid clear of debris, and also clear of protruding stones, humps, etc. which might damage the cable if the reel straddles them.
3. Storage of reels of cable:
- a. Cable ends shall be sealed prior to shipment to prevent moisture entry into cable. Cable ends shall remain sealed at all times including during installation. Where ends seals are removed, reseal cable ends by stripping cable finishes back 2-inches down to insulation. Then apply four (4) layers of an insulating tape criss-cross over the cable end and carry back at least 4-inches onto cable outer finish. Add a containing cover of two (2) layers of vinyl electrical tape completely over the end seal.
 - b. Cable reels shall be shipped with factory applied lagging (protective cover) left in place until removal is absolutely necessary. Additional covering such as tarpaulin, plastic sheeting, etc. shall be used if cable is to be stored outdoors.
 - c. Store reels of cable on a firm surface, paved, or on planking to prevent settling into soft ground.
 - d. Use fencing or other barriers to protect cables and reels against damage by vehicles or other equipment moving about in the storage area.

3.05 CABLE SPLICES

A. General

- 1. Splice(s) in cables shall occur only in the following locations:
 - a. Pullboxes or manholes.
 - b. Terminal backboard, closets or rooms.

- c. Equipment racks.
 - d. Wall mounted interface cabinet.
 - e. Do not splice cables in conduit, cable tray, raceways or plenums.
2. Polarity and color-coding shall be maintained consistent through splices, terminations, and outlets for the entire electronic network system.
 3. Cable splices in outdoor areas, manholes, pullholes shall be water tight, inside universal splice enclosures.
- B. Fiber optic cable splices unless specifically indicated otherwise below, fiber optic cable splices between fiber optic cable fibers shall be fusion type splices.
1. Splices between loose tube gel filled fiber optic cable fibers shall be fusion type splices.
 2. Splices between indoor/outdoor fiber optic cable fibers shall be fusion types.
 3. "Pigtail" splices of tight buffered and indoor/outdoor fiber optic cable fibers to loose tube gel filled cables shall be fusion type splice.
 4. Splices between tight buffered fiber optic cable fibers to indoor/outdoor fiber optic cables shall be fusion type splice or mechanical type splice.
 5. Splices between tight buffered fiber optic cable fibers shall be mechanical type splice or fusion type splice.
 6. "Pigtail" splices of tight buffered fiber optic cable fibers to tight buffered fiber optic cable fibers shall be mechanical type splice or fusion type splice.
 7. Fiber optic splices shall be performed to maintain the data transmission rates specified for the entire respective system.
- C. Copper Wire Splice
1. Copper wire extending from infrastructure workstation outlets to respective equipment rack patch panel outlets shall not be cut or broken and shall be continuous end to end.
 2. Copper wire extending from telephone/voice workstation outlets to respective terminal blocks shall not be cut or broken and shall be continuous end to end.

3. Copper wire splices shall be performed to maintain the data transmission rates specified for the entire respective system.

3.06 CABLE TERMINATIONS

A. General

1. Infrastructure workstation outlets connecting to ports in patch panels shall be grouped together in the patch panel by outlet function, room location and building area location (i.e. Group #1 Room #120 1st floor; Group #2 Room 200 east wing, etc.). Each group shall be identified with engraved (etched) nameplates indicating grouping identification and individual port numbers.
2. Polarity and color coding of cable connections at splices, terminations and outlets shall be consistently maintained throughout the entire electronic network system.
3. Terminate all cables onto respective outlets connectors, interconnection couplers and terminals. Terminations shall comply with manufacturer's recommendations, ANSI/TIA/EIA-568C related standards, amendments and TSB.
4. Fiber optic cable fiber strands and copper wire cable conductors terminated at outlet locations shall be connected with a strain relief device attached to the cable jacket to prevent cable tension from being transmitted to the termination connectors.
5. Cable terminations shall be performed to maintain the transmission rates specified for respective system.

B. Fiber Optic Terminations

1. Individual fiber-optic fibers shall each be terminated with a fiber optic fiber connector. The connector for each fiber shall be "plugged" into separate fiber-optic fiber interconnection couplers on the rear of each respective outlet.
2. Each fiber optic termination ferrule shall be inspected, after completion of the termination, visually with a fiber optic inspection microscope and an interferometer, to insure fiber "undercut", "protruding" fiber, over polish and under polish of fiber termination ends does not exist in the finished termination ferrule.
3. Fiber-optic cables terminated between two (2) fiber optic patch panels located in separate equipment racks. The fibers shall be paired together for purposes of identification. Each pair of connectors for fibers shall be "plugged" into separate, physically adjacent fiber optic fiber interconnection

couplers at each patch panel. The horizontal/vertical arrangement of paired patch panel fiber couplers shall match at both ends of the fiber cable.

4. Fiber optic cable fiber strands terminated at patch panels shall be installed with a minimum of 540 degrees of each fiber strand looped around the splice tray individual fiber "training" rings.
5. Fiber optic cable connecting from infrastructure workstation outlet to a fiber optic patch panel.
 - a. The connectors for fibers shall be "plugged" into separate, physically adjacent fiber optic fiber interconnection couplers.
 - b. The patch panel coupler shall be color coded to identify the polarity of the transmitting and receiving optical fibers.
6. Fiber optic cable connections at workstation outlets.
 - a. The connectors for fibers shall be "plugged" into separate physically adjacent fiber-optic fiber interconnection couplers in the outlet.

C. Copper Wire Terminations

1. Where occurs, the shield on metal shielded copper wire shall be terminated and connected to the shield grounding connection at each termination point.
2. Twisted wire pairs shall not be untwisted for a length of more than 0.4-inches at any location and the cable jacket shall not be stripped back not more than 0.5-inches any location including splices and terminations.
3. Unless specifically directed otherwise by the Owner's Representative, Pin assignment for wiring terminations shall comply with ANSI/TIA/EIA-568C type T568A or T568B as required for compatibility with the electronic network equipment. The termination type shall be consistent throughout the project contract area.

3.07 EQUIPMENT RACKS

A. General

1. Install, assemble, mount and connect devices and equipment in the respective equipment racks, bolted securely to the rack frame with stainless steel hardware. "Star" style lock washers shall be provided to insure an electrically continuous ground path between the equipment/devices and rack frames.

2. Provide blank metal filler panels to close unused equipment "front" mounting space in equipment racks, manufacturer's standard finish color.
3. Provide a copper wire outlet connector in the respective equipment rack for each remote copper wire infrastructure workstation outlet and copper wire cable shown connected to the respective equipment rack, plus the spare copper wire outlet connectors required in the contract documents. The copper wire outlet connectors in the equipment racks shall be provided in equipment rack mounted copper wire patch panels. In no case shall the quantity of equipment rack mounted copper wire outlet connectors be less than the quantity of cables indicated on the drawings, plus required spaces/spares.
4. Provide fiber optic fiber connectors and fiber optic fiber interconnection couplers in the respective equipment rack for each remote fiber optic infrastructure workstation outlet, and fiber optics cable fiber shown connected to the respective equipment rack, plus the spare fiber optic fiber connectors required in the contract documents. The fiber optic fiber connectors and fiber optic fiber interconnection couplers in the equipment racks shall be provided in equipment rack mounted fiber optic fiber distribution enclosures (RTDE). In no case shall the quantity of equipment rack mounted fiber optic fiber connectors and fiber optic fiber interconnection couplers be less than the quantity of cables indicated on the drawings, plus required spaces/spares.
5. Fiber optics cable fibers specifically shown as non-terminated "splicing-thru" in the equipment rack shall route through fiber optic splice only enclosures (RMSE), mounted in the respective equipment rack.
6. The maximum quantity of cable terminations, in each equipment rack mounted patch panels shall not exceed the following:
 - a. 100% copper wire outlet connectors, 672 maximum per 42U rack. 144 maximum in 24- inch high, 240 maximum in 30-inches high and 432 maximum in 48-inches high mini- equipment racks.
 - b. 100% fiber optic fiber terminations, 144 maximum per rack [twenty-four (24) maximum in mini-equipment racks].
 - c. Combination of copper wire outlet connectors and fiber optic fiber terminations in the same rack; 48 maximum fiber optic fibers plus 144-maximum copper wire outlet connectors per rack. [18 maximum fiber plus 192 maximum copper wire in 30-inches high and twenty-four (24) maximum fiber plus 488 maximum copper in 48-inches high mini-equipment racks.]

- d. In addition to the quantity of patch panel outlets for termination of incoming and outgoing cables, provide not less than an additional 15% of patch panel spare outlets in each equipment rack for future use.
7. Provide additional equipment racks, quantity of racks to ensure the maximum specified quantity of terminations in single rack are not exceeded and the quantity of cable terminations complies with the requirements of the Contract Documents.
8. Terminal racks, equipment locations, patch panels, and cross connects shall be arranged to allow for natural cabling progression, minimize crossing of cables and allow easy access to each system component.
9. Equipment Rack Anchorage:
 - a. Equipment racks installed on raised "access floor" systems, shall be supported and anchored with bolts that extend into the "structural" floor located below the "access floor".
 - b. Securely anchor the support arms of swing gate racks to the wall structural support system.
 - c. Securely anchor fixed support base of the racks to the floor.
 - d. Mounting method shall support the total rack weight including installed equipment, but in no case less than 500-pounds with a 2.0 times safety factor.
 - e. Attachments and anchorages shall comply with the requirements for earthquake seismic zone 4.
10. Unless specifically noted, otherwise provide the following equipment rack types:
 - a. Floor standing equipment racks containing patch panel locations, computer/data network HUBS/switches and computer data network concentrators, shall be Open Frame style 4- post equipment racks.
 - b. Wall mounted external to dedicated IDF/MDF terminal rooms/closets (i.e. inside individual classrooms), shall be Mini-Equipment racks.

11. Install ground bus, PDU/TVSS, cable management rings, equipment, patch panel and patch panel outlets, etc. in equipment racks.
12. Equipment rack terminology:
 - a. The location containing the main campus equipment rack location shall be identified as the Main Distribution Frame (MDF).
 - b. The locations remote from the MDF containing satellite equipment racks shall be identified as Intermediate Distribution Frames (IDF).
 - c. An individual building located on a multi-building campus site with multiple equipment rack locations in the building, the building main rack location shall be identified as Sub- MDF and the remaining equipment rack locations in the building shall be identified as IDF.

B. Floor Standing Equipment Racks

1. General:
 - a. Securely anchor racks to floor.
 - b. All incoming cables shall enter through the top or bottom of the racks.
 - c. The front of the racks shall maintain a minimum of 42-inches of clear working space.
 - d. Multiple floor standing racks shall be installed directly adjacent to each other (i.e. side by side), with not less than 6-inches (edge-to-edge) space between adjacent racks.
 - e. Cables entering racks shall enter into the top of the rack from overhead cable tray or from wall along wall support arms to rack.
2. Floor standing open equipment racks.
 - a. The rear of the rack shall maintain a minimum of 54-inches clear working space behind the rack frame rails for adequate installation depth of HUBS/switches equipment, for "walk" behind access to equipment and for cable terminations access.
 - b. Provide a minimum spacing between (edge-to-edge) racks of not less than 6-inches.

C. Mini-Equipment Racks:

1. Install surface mount on the wall, on wall mount horizontal "C" channels.
2. In public spaces the bottom of the rack shall not be less than 6-feet – 6-inches above finish floor. Top of rack shall be tight to ceiling.
3. Position the rack to allow the door section, and center section to swing open a full 90 degrees Arc without obstructions.
4. Connect raceways to the non-moveable pan section.

3.08 MDF AND IDF CIRCUIT TERMINAL ROOMS AND CLOSETS

A. Terminal Backboard

1. A ¾-inch thick marine "A-C" grade plywood backboard shall fully cover each wall of terminal closets and terminal rooms, including all MDF and IDF rooms/closets. Provide backboard on the wall for equipment racks, incoming cable raceways and terminal blocks. Plywood shall extend continuous from the finish floor to 8-feet above the finish floor on all walls. "A" side of plywood shall be exposed.
2. Attach plywood to wall structural framing with mechanical fasteners minimum 6-inches on center vertically on walls at each framing vertical member, and along the length of the wall, but not less than 16-inches on center horizontally along the length of the wall.
3. Paint plywood terminal backboards after installation and prior to mounting any equipment.

One (1) coat of wood paint fire resistant primer and two (2) coats of fire resistant/intumescent, non-conductive finish coats of paint. Finish color matt/flat white, acrylic enamel fire resistant/ retardant latex paint.

B. Cable Tray

1. Locations with equipment racks, installed in the same room/closet (MDF or IDF).
 - a. Provide a horizontal cable tray above the equipment racks in each circuit terminal room and closet.
 - b. Provide a horizontal cable tray continuous "loop" around the perimeter inside each MDF and IDF room, within 12-inches of the ceiling. Parallel with and adjacent to all walls in the room.

2. Ladder type cable tray 18-inches wide by 6-inches deep; length-end wall to end wall, of the closet or room.
3. Install the cable tray centered above all equipment racks, and around the room perimeter at ceiling/walls with ceiling and wall suspension system. Install trays not more than 36 inches above and not less than 12-inches above the top of the equipment racks.
4. Where multiple segments of cable trays occur in terminal closets and rooms, provide interconnecting cable trays between each segment located in the respective room/closet.

C. Conductor Training and Support

1. Provide conductor/cable training and racking support distribution rings installed on backboards. As manufactured by Newton 3042 series, Saunders or equal.
2. Support rings shall be spaced a minimum of 10-inches on center along all cable/conductor routing paths on backboards and within 4-inches of each change in cable/conductor direction.
3. The capacity of support rings shall be equal to the weight and quantity of conductors/cables passing through the respective support ring plus 100% spare capacity for installation future conductors/cables. In no case shall support rings be smaller than 3-inches.
4. Attach support rings to backboards with not less than two (2) 3/8-inch diameter by 1 1/8-inch long threaded wood anchor bolts for each individual bracket.

D. Environment Space Monitoring (MDF and IDF)

1. In each room/closet provide one (1) automatic environmental monitor. Self calibrating, simultaneous monitoring and software programmable, with alarm set points. Shall measure and monitor ambient conditions and provide data-logging for conditions in the space for the following:
 - a. One (1) ambient temperature port and plug-in indoor sensor.
 - b. One (1) ambient humidity port and plug-in indoor sensor.
 - c. One (1) spare plug-in port for an external digital sensor.
2. Digital Fast Ethernet LAN RJ-45 communications port, with alarm alerting and communications software for remote monitoring of the ambient conditions via the LAN. Multi- user site wide software license, compatible with PC-computer and IP-WEB HTTP remote operations.

3. Local internal audio and visual alert annunciators, with local silence and re-set.
4. 120 volt, 60Hz AC input power supply operation. Equipment rack mount self contained unit housing configuration. Provide all interconnect cabling and connectors.
5. Provide the environmental unit in one of the equipment racks located in each of the respective spaces.
6. As manufactured by Avtech-Room Alert; or SensaTronic-Environmental Systems; or IT Watch Dog-Climate Monitors.

3.9 GROUND (ADDITIONAL REQUIREMENTS)

A. Electronic Equipment MDF, IDF and Terminal Rooms and Closets

1. Terminal equipment ground bus (TEGB) - Provide a wall mounted TEGB ground bus in each MDF location. Also provide a TEGB where two or more equipment racks are provided in each IDF. The TEGB ground bus shall be copper ¼-inch by 2-inches (nominal) by 12-inches long (minimum). Install the TEGB on the wall with a minimum of two (2) "stand-off" electrical insulators. Drill and tap the ground bus and provide bolted type ground lugs for connection of each ground conductors size #10AWG - #1AWG. Provide four (4) spare unused ground lugs on the TEGB.
2. Provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB homerun to the building main ground reference bus. Provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB homerun to the nearest building main structural steel member and to the nearest metal cold water pipe larger than 0.6-inch diameter pipe.
 - a. Provide the same ground connections from the equipment rack ground bus where only a single equipment rack occurs in the IDF location.
3. The ground conductor required from the TEGB to the building main ground reference bus may be looped and connected between separate TEGB ground bus locations if all of the following conditions are met.
 - a. The ground conductor is increased to 1.5-inch conduit with 1#2/0AWG copper insulated and the total end to end length does not exceed 300-feet.
 - b. The building exceeds two (2) floors in height.

- c. Not more than four (4) TEGB buses are connected to the same "looped" ground conductor.
- d. The TEGB ground conductor is continuous (not cut, spliced or broken) along its entire length.
- e. The TEGB ground conductor is connected to the TEGB ground buses with a UL listed "Exothermic" welding process.

B. Equipment Racks:

- 1. Provide a separate #12AWG copper stranded green insulated ground conductor from each individual equipment element in the rack to the respective rack ground bus.
- 2. Provide a separate #8AWG copper insulated ground conductor from each equipment rack ground bus to the TEGB terminal equipment ground bus located in the same space.
- 3. Where only one equipment rack is installed, provide 1.25-inch conduit with 1#1AWG copper insulated ground homerun conductor from the equipment rack ground bus homerun to the building main ground reference bus and provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB or single equipment rack ground bus (as applicable), to the nearest building main structural steel member and to the nearest metal cold water pipe larger than 0.6-inch diameter pipe.
- 4. Provide 1.25-inch conduit with 1#4AWG copper insulated ground conductor from each wall mounted fiber interface cabinet to the respective TEGB ground buses.
- 5. Provide a 1#10AWG copper insulated ground conductor connecting in a continuous loop to all miscellaneous cable trays and metal support equipment located in the terminal closet or room and connect to the TEGB ground bus.

C. Telephone/Voice Terminal Blocks:

- 1. Provide a separate #8 copper insulated ground conductor from each terminal block section ground bus to the TEGB terminal equipment ground bus.
- 2. Provide a separate #6 copper insulated ground conductor from the terminal room/closet to the lightning ground system.

3.10 WALL MOUNTED FIBER INTERFACE CABINET - WMIC

The WMIC shall provide the interface/transition for any loose tube gel filled fiber optic cable entrance into a building for "Pigtail" terminations into equipment located in the building or "thru splices" onto other areas.

3.11 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. General

1. Fiber optic and copper wire cables shall be identified in each manhole, pull box, equipment rack, patch panel and computer workstation outlets.
2. Infrastructure documentation, identification labels and color coding shall comply with ANSI/TIA/EIA-606A Administration Standard for Telecommunications Infrastructures, Class-1 through Class-4. Provide management software MS-Windows-based single user license, with all as-built data entry documentation information complete.
3. Color-Coding of Termination (Specific additional OWNER's requirements): Termination at the MDF/IDF termination areas and at telephone terminals shall be color-coded with colored designation strips. Designation strips will be marked with architectural area designation as indicated on the plans. Colored designation strips shall be assigned as follows:
 - a. Data Outlets Black
 - b. Voice Outlets Red
 - c. Multi-pair copper (MDF/IDF) Green
 - d. Multi-pair copper (Voice) Yellow

B. Identification tags shall include the following information:

1. Cable name as indicated on drawings (i.e., HV1, F4, MSB3 etc.).
2. Installation month and date (i.e., 3/92, 4/78 etc.).
3. Conductor size conductor type (i.e., loose tube fiber; (#24AWG ScTP Category 5, 200 pair, telephone/voice etc.).
4. Feeder taps to equipment or building shall also be identified with equipment name or building (i.e. library, SW1, Rack #21, etc.)

C. Identification Tags

1. Tags shall be 1/8-inch thick 98% lead, approximately 2-inch square with chamfered corners.

Two holes shall be drilled for attachment to primary cable. Lettering shall be 1/8-inch high, engraved or die stamped. Attach tags to primary cables with two #14AWG (THWN insulated) solid copper conductors "twist-tied", with insulated CAP wire-nut on the tie-wire ends, to cover sharp edges of tie-wire conductor.

2. Alternate identification tags, at the CONTRACTOR'S option in lieu of lead tags. Provide polypropylene tag holders with interchangeable, yellow polypropylene tag with black alphanumeric character sets. Characters shall be approximately 0.25-inch high. As manufactured by Almetek industries "EZTAG" Ledgewood, New Jersey.

D. Equipment and outlet naming identification and color-coding shall comply with ANSI/EIA/TIA latest revision.

1. Naming method for equipment, outlets and cables; where a position in the naming string is unused, provide multiple "*****" symbols.

Typical naming string "ADM-02-1141-PP17-1271"

- a. "ADM" - Abbreviated Building Name or Number (i.e., Administration, B127, etc.)
 - b. "02" - Floor Level #2 or as applicable.
 - c. "1141" - Outlet, Equipment or Terminal Room/Closet name or room number as applicable.
 - d. "PP17" - Terminal Rack Patch Panel Identification. e. "1271" - Individual Outlet or Port Identification.
2. Connecting hardware color coding shall be as follows:

"Green" - Main central terminal location for entire site.

"White" - Distributed terminal locations other than the main terminal.

"Blue" - Horizontal wiring hardware systems for workstations.

E. Documentation and Labeling (Specific additional OWNER's requirements)

1. The Contractor shall provide printed labels for all cables and cords, distribution frames and outlet locations. No labels are to be written by hand.
2. An example of appropriate classroom outlet documentation/labeling shall be as follows:

D = Data only
V = Voice only
26 (numeric jack assignment on MDF, IDF or telephone terminal)
2 (MDF, IDF or telephone terminal number)

3. An example of appropriate patch panel/punch block documentation/labeling shall be as follows:

Label on patch panel = D46/A/406

Type outlet:

D = Data only
V = Voice only
46 (numeric jack assignment on MDF, IDF or telephone terminal)
A (school building designation)
406 (room number)

4. An example of appropriate interbuilding cabling documentation/labeling shall be as follows:

Outlet label on LIU = 4/4-2/4

4 (school building number)
4-2 (IDF floor/closet room number)
4 cable pair or fiber number per color coding provided by manufacturer.

- F. Provide warning nameplates on fiber optic patch panels, fiber optic outlets, and any location where fiber optic cables are terminated. Minimum 1/8-inch high engraved/etched letters. "WARNING - LASER LIGHT SOURCE. DO NOT LOOK DIRECTLY AT OUTLET OR FIBER CABLE ENDS. RISK OF SEVERE EYE DAMAGE OR BLINDNESS".

3.12 TRUNKING CABLE TERMINAL BLOCKS

- A. The trunking cable terminal blocks shall be assembled in vertical sections, for wall mounting.

Install adjacent vertical sections with not less than 8-inches blank space between sections, for cable training space.

- B. Install terminal blocks on plywood terminal backboard with #8 x 1-inch wood screws. Minimum 6 inches on center, along each side of each terminal block.
- C. Terminal block wire pair capacity:

1. The minimum wire termination capacity shall not be less than 300-pairs of trunking cable conductors, at each terminal block assembly.
 2. Plus fifteen (15) spare capacity.
- D. Trunking cable installation:
1. Trunking cable and insulation shall be rated for installation in the locations shown on the drawing, installed in conduit end-to-end.
 - a. Outdoor underground or exposed to sun, wet locations installed in conduit.
 - b. Inside the building installed in conduit.

END OF SECTION

27 20 00

SECTION 27 41 00
AUDIO/VIDEO COMMUNICATIONS (CLASSROOM TECHNOLOGY)

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Stand-alone **& networkable**, scalable, one (1) room AV control system for each classroom indicated on plans with keypad control. Available models support 1, 2, or 3 source inputs, option of ceiling or wall projector mounts and option of ceiling or wall mounted speakers. System includes control processor, keypad, audio amplifier, speakers, projector mount and AV interface cables required to integrate with a compatible video projector with **white board or** screen. Browser control interface, optional touch panel support and campus wide scheduling and management software require no additional processing or translation hardware.

B. Related Information:

1. Division 27 Section "Common Work Results For Communications".
2. Division 27 Section "Schedules for Communications".
3. Division 27 Section "Communications Horizontal Cabling" for communications cabling requirements for modular dimming control system.
4. Division 27 Section "Audio-Visual Communications" for communications and network cabling requirements for Audio-Visual systems and over all control systems communications.

1.02 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

1.03 REFERENCES

A. Abbreviations

1. BAS: Building Automation System.
2. AV: Audio Visual.

1.04 SYSTEM DESCRIPTION

- A. Stand-alone **and networkable**, scalable, one (1) room AV control system with keypad control. The system is composed of two (2) parts: the projector **device** ~~with projection screen~~ and the control and audio package. The control and audio package includes all major components and cables needed to provide a controlled

AV classroom *system*. The control and audio package supports direct integration with the following systems and de-vices using native control protocol:

1. Networked scheduling and management software.
2. Communication with building wide Audio Visual Systems.
3. Touch panel controls.
4. ~~Room HVAC control.~~

B. Unified System Integration – Controller supports native communication protocol of AV control system and facility management system, *TCP/IP*.

1.05 INFORMATIONAL SUBMITTALS

- A. Buy American Act certificate.
- B. Sample of manufacturer's warranty.
- C. Submit a complete AV components list with all manufacturers and product numbers to be provided for approval by the District prior to ordering.

1.06 CLOSEOUT SUBMITTALS

- A. Operating and maintenance instructions.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualification: Manufacturer of controller with minimum 5-years record of satisfactory manufacturing and support of components comparable to basis of design system.
- B. Source Requirements: Provide modular dimming controls hardware and software through a single source from a single manufacturer.
- C. Manufacturer Qualifications: Approved manufacturer of controller listed in this Section with minimum 5-years record of satisfactory manufacturing and support of components comparable to basis of design system.
 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data indicating compliance with requirements of this Section.
 - b. Samples of each component.
 - c. Sample submittals from similar project.
 - d. Project references: Minimum of five (5) completed installations, with District and Architect contact information. e. Sample warranty.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 3. Approved manufacturers must comply with separate requirements of Submittals Article.
 4. ***All installation must be by manufacturer authorized personnel.***
- D. Regulatory Requirements: Provide components and systems that comply with requirements of the following:
1. Applicable codes and regulations.
- E. Installer Qualifications: AV components are to be installed only by factory approved installers. Provide proof of approval.

1.08 COORDINATION

- A. Coordinate integrated AV controls with systems and components specified in the following sections:
1. Division 23 Section "Instrumentation and Control for HVAC".
 2. Division 27 Section "***Common Work Results for Communications***".
 3. Division 27 Section "Structured Cabling".
 4. ***Division 27 Section "Communications Equipment Room Fittings"***.
 5. ***Division 27 Section "Data Network Infrastructure"***.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace, ***at no cost to the District, all*** components of controls system that fail in materials or workmanship within the specified warranty period following substantial completion.
1. Warranty Period: Touch screen display and overlay components: 90 days.
 2. Warranty Period: Disc drives and other moving parts, pan/tilt heads, and power supplies: 1 year.
 3. Warranty Period: Other components, 3-years.
- B. Manufacturer's Extended Support Service: Extended telephone support: Unlimited period.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Panasonic, ***Liberty Wire and Cable, Front Row, Crestron, Epson and Business Machine Security. Inc., Roekleigh, NJ 07647, Phone: (800)237-2041, Fax: (201)767-1903.***

- A. ~~System~~ **Presentation** controller: Integrated control of system power, source selection, ~~screen—control—(up/down)~~, and audio volume control **and remote management** in a two (2) gang **grounded** wall mount interface. System includes an Ethernet LAN port for system expansion (unlimited number of rooms), system control via web browser and or enterprise level system management software **with 10 programmable buttons, customizable backlit labeling, LED feedback, and control ports for controlling external devices. Ten (10) custom programmable pushbuttons, 1 RS-232, 1 IR/Serial control port, two (2) digital/analog inputs, and two (2) relay control ports. Controller must be code-compatible with Owner’s previous site installations. Crestron MPC-M5-W**
- B. **Display Device Requirements:**
1. **Projector Requirements**
 - a. **Model selected must be approved by Owner.**
 - b. **Projection device shall utilize the white board as a screen unless otherwise specified.**
 2. **Video Projector must have the following characteristics/specifications:**
 - a. **VGA Inputs: One (1) HD15F computer VGA inputs with RCA or 3.5mm mini-TRS stereo audio inputs.**
 - b. **Video Inputs: One (1) RCA composite video inputs with two (2) RCA or 3.5mm mini-TRS stereo audio inputs.**
 - c. **HDMI Input: One (1) HDMI input**
 - d. **Audio Output: One (1) RCA or 3.5mm mini-TRS stereo line-level output with command controllable volume.**
 - e. **Control: DB9M RS-232 (without hardware handshaking) and Ethernet. Must process commands for setting power, display muting, audio volume, and input port selection. Must process commands for reading the current settings of power, display muting, audio volume, and input port selected. Must be “Crestron Enabled”.**
 - f. **Resolution must be WXGA or better. High Definition is preferred.**
 - g. **If Owner chooses an interactive projector, a USB connection is required.**
 - h. **Mounting: must be wall mount compatible with ultra-short-throw lens.**
 - i. **Acceptable products: SMART LightRaise 60wi2, Epson 575W, Panasonic PT-CW330U with ET-PKC200W mount.**

C. **Amplifier:**

1. ***Minimum 15-watts per channel output power and stereo or dual-mono configurable.***
2. ***Capable of driving 4 speakers or more in multiples of 2***
3. ***Minimum 4 audio input channels plus 1 channel for wireless mic audio.***
4. ***Prioritization of input channels using “sound ducking” for lower priority inputs***
5. ***Ethernet connection utilizing PoE for emergency power and fall back operations during a loss of power.***
6. ***Control: PoE Ethernet. Must process commands for setting audio muting, audio volume, and input port selection. Must process commands for reading the current settings of display muting, audio volume, and input port selected.***
7. ***Must contain a built in web page host for remote configuration***
8. ***Acceptable Products: Front Row CM-3000 (tested), Audio Enhancements MS-400 (untested).***

E. **Voice Amplification:**

1. ***Two (2) wireless microphones, using IR and/or RF technology. Wireless unit will not interfere with adjacent classrooms using the same technology. Panasonic WX-LR200 and Power Supply***
 - a. ***Teacher microphone shall have volume control for both wireless mics and an emergency alert capability. Panasonic WX-LT350 with 3120-0001 Battery.***
 - b. ***Student microphone shall have on/off capability. Panasonic WX-LT150 with 3120-0001 Battery.***
2. ***IR/RF receiver shall be ceiling mounted on a Business Machines Security DCP150-G 2x2 grid mounted plate near center of room, in accordance to manufacturer’s instructions.***
3. ***A dual Charging Stand and Power Supply shall be provided for the microphones***

4. *Momentary contacts compatible with Crestron controller input for indicating an "alert" condition.*
 5. *Other parts: 3' CAT6 cable (IR to signal breakout box, CAT6 cable for PoE connection.*
- F. Speakers: Four (4) ceiling mount 8-inches, 8 ohm, 2-way, 15-watts maximum power handling with 2x2 suspended ceiling grid mountable enclosure.
1. *Crestron FSDI8 2'x2' or Extron SF228.*
- G. Wall Plates – 3 Input System:
1. *Liberty Wire and Cable drawing number CSCWB-CQ86398-4 (white) or CSCWB-CQ86398-3 (beige). Use plate color (part number) specified by Owner.*
- H. Cables: RS-232 projector control cable, (3) 20AWG conductors + shield, Ethernet CAT6 LAN cable, 16awg speaker cable, shielded VGA video, shielded TRS-TRS audio, shielded HDMI cable minimum length possible. Contractor will provide all necessary cables to complete the installation according to drawing and/or instructions provided by Owner.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Prior to installation, examine work area to verify measurements, and that commencing installation complies with manufacturer's requirements.

3.02 INSTALLATION

- A. Comply with requirements of Division-27 Sections "Common Work Results for Communications."
- B. Do not install AV or control devices until space is enclosed, HVAC systems are running, and over-head and wet work in dimming control work space are complete.
- C. Install control devices in accordance with manufacturer's instructions.
- D. Install speakers in accordance with manufacturer's instructions.
- E. Install projector and mount in accordance with manufacturer's instructions.
- F. Grounding: Provide electrical grounding in accordance with NFPA 70.
- G. Perform setup for each audio-visual equipment component.
- H. *All PoE equipment shall be set up as DHCP with a specific "HostName". A list of MAC addresses with hostnames shall be supplied to Owner's technology department prior to installation. Each device shall be labeled with the assigned hostname and installed in its assigned location. A sample device shall be provided to Owner's technology department in advance of installation for network compatibility testing.*

I. Speakers shall be mounted according to manufacturer's instructions. Installation shall not allow resonance between speaker assembly and ceiling grid system at any audible frequencies.

J. See Owner provided drawing and/or instructions at end of this Section.

3.02 SYSTEM STARTUP

- A. Provide system startup and adjustment to occupied conditions in accordance with manufacturer's recommendations.
- B. Perform operational testing to verify compliance with Specifications. Adjust as required.

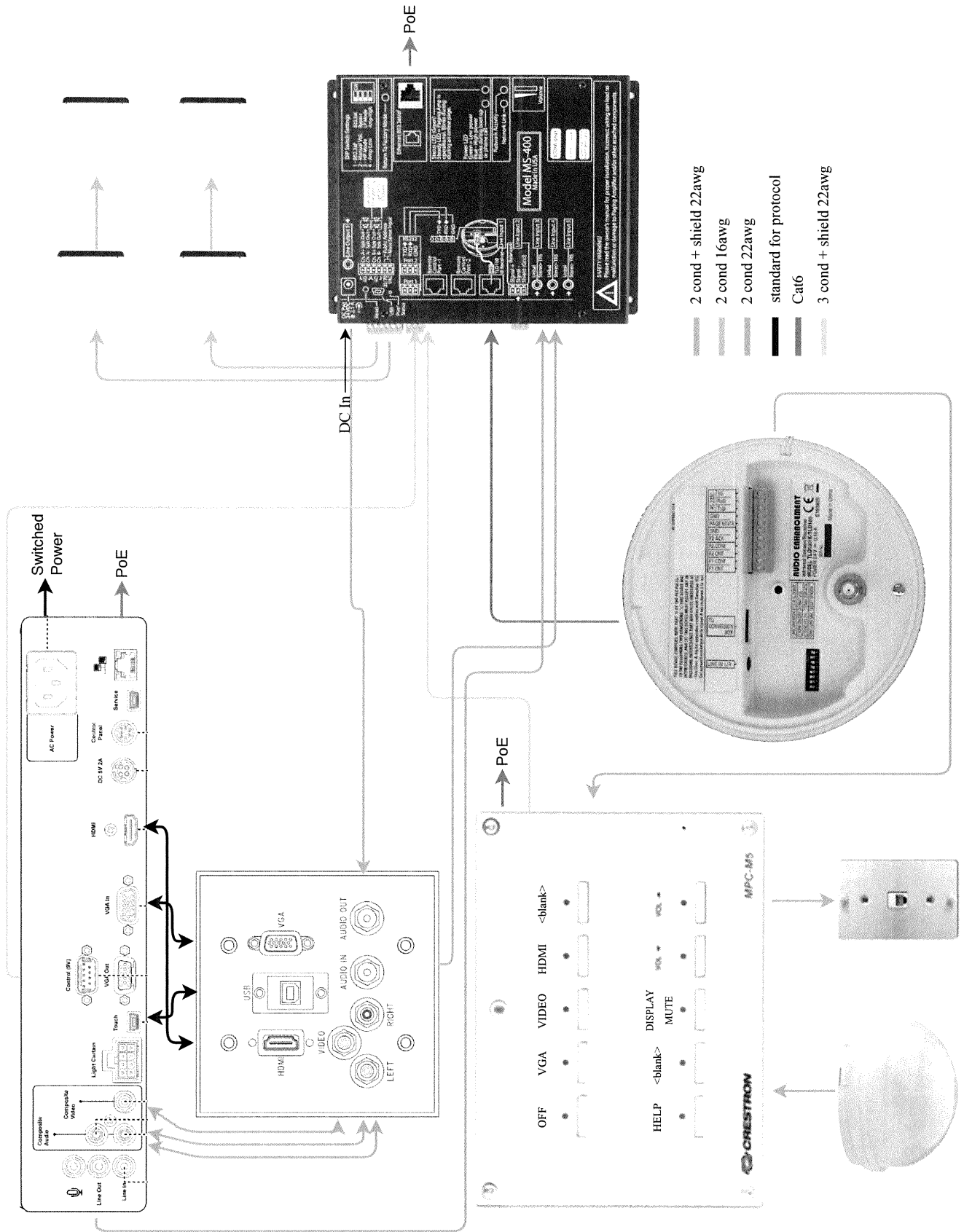
3.04 CLOSEOUT ACTIVITIES

~~A. Demonstration: Schedule dimming controls demonstration with District to allow verification that dimming controls function as required.~~

A. Training: Train District's personnel to operate, maintain, and program modular dimming controls.

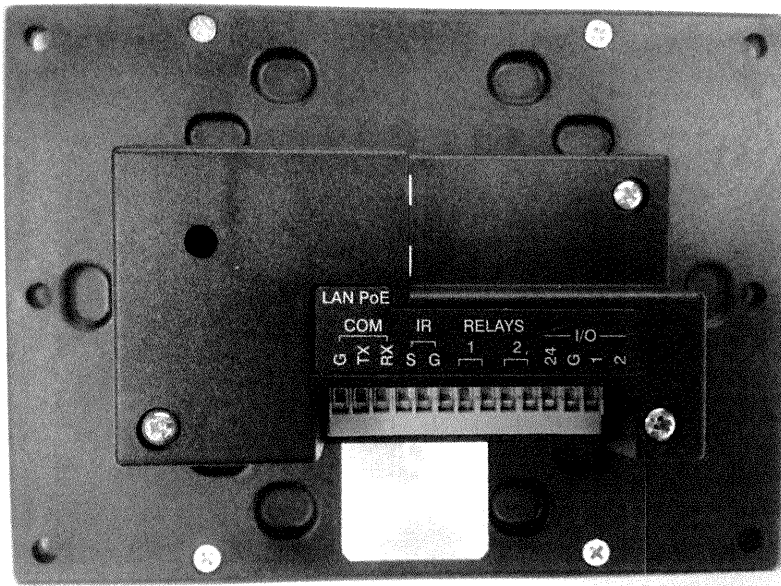
- 1. Contractor to schedule two (2) training sessions; one on-site session with site staff (as designated by site administrator) and FASO Maintenance Technicians before Beneficial Occupancy; and one on-site training with FASO Technicians in the first month of Occupancy.

END OF SECTION



- 2 cond + shield 22awg
- 2 cond 16awg
- 2 cond 22awg
- standard for protocol
- Cat6
- 3 cond + shield 22awg

GUSD Classroom Controller Wire List v2 for Crestron MPC-M5-W



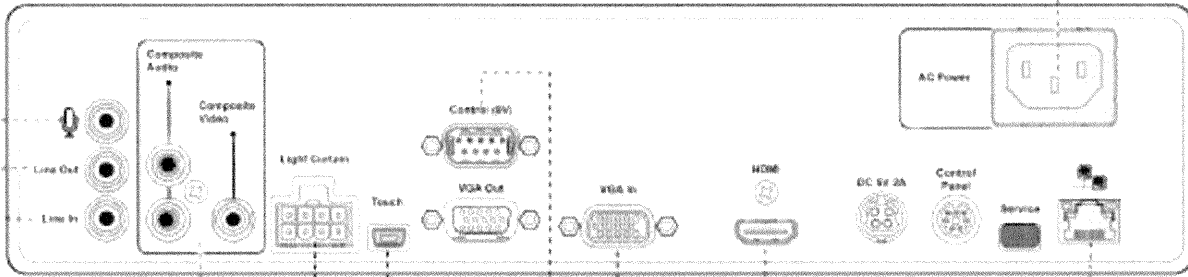
Crestron MPC-M5 Signal	Connected to...	Notes
LAN PoE	PoE	Cat6
COM G	MS-400 RS232 Port 2 GND blk	3 conductor (20 AWG) + shield, stranded Black and shield wires are connected together and terminated at COM G.
COM TX	MS-400 RS232 Port 2 TXD red	
COM RX	MS-400 RS232 Port 2 RXD wht	
RELAYS 1	Telephone jack plate	2 conductor (20 AWG), solid if IDC* at phone, otherwise stranded. Black/Yellow pair on telco plate.
RELAYS 1	Telephone jack plate	
I/O G	Bosch DS9360 C and TLD100 or WX-LR200 F1 COM	DC ground for OCC and Alert signals. Black wires from I/O 1 and I/O 2 pairs terminate here.
I/O 1	Bosch DS9360 NO	2 conductor (20 AWG) stranded
I/O 2	TLD100 or WX-LR200 F1 CNT	2 conductor (20 AWG) stranded

* IDC = Insulation Displacement Connector ("punch-down")

Observe polarity! Black is common, negative, or ground

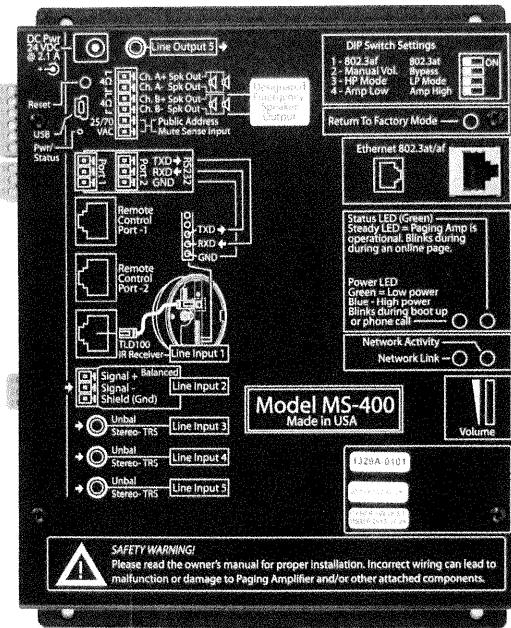
1. Label unit (2 places) according to picture. Add label for ethernet port below unit.
2. Program HostName to match label and all other network configuration data
3. Load Crestron program (District provided)

GUSD Projector Wire List for SMART LR60wi



LR60wi	Connected to...	Notes
Line Out	MS-400 Line Input 3	1/8" TRSm - 1/8" TRSm 3 cond
Composite Audio L	Wall Plate (white)	
Composite Audio R	Wall Plate (red)	RCAm - RCAm
Composite Video	Wall Plate (yellow)	
Touch	Wall Plate USB-Am	Use USB Extender mini-USBm
Control pin 2	MS-400 RS232 Port 1 TXD red	
Control pin 3	MS-400 RS232 Port 1 RXD wht	3 conductor + shield (20 AWG) stranded DB9m. Leave shield open
Control pin 5	MS-400 RS232 Port 1 GND blk	
VGA In	Wall Plate	VGA _m - VGA _m
HDMI	Wall Plate	HDMI - HDMI. As short as possible
AC Power	Switched power	
Ethernet	PoE	Cat6

GUSD Audio Amplifier Wire List for Audio Enhancement MS-400

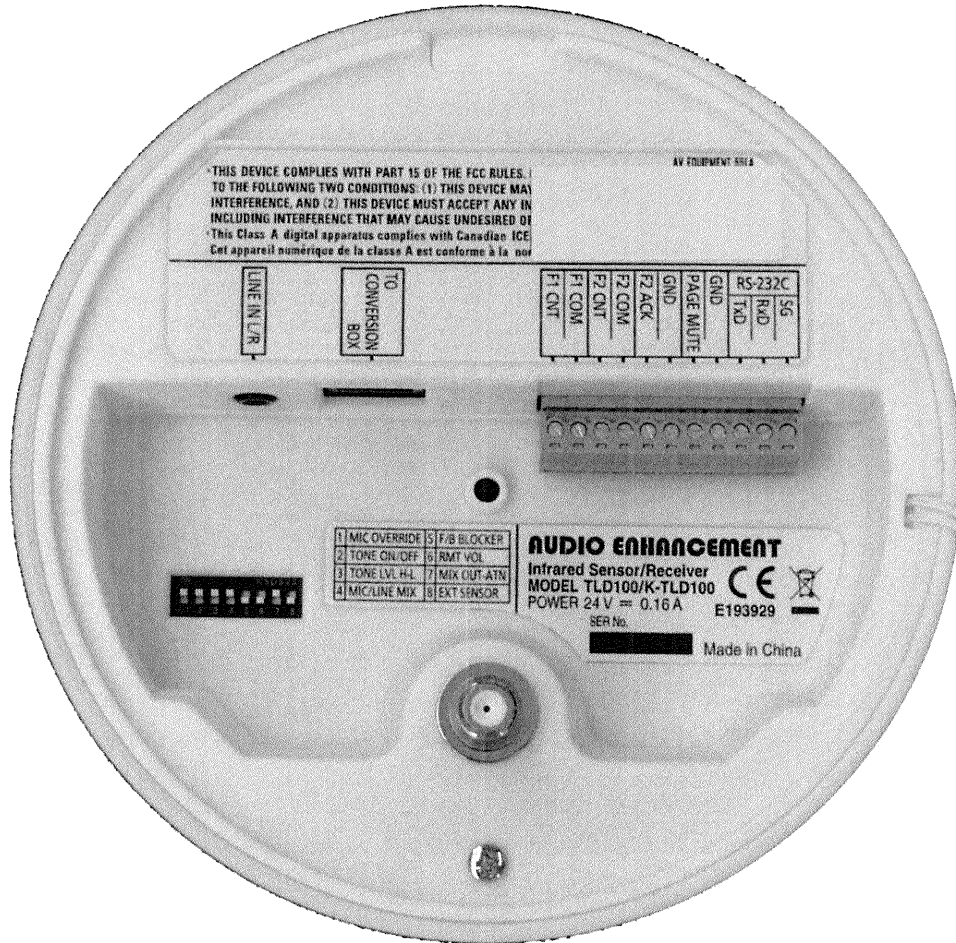


MS-400	Connected to...	Notes
DC Pwr	Power Supply brick	
Line Output 5	Wall Plate Audio Out	1/8" TRSm - 1/8" TRSm 3 cond
Ch A+ Ch A-	2 speakers in parallel	16awg speaker wire
Ch B+ Ch B-	2 speakers in parallel	16awg speaker wire
Port 1 RS232 TXD	SMART LR60wi Control pin 3 wht	3 conductor + shield (20 AWG) stranded Connect shield wires for this cable with the Port 2 cable. Do not attach to amp.
Port 1 RS232 RXD	SMART LR60wi Control pin 2 red	
Port 1 RS232 GND	SMART LR60wi Control pin 5 blk	
Port 2 RS232 TXD	Crestron MPC-M5 COM RX red	3 conductor + shield (20 AWG) stranded Connect shield wires for this cable with the Port 1 cable. Do not attach to amp.
Port 2 RS232 RXD	Crestron MPC-M5 COM TX wht	
Port 2 RS232 GND	Crestron MPC-M5 COM G blk	
Line Input 1	TLD100 or WX-LR200	Cat6
Line Input 3	Projector Line Out	1/8" TRSm - 1/8" TRSm 3 cond
Line Input 4	Wall Plate Audio In	
Ethernet	PoE	Cat6

Observe polarity! Black is common, negative, or ground

1. Program amp configuration to District specs

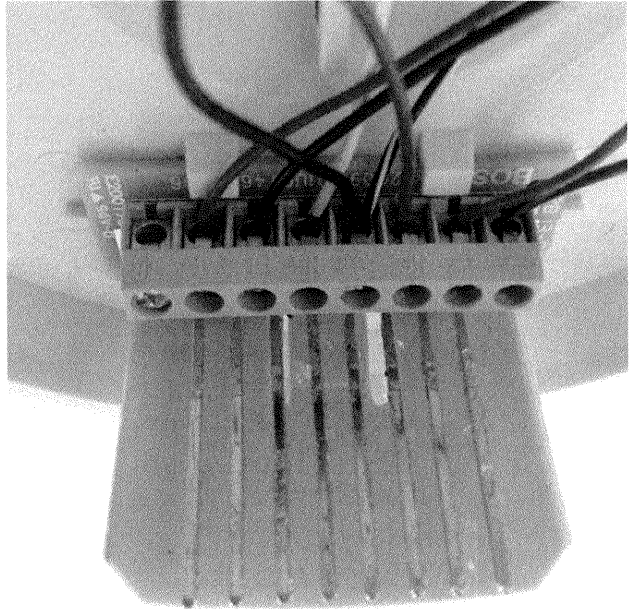
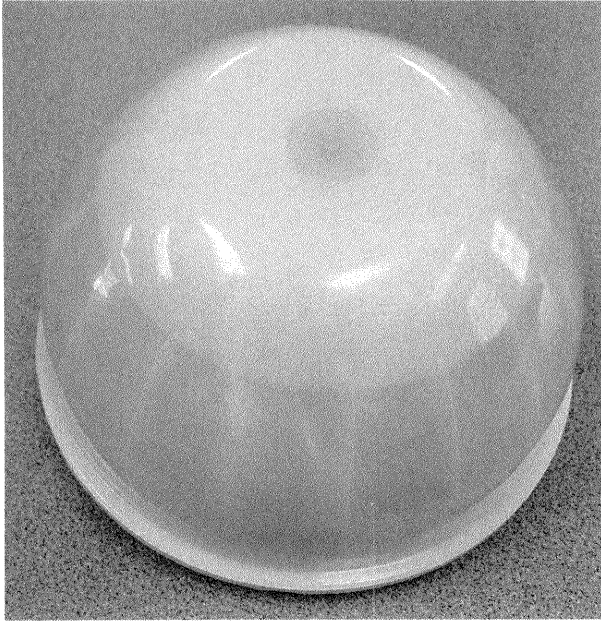
GUSD IR Sensor Audio Wire List for Audio Enhancement TLD100 (Panasonic WX-LR200)



TLD100 or WX-LR200	Connected to...	Notes
TO CONVERSION BOX	MS-400 amp Line Input 1	Cat6 x 3 feet if IR sensor is mounted on BMS plate
F1 COM	Crestron MPC-M5 I/O G blk	2 conductor (20 AWG) stranded
F1 CNT	Crestron MPC-M5 I/O 2	
DIP Switch	1, 2, 4, 7 ON	

Observe polarity! Black is common, negative, or ground

GUSD OCC Sensor Wire List for Bosch DS9360



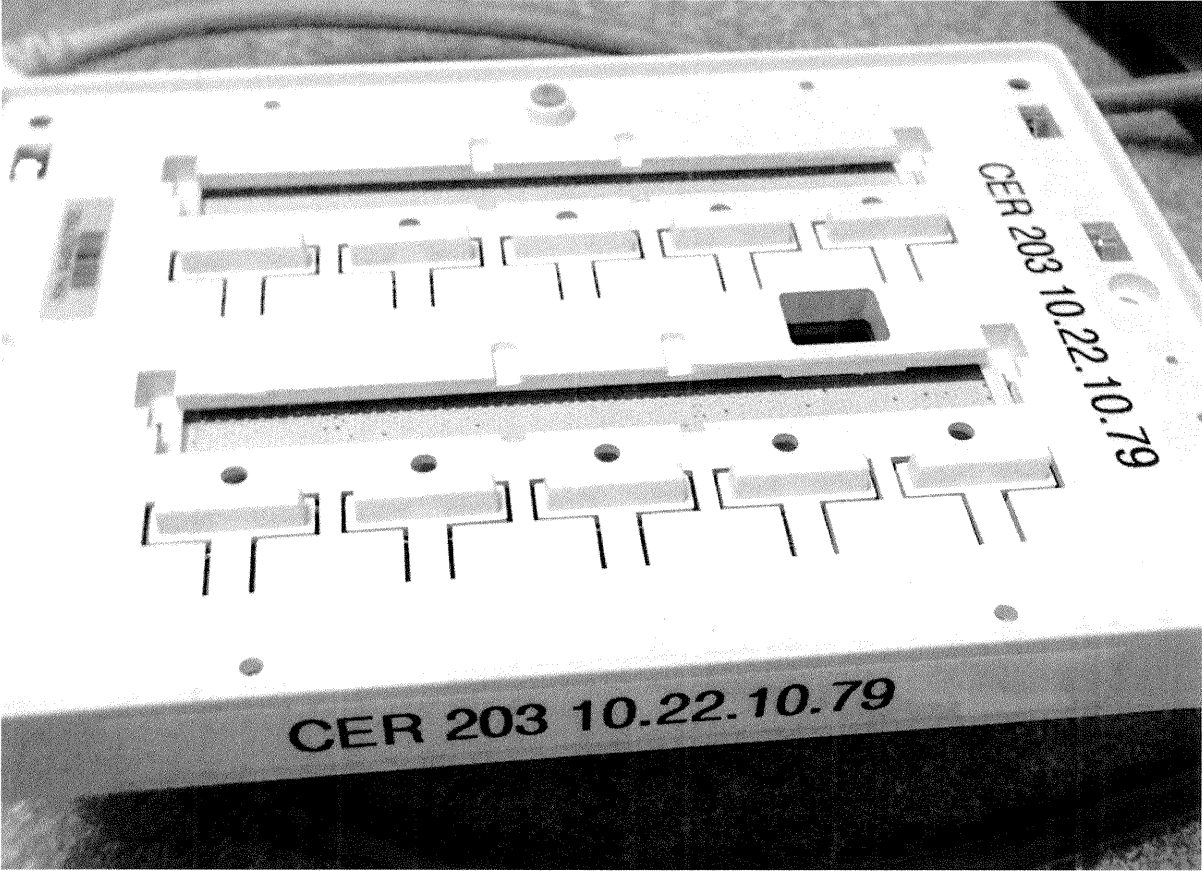
1. Remove sensor module from mounting plate
2. Fish 2 conductor cable through Bosch mounting plate
3. Add black wire to terminal "C". There will be 2 wires when completed
4. Connect signal wire to terminal "NO"
5. Replace sensor module

DS9360	Connected to...	Notes
C	Crestron MPC-M5 I/O G	2 cond 20awg stranded
NO	Crestron MPC-M5 I/O 1	

Observe polarity! Black is common, negative, or ground

Caution: Alarm sub-contractor is responsible for the correct operation of this unit. If installation of cable is done correctly, there will be no impact on the alarm system.

Custom IP Labeling Example



SECTION 27 51 13
PAGING SYSTEM

PART1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other sections for work related to those other sections and required to be included as work under this section.
 - 2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets and descriptive literature for all component parts.
- B. Submit block wiring diagram of the clock and paging systems. Showing head end equipment, terminal cabinets, remote power supplies, and typical clock and speaker for each zone.

1.03 EQUIPMENT QUALIFICATION

- A. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturer's data sheets available at the time of bid-ding this project shall be applicable to the present work as though fully written out herein.
- B. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.
- C. System shall be Bogen Multicom Current compatible series to integrate with existing maintenance and operations standards on the Campus. No substitutions will be approved.

1.04 QUALIFICATIONS

- A. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified sound contractor and shall hold a valid C61 License issued by the Contractors State License Board of California. The system bidder or

Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the brand of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

Comply with pertinent provisions of Section 26 05 00.

2.02 GENERAL

- A. Eight separate paging zones, each of which may be programmed in software to be-long to any combination of zones plus all-call. Initially zones shall be provided and programmed as follows:
 - 1. One zone for each interior speaker.
 - 2. One zone for outside speakers by building.
 - 3. One zone for outside speakers located toward ballfields.
 - 4. One zone for each of the five academies.
- B. The System shall be equipped with one (1) program channel for distribution to any speaker or group of speakers on the system.
- C. System shall include inputs for connection of the telephone system so paging can be initiated from telephones.
- D. System shall include a separate desk type telephone and desk mounted microphone at receptionist desk for paging and announcements.
- E. Head-end equipment shall be housed in a rack constructed of at least 16 ga. heavily steel, heavily reinforced for maximum strength and durability. The rack shall be finished in Baked Enamel and have a hinged and key-locking rear doors for easy access to the equipment by authorized personnel.
- F. Within the rack shall be an AM/FM tuner, cassette tape player, and a compact disc player.
- G. Within the rack shall be a tone generator capable of supplying four separate distinct alarm tones, plus a separate chime signal. The selection of the tones will be software programmable to sound over the systems speakers.
- H. Provide a solid state microprocessor-controlled master clock interfaced with the system to sound class-passing signals. Master clock shall have the following mini-mum features:
 - 1. Capable of storing up to 350 events plus 100 holidays.
 - 2. Automatic Daylight Savings Change.

3. Programmable 8 separate zones.
 4. Each schedule shall have the choice of sounding class-passing signals.
 5. Resets slave clocks automatically after power failure.
 6. Five-year battery back-up shall be provided for time keeping.
 7. Key switch to prevent tampering.
 8. Software selection of user zones.
 9. Capable of operating and correcting both direct read digital and analog synchronous clocks.
 10. Relay outputs.
 11. Output test circuit.
 12. Class-pass time duration shall initially be software programmed as follows:
 - a. Interior circuits-5 seconds.
 - b. Exterior circuits - 15 seconds.
- I. Power amplifiers shall be UL listed, with the following features:
1. Each amplifier shall have than 1% harmonic distortion at its full rated output. Hum and noise level shall be greater than 105dB (A- weighted) below rated output. Frequency response shall be +1dB, 20-20,000 Hz.
 2. Input impedance shall be 20,000 ohms nominal balanced. Controls shall be provided for level control setting. Each amplifier shall be capable of delivering full rated output to 25V or 70.7V constant volt-age lines.
 3. Exterior building-mounted speakers shall be driven by amplifier(s) separate from the interior speakers. Quantity and output rating of amplifiers driving exterior speakers shall be based on each speaker tapped at 3 watts. Provide spare amplifier capacity for the future addition of 25% additional exterior speakers.
 4. Quantity and output rating of amplifiers driving indoor speakers shall be based on each speaker tapped at 1/2 watt. Provide spare amplifier capacity for the future addition of 25% additional interior speakers.

2.03 CABLING

- A. Cable run in conduits below grade shall be approved by the manufacturer for the pur-
pose.
- B. Cable serving speakers shall be a twisted pair of #16 AWG solid copper
conductors with overall jacket.
- C. Provide multiple pairs of 70.7 volt conductors for paging circuits from headend
amplifiers to each building to match system zoning requirements.

2.04 SPEAKERS AND ACCESSORIES

- A. Interior speakers shall be 8-inch diameter paper cone type with line matching transformer. Frequency range to be 30 to 15,000 Hz. Interior wall-mounted speakers shall be flush mounted in Soundolier #198-8 backbox and metallic screw-on grille.
- B. Exterior speaker assembly shall consist of an Atlas #APF-15 series loudspeaker with T-11 transformer in a Soundolier #L20-211NP161-APF backbox and cover or equal. Housing shall include a baffle and shall be painted to match surrounding surfaces.
- C. Provide power supplies in the system terminal cabinets throughout the project as required to properly operate all speakers indicated.

PART 3 - EXECUTION

3.01 MATERIALS

Comply with pertinent provisions of Section 26 05 00

3.02 WIRING DESIGNATION AND TERMINAL CABINET MAKE UP

- A. All connections throughout the system shall be made on barrier screw terminals. All conductors in terminal cabinets shall be carefully formed and harnessed in a work-manlike manner.

3.03 INTERFACE

- A. Provide connection between fire alarm control panel and class-passing equipment and between fire alarm control panel and paging system equipment. In the event of fire alarm alert, the fire alarm shall override the class-passing and paging systems.

3.04 PROGRAMMING

- A. All programming shall be as directed by the District.

3.05 The Contractor shall provide four (4) copies of the complete as-built drawings and service manuals. The drawings and manuals shall include the following:

1. Identification of all components and cable runs in the system. The identification numbers must match those used in construction.
2. Service manuals and schematic diagrams of all active components used in the system.
3. A complete manual must be assembled and organized to permit easy reference and cross-checking and to facilitate future servicing.
4. A complete block diagram.

5. All information shall be printed or typewritten.

3.06 Provide a minimum of two (2), four hour periods to instruct district personnel in proper operation of all systems. The first instructional period shall be held and electronically recorded audio/visually prior to final acceptance of the systems and a DVD of the training turned over to the Director of FASO. The second instructional period shall be within a period of one year after final acceptance of the systems, held at the site during normal working hours, Mon-Fri, upon request of the District, and arranged a minimum of 7 working days in advance.

END OF SECTION

SECTION 27 53 13
CLOCK SYSTEM

PART 1 GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other sections for work related to those other sections and required to be included as work under this section.
 2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets and descriptive literature for all component parts.
- B. Submit block wiring diagram of the clock and paging systems. Showing head end equipment, terminal cabinets, remote power supplies, and typical clock for each zone.

1.03 EQUIPMENT QUALIFICATION

- A. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturer's data sheets available at the time of bidding this project shall be applicable to the present work as though fully written out herein.
- B. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.

1.04 QUALIFICATIONS

- A. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified sound contractor and shall hold a valid C61 License issued by the Contractors State License Board of California. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the brand of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

1.05 GENERAL REQUIREMENTS AND SCOPE

- A. Furnish and install a complete new GPS wireless clock system using Primex Wireless Inc. GPS wireless system or equal by American Time and Signal, Sapling.. All bids shall be based on the equipment as specified herein.
- B. Section includes Transmission Systems GPS Receiver, Primary Transmitter, Satellite Transmitter.
 - 1. Clocks:
 - a. Analog
 - b. Digital

1.06 RELATED SECTIONS

- A. Division 26 – Electrical (120 volt grounded outlet required for transmitter).

1.07 REFERENCES

- A. This Technical Specification and Associated Drawings, Primex Wireless GPS Satellite Time System User Manual.

1.08 DEFINITIONS

- A. GPS: Global Positioning System, a worldwide system that employs twenty-four (24) satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits Universal Coordinated Time, the world's most accurate and reliable time.

1.09 SYSTEM DESCRIPTION

- A. GPS wireless clock system shall continually synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired.
- B. The system shall provide wireless time using GPS and be synchronized to UTC. The system shall not require hard wiring. Clocks shall automatically adjust for Daylight Saving Time
- C. Analog Clocks shall be synchronized to within 10-milliseconds 6-times per day, and the system shall have an internal oscillator that maintains plus or minus one second per day between synchronizations, so that clock accuracy shall not exceed plus or minus 0.2 seconds.
- D. The system shall include an internal clock reference so that failure of the GPS signal shall not cause the clocks to fail in indicating time.
- E. The system shall incorporate a “fail-safe” design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal Operation without the need to reset the system or any component thereof.
- F. Clock locations shall be as indicated, and clocks shall be fully portable, capable of being relocated at any time.
- G. The system must operate in accordance with a “Radio Station Authorization”, Form FCC 601 – LM, granted by the Federal Communications Commission (FCC). This license will be issued to and held by the end user.

1.10 REGULATORY REQUIREMENTS

- A. Equipment and components furnished shall be of manufacturer's latest model.
- B. The end user will hold a license, known as a "Radio Station Authorization" granted by the FCC.
 - 1. This license grants the end user protected use for wireless transmission at the designated frequency.
 - 2. This license will designate a unique "call sign" for each end user.
- C. Transmitter and receiver shall comply with Part 90 of FCC rules as follows:
 - 1. This device may not cause harmful interference, and
 - 2. This device must accept interference received, including interference that may cause undesired operation.
 - 3. Transmitter frequency shall be governed by FCC Part 90.35.
 - 4. Transmitter output power shall be governed by FCC Part 90 257 (b)
- D. System shall be installed in compliance with local and state authorities having jurisdiction.
- E. Operating License: Submit evidence of application for FCC Radio Station Authorization prior to installing equipment. Furnish the license or a copy of the application for the license, to the District/End User prior to operating the equipment. The original license must be delivered to the District/End User.
- F. Samples: Submit one (1) clock for approval. Approved sample shall be tagged and shall be installed in the work at location directed.
- G. Manufacturer's Instructions: Submit complete installation, set-up and maintenance instructions.
- H. Floor plans indicating the location of system transmitter(s), approved by manufacturer, will be submitted to District prior to installation.

1.11 QUALITY ASSURANCE

- A. Permits: Obtain operating license for the transmitter from the FCC.
 - 1. Qualifications:
 - a. Manufacturer: Company specializing in manufacturing commercial time system products with a minimum of 30 continuous years of documented experience including 4 years experience producing GPS wireless time systems.
 - b. Installer: Company with documented experience in the installation of commercial time systems.
 - 2. Prior to installation, a site survey must be performed to determine proper transmitter placement.

1.12 DELIVERY STORAGE AND HANDLING

- A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information.
- B. Store equipment in finished building, unopened containers until ready for installation.

1.13 PROJECT SITE CONDITIONS

Clocks shall not be installed until painting and other finish work in each room is complete. Coordinate installation of GPS receiver for access to the roof or exterior side wall so that the bracket and related fasteners are watertight.

1.14 SYSTEM STARTUP

At completion of installation and prior to final acceptance, turn on the equipment; ensure that all equipment is operating properly, and that all clocks are functioning.

1.15 WARRANTY

Manufacturer will provide a 1-year warranty on GPS receiver, transmitter, and satellite transmitter. All other components will have a 1-year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. GPS wireless clock system shall be manufactured by Primex Wireless, Inc., N3211 County Road H, Lake Geneva WI 53147 (800) 537-0464 Fax (262) 248-0061 www.primexwireless.com.

2.02 SEQUENCE OF OPERATION

- A. Transmitter Operation: When power is first applied to the transmitter, it checks for and displays the software version. It then checks the position of the switches and stores their position in memory. The transmitter looks for the GPS time signal. Once the transmitter has received the GPS time, it sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmitter updates its internal clock every time it receives valid time data from the GPS.
- B. Analog Clock Operation:
 - 1. Apply power or insert batteries. Follow set up procedures detailed in manufacturer's instructions.
 - 2. After initial setup, the clock will shut off the receiver. Six times each day, the microprocessor will activate the receiver and starting with the stored channel, it will again look for a valid time signal. If necessary, the clocks will resynchronize to the correct time.
 - 3. If the clock has not decoded a valid time signal for a pre-determined number of days, it will go to a step mode. Non signal reception can be caused by low battery voltage. If this occurs, replace the batteries.

2.03 EQUIPMENT

- A. General: The clock system shall include a transmitter, a roof or window mounted GPS receiver, indicating clocks, and all accessories for complete operation.

- B. The GPS Receiver shall be a complete GPS receiver including antenna in a waterproof case, designed for roof or outdoor mounting. Provide mounting bracket for attachment to roof structure.
- C. The GPS Receiver cable must be plenum rated where required by local code.
- D. Transmitter: Primex Wireless Model 14400, consisting of wireless transmitter with GPS receiver, a surge suppressor/battery backup, and a mounting shelf. Unit shall obtain current atomic time from satellite. The clock system shall transmit time continuously to all clocks in the system.
 - 1. Transmission:
 - a. Frequency Range: 72.100 to 72.400 MHz.
 - b. Transmission Power: 1 watt (30dBm) maximum c. Radio technology: narrow band FM
 - d. Number of channels: 16
 - e. Channel bandwidth: 20kHz maximum
 - f. Transition mode: one-way communication g. Data rate: 2 KBps
 - h. Operating range: 32 degree F to 158 degrees F (0 degrees C. to 70 degrees C).
 - 2. Transmitter:
 - a. Transmitter output power: +26 to +30 dBm b. Frequency deviation: +/- 4 kHz
 - c. Transmitter power requirements: 120 VAC 60 Hz d. Internal power requirements: 5 VDC
 - e. Carrier frequency stability: +/- 20 ppm
 - 3. Transmitter shall have 16 selectable channels to assure interference-free reception.
 - 4. Transmitter shall have the following switches:
 - a. Time zone adjustment switches for all time zones in the world. Includes: Eastern, Central, Mountain, Pacific, Alaska, and Hawaii.
 - b. Daylight Saving Time bypass switch. c. 12-hours or 24-hours display.
 - 5. Transmitter housing shall be black metal case, 16-3/4 inches (424.4mm) by 12 inches (304.8mm) by 1-7/8 inches (46.4mm) in size.
 - 6. Antenna shall be 46-inches (1168mm) high, commercial type, mounted on top center of transmitter housing. Antenna gain shall be < 2.2 dB. Antenna polarization shall be vertical.
 - 7. Transmitter housing shall incorporate a display which shall include the following:
 - a. Time readout
 - b. AM and PM indicator if 12-hour time display is set c. Day and date readout
 - d. Indicator for daylight savings or standard time
 - e. LED which shall flash red in event of reception problem f. GPS reception indicator
 - 8. Transmitter shall contain an internal clock such that failure of reception from the GPS will not disable the operation of the clocks.
 - 9. Power supply (included):
 - Input: 120 volt AC 50/60 Hz, 0.4 amps. Output: 9 volt DC, 1.5 amps.
- E. Surge Protector/Battery Backup (included).
 - Input: 120 volt AC 60 Hz +/- 1 Hz. Output: 120 volt AC, 500VA, 300 watts

Surge Energy Rating: 365 joules

F. Additional Equipment

1. Wireless Receiver Switches: Switches shall receive time packets from the Primary Transmitter and relay the synchronized time to the Satellite Transmitter connected to it. The unit shall include the following:
 - a. Antenna mounted on top of the switch housing, 11½-inches (292mm) long.
Power Supply:
 - Input 120 VAC 50/60Hz, 0.4 amps
 - Output: 9 volt DC, 1.5 amps RS 232 data cable, 5 feet (1.5mm) long
 - b. Daylight Savings Time bypass switch
 - c. Dimensions: 4¼-inches (108mm) long, 5¾-inches (146mm) wide, 1¼-inches (31.75mm) deep.
 - d. Weight: 12 ounces (.34kg)
 - e. Operating Range: 32 degrees F to 158 degrees F (0 to 70 degrees C)
2. Satellite Transmitters Primex Wireless Model 14401: Satellite Transmitters shall receive the signal from the Wireless Receiver Switches and transmit the signal to the devices in its vicinity, which are out of the range from the Master Transmitter. The unit shall include the following:
 - a. Antenna mounted on top of the housing, 46 inches (1168mm) long.
 - b. Wireless Receiver Switch.
 - c. Power Supply Input: 120 d. VAC, 50/60Hz, 0.4 amps
 - e. Output: 9 volt DC, 1.5 amps. f. 6 foot (1.83m) cord
 - g. Surge Suppressor/Battery Backup
 - h. Mounting Shelf.
 - i. Transmission Power: 1 watt maximum j. 72 MHz frequency.
3. Traditional analog clocks (battery): Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black.
 - a. 12½-inch (317.5mm) diameter analog clock: Primex Wireless Model 14155

4. Additional colors, finishes, and dial faces are available from manufacturer.
 - a. Analog clocks shall be battery-operated,
 - b. Analog clocks shall be capable of automatically adjusting for Daylight Saving Time. An on-off switch located on the transmitter shall disable this function if desired.
 - c. Time shall be automatically updated from the transmitter 6 times per day.
 - d. Analog clocks shall remember the time during changing of batteries.
 - e. 9 inches (228.6mm) and 12.5 inches (317.5mm) analog clocks shall have a tamper proof/ theft resistant clock lock mounting slots.
5. Analog clock receivers shall be as follows:
 - a. Receiver sensitivity: >-110 dBm
 - b. Receiver power: 24 VAC or 120 VAC (see model #)
 - c. Antenna type: internal
 - d. Antenna gain: -7 dBd

If transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded. If signal transmission is not restored after 96 hours, the second hand will "five step" as a visual indicator that the signal has been lost. Should the clocks lose power and signal, the clocks will not function.
6. Wire guards: Provide one for each analog clock as follows:
 - a. Analog clock wire guard Primex Wireless Model 14131, 14-inches by 14-inches (355.6 by 355.6 mm) size, for nominal 12½-inch (317.5 mm) diameter analog clocks.
 - b. Analog clock wire guard Primex Wireless Model 14123, 18-inches by 18-inches (457.2 by 457.2mm) size, for 16 inches (406.4mm) diameter analog clocks.
7. Cable Connection Sealant: Radio Shack Coaxial Cable Connector Sealant 278-1645, or approved electrical grade silicone sealant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that construction is complete in spaces to receive equipment and that rooms are clean and dry.
- B. Verify that 120-volt electrical outlet is located within 6 feet (1.83m) of location of transmitter and the outlet is operational and properly grounded.

3.02 INSTALLATION

- A. Provide all equipment necessary for a complete and operable system.
- B. Transmitter:
Locate transmitter where indicated, a minimum of 2 to 3 feet (.6 to 1 meter) above the floor, away from large metal objects such as filing cabinets, lockers or metal framed walls.

Transmitter(s) will be placed at locations indicated below:

1. Attach receiver to transmitter using cable.
2. Connect antenna to transmitter, using care not to strip threads.
3. Connect power supply to the transmitter. Set the channel number on the display to correspond to the FCC license.
4. Plug power supply into electrical outlet.

C. Analog clocks shall perform the following operations with each clock:

1. Set clock to correct time in accordance with manufacturer's instructions.
2. Observe analog clock until valid signals are received and analog clock adjusts itself to correct time.
3. Install the analog clock on the wall in the indicated location, plumb, level and tight against the wall. If using 12½-inch (317.5mm) clock, attach using clock-lock hanging method and suitable fasteners as approved by clock manufacturer.
4. Wire guards: Secure to wall, using approved theft-resistant fasteners.

3.03 ADJUSTING

- A. Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

3.04 CLEANING

- A. Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer. Remove temporary labels from clock faces. Do not remove labels from backs of clocks.

3.05 DEMONSTRATION

- A. Provide training to District's Representative's on-site staff as well as FASO Maintenance Technicians of at least two (2), two-hour sessions on setting and adjusting clocks, replacing batteries and routine maintenance. A training session shall be scheduled before Beneficial Occupancy, and a training session within one month of Occupancy, as scheduled by the District Representative/ProjectManager/Director of FASO.

3.06 PROTECTION

- A. Protect finished installation until final acceptance of the project.

3.07 TESTING

- A. All devices must be tested at their operational location under normal operational conditions to assure reception of signal.

END OF SECTION

SECTION 28 16 00

INTRUSION DETECTION SYSTEM

PART1 GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other specifications sections and drawings for related work required to be included as work under Division 26 00 00, 27 00 00, 28 00 00.
 2. General provisions and requirements for electrical work.

1.02 QUALIFICATION OF BIDDERS AND EQUIPMENT

- A. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified contractor and shall hold a valid License issued by the State of California Department of Consumer Affairs Collection and Investigation Services for the purpose of installing security systems. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.
- B. The equipment specified herein shall be Bosch Security Systems or equal. Call Bosch at 1-800-289-0096 for a list local factory authorized suppliers.
- C. The system shall be serviced by a field supported 2-year warranty.
- D. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturers data sheets available at the time of

bidding this project shall be applicable to the present work as though fully written out herein.

- E. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.

- F. Installation Certification
 - 1. Work and material for cables, cable terminations and related components shall be performed by certified installers. The installer shall be certified by the respective product manufacturers.
 - 2. The manufacturers of the indicated work and material, shall provide a installer education/training and certification program for the supplied products.
 - 3. The installers performing the Contract work for the indicated products, shall have attended and successfully completed each of the respective manufacturer's installation training education programs for the specified products.
 - 4. Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved prior to initiating any related contract work.
 - 5. Contract material installed and work performed by installers not complying with these requirements shall be removed. Removal of work and material not in compliance with these requirements shall done at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions. New material and work required to replace the non-complying removed work and material shall be provided at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide main control panel, terminal cabinets, keypads, and site underground conduits as indicated.

- B. Provide motion sensor(s) in each room having exterior doors, exterior glass, or skylights. Quantity of sensors in each room shall be as required to detect entry through exterior doors, exterior glass, or skylights.

- C. Provide a magnetic switch at the entry door to each building, near its respective keypad. Connect to the system to initiate a timing circuit for keypad operation. D. Provide magnetic switches at roof hatches.

- E. Provide all conduits, cabling, and outlet boxes required for a complete and operable system.
- F. Meet with representatives of the District at a time and location convenient to the District. Advise the District of programming options and incorporate all requirements onto the shop drawings before submittal to the Architect.

1.04 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit evidence of having met with District representatives as specified herein.
- B. Submit product data sheets for all switches, keypads, wiring devices, device plates, controllers, power supplies, cabinets, etc.
- C. Submit detailed shop diagrams including dimensioned plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts and cabinets.
- D. Submit six (6) copies redrawn building floor plans showing all components of the intrusion detection system including interconnecting cabling and conduits. Sensors shall be located on the drawings in the location conforming to the requirements stated herein. Drawings shall be prepared to scale and show all exterior glass, exterior doors, all interior and exterior building walls, roof hatches, architectural and structural elements relevant to the installation of the system. Each zone shall be shown on the plans.

PART 2 PRODUCTS

2.01 SYSTEM FUNCTIONS

- A. Provide a complete and operable supervised intrusion detection system as shown on the plans including but not limited to master control panel, key pad stations, motion detectors, connections to door switches, a State Fire Marshal listed digital communicator, and an automatic dialer.
- B. Upon detection of an intruder by initiation of any device in the system, the system shall cause the annunciator LED to light and sound an alarm signal on the school's telecommunication system. Alarm information shall be sent by digital dialer to central station alarm monitoring agency.
- C. Systems shall detect the motion of a body taking not more than four steps in an area secured with motion detection equipment where entry doors or windows are possible access.

- D. Each building area shall be on a separate zone with each zone controlled separately so that any building area may be secured while others remain unsecured.
- E. The system shall be capable of off-site computerized access for remote access, programming and control.

2.02 CONTROL PANEL

- A. Control/Communicator panel shall be a Bosch Security System control panel compatible with an integral digital communicator and shall be Underwriters Laboratories listed. All external circuit connections shall be UL listed as power limited in accordance with the provisions of Article 760 of the California Electrical Code (CEC).
 - 1. Provide point of protection (POPEX) modules at the control panel for Popit module supervision.
 - 2. Provide point of protection identification transponders (Popit) modules at building terminal cabinets to individually identify each detector in the system.
- B. The control/communicator shall be IP based.
- C. System shall include the following features:
 - 1. Real time clock and test timer.
 - 2. Battery charging circuit.
 - 3. Battery voltage supervision.
 - 4. Supervised automatic reset circuit breakers.
 - 5. Onboard warning buzzer and diagnostic LEOs.
 - 6. Automatic answer modem.
 - 7. Lightning and RFI protection.
 - 8. Central Station reporting format.
 - 9. Printer/CRT interface module for on-site serial data printer recording or CRT display of events.
 - 10. Quad serial output module for enhanced serial data interface capability for specific accessory modules and devices.
 - 11. Individual zone responses.
 - 12. Custom annunciator text.
 - 13. Audible alarm output, steady or pulsed.
 - 14. Automatic silencing.

15. Attack-Resistant enclosure and lock meeting Underwriters Laboratory Local Burglary requirements.
16. A minimum of eight (8) auxiliary form "C" dry contacts for a variety of programmable responses to alarm and trouble conditions.
17. Transformer enclosure for internal mounting of Class 2 transformer.
18. Two telephone numbers with selective signaling options.
19. Individual zone responses.
20. Automatic test reports.

2.03 Bar-code programmer for diagnostics and programming capability.

2.04 RECEIVER

- A. Receiver shall be Bosch Security System #D6600 Series, UL listed for fire and intrusion detection.
- B. Provide a 50VA Class 2 plug in transformer for power input.
- C. System shall contain 48 hours of standby power utilizing rechargeable sealed lead acid batteries and a battery charger.
- D. System shall be FCC approved for telephone connections.
- E. An alpha numeric LCD display shall indicate account number, area number, time, date, event, zone or point number, line or group number, status and external devices.
- F. 24-hour clock and 128 year calendar.
- G. 40 character line internal printer and interface capability with an external serial printer.
- H. Transmission verification appropriate with the format utilized.
- I. Storage of 249 separate events.
- J. Transmission format shall support the control panel.
- K. Turn the receiver over to the District for central station or campus monitoring.

2.05 REMOTE ACCOUNT MANAGER

- A. System shall be Bosch Security Systems #D5300 series or equal with all equipment necessary for computerized access, programming, diagnostics, and remote control of the system. It shall be possible to remotely change passcodes, locate faults, shunt problem zones, arm and disarm the system, silence alarms, and control the auxiliary output contacts in the control panel.
- B. System shall permit remote diagnostics including utility and battery power conditions, phone line condition, event memory by zone, and current clock and calendar settings.
- C. System shall be 100% IBM compatible for use with personal computers.
- D. System shall include a plug-in modem and software necessary for a complete and operable installation. Furnish the District with a software license agreement for updated software enhancements as they develop.

2.06 KEYPADS

- A. Master keypad shall be Bosch Security Systems #D1260 Alpha V Command Center series or equal capable of displaying system status and controlling the alarm system. Unit shall receive its operating power from the main control panel. Keypad shall be flush-mounted on a wall near the entry doors of each Building. Faceplate shall be brass or stainless steel as selected by the Architect.
- B. Sub-zone keypads shall be Bosch Security Systems #D720 series or equal to allow individual zones to be bypassed. Keypad shall be flush wall where shown on plans Faceplate shall be brass or stainless steel as selected by the Architect.

2.07 Motion sensors shall be Detection Systems Inc. DS774i; Series for wall-mounted types and DS938Z for ceiling mounted types. Sensors shall be dual performance, dual event devices to minimize false alarms or equal passive infrared devices detecting thermal motion signals. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be adjustable Gimbal mounted with plate and outlet box. Provide an attack resistant enclosure DS AE774 at Multipurpose areas.

2.08 Magnetic switch shall be fully concealed in the door frame, Admeco, Sentrol or equal.

- 2.09 Each intrusion detection system terminal cabinet shall contain a power supply for motion sensors and/or POPIT/POPEX (Zonex) modules.
- 2.10 Cabling shall be as required for system operation. All cabling shall be shielded.

PART 3 EXECUTION

- 3.01 All connections throughout the system shall be soldered, crimped by means of AMP lugs, fastened with screw type terminals, made by spring tension clip "punch block" terminals or made by standard plugs and receptacles. Each wire twisted pair or cable shall be tagged throughout the site with EZ Markers with the room number it serves. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.
- 3.02 All system cabling shall be installed in conduit except where wiring occurs above accessible ceilings. Wiring not in conduit shall be UL listed plenum-type cable. All wiring in walls shall be in conduit. All conduits shall be run concealed. Where architecture precludes concealed conduits, run conduits on top of beams or trusses and minimize the exposure to view. Identify on the submittal drawings all locations where conduits must run exposed.
- 3.03 Locate motion sensors to provide optimum coverage of the space and to avoid conflicts with the architectural aesthetics of the building. Submittal drawings shall show the exact locations of all system sensors and keypads for approval by District's maintenance managers.
- 3.04 Coordinate concealed door switch installations with finish hardware manufacturer.
- 3.05 Provide all system programming as required by the District's Electronic Tech's Regional Maintenance Supervisor, including the necessary product handlers, so that all parameters are entered into the system and the annunciator displays a text, which is customized to the facility.
- 3.06 SYSTEM TESTING AND DOCUMENTATION
- A. Before the contract shall be considered complete, the Contractor shall program the system per District requirements and demonstrate the performance of the system in the presence of the District. The Contractor shall provide all test and reception gear required to prove the performance as outlined.
- B. Actuate motion sensing devices and verify that the system performs as specified.

- C. The communication loops shall be opened in at least two (2) locations per building to check for the presence of correct supervisory circuitry.
- D. When the testing has been completed to the satisfaction of both contractor's job foreman and the representatives of the manufacturer and the DSA inspector, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be provided by the contractor and forwarded to the Architect.

3.07 Provide a minimum of two (2), four hour periods to instruct District personnel in proper operation of all systems. Instruction to be arranged in advance at the District's convenience and conducted during normal working hours from 6:30 a.m. to 3:00 p.m. Monday through Friday. Instructors and participants shall sign an attendance sheet of which a copy is to be given to the district Authorized Representative during closeout documentation. The first instructional period shall be held prior to final acceptance of the systems. Instructional training shall be done at the project site and shall be conducted by factory-trained technical personnel. Furnish the District with an electronic audio/visual recording of the first instruction session on a DVD. The second instructional period shall be within a period of one year after final acceptance of the systems, upon request of the District, during normal working hours 6:30 a.m. to 3:00 p.m., Monday through Friday.

END OF SECTION

SECTION 32 01 90
LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 SUMMARY

- A. Extent: Work in this Section includes the growing and maintenance operations necessary to establish the plantings, provide pest and disease control, to maintain the irrigation system and related construction elements.
- B. Related Work:
 - 1. Planting: Section 32 93 00.

1.02 QUALITY ASSURANCE

- A. Reviews:
 - 1. Substantial Completion - At the time major planting, including ground cover, the irrigation system is installed, the Architect will review for a final checklist of minor items to be completed. Once completed, the Maintenance Period shall commence with approval of Architect.
 - 2. Final Review - Contractor shall request a final review of the Project within five (5) days in advance of the proposed date. Failure to request this notice shall automatically extend the date of completion. The maintenance period will continue until final completion is approved by the Architect.

PART 2 - MATERIALS

2.01 FERTILIZER

As specified in Soil Preparation - Section 32 91 13.

2.02 WATER

During the course of construction and maintenance, water shall be paid for by the Owner.

2.03 PRE-EMERGENT HERBICIDE

As recommended by licensed Pest Control Operator, approved by Architect, and in conformance to Healthy Schools Act.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Time Limits: The maintenance period shall commence from the date of substantial completion and extend for sixty (60) days, or until final completion approval.

SECTION 32 01 90
LANDSCAPE MAINTENANCE

- B. Contractor's Responsibility: Work installed under this Contract damaged by vandalism, vehicular damage and/or theft during the installation of the work and up to the Substantial Completion approval, shall be repaired or replaced by the Contractor without costs to the Owner.
- C. Owner's Responsibility: Throughout the maintenance period, these damages and similar factors such as excessive litter, abuse and defacement shall be the Owner's responsibility to repair or replace and shall not be a part of this Contract. No planting shall be guaranteed beyond the maintenance period, except as to conformance to specified species and variety and as specified in Section 32 93 00.

3.02 BASIC REQUIREMENTS

- A. Planting areas shall be kept weed-free at all times during the maintenance period. Pests and disease control shall be the Contractor's responsibility. Planting areas shall be kept at optimum moisture for plant growth. Planting not adequately served by the automatic irrigation system shall be hand watered. Settlement of soil and plants and soil erosion shall be repaired and areas replanted. Dying or deficient plants shall be replaced as they become apparent.
- B. Weeding, Cultivating, and Clean-Up: Planting areas shall be kept neat and free from debris at all times and shall be cultivated and weeded at not more than ten (10) day intervals.
- C. Fertilizer: Initial application shall be as specified in the Planting Section 32 91 13. Second application shall be at a 45-day interval and shall be as specified in Landscape Planting.
- D. Pruning: Prune new trees and shrubs with the direction of the Engineer. Do not remove lower branches from multi-trunk or low branching trees unless directed.
- E. Insect, Pest, and Disease Control: Insects, pests and diseases shall be controlled by the use of approved insecticides and fungicides, as recommended and applied by a licensed pest control operator, and in conformance with Healthy Schools Act.
- F. Replacement Materials: Immediately replace dead or damaged plant materials. Lawns not fully established and healthy shall be repaired or replaced as directed by the Architect. Replacements shall be made to the Specifications as required to match adjacent plantings at no cost to the Owner.
- G. Irrigation:

SECTION 32 01 90
LANDSCAPE MAINTENANCE

1. Schedule and monitor controller stations as necessary to minimize water consumption while still providing adequate water for the plant material.
2. Adjust and clean heads, arcs and redii, valves, and other equipment as necessary including drip system, filters and emitters to maintain the system.
3. Leave schedule of established irrigation schedule at the end of maintenance period in the controller.
4. Review schedule with District Grounds Supervisor and maintenance personnel prior to final payments. Review is to be scheduled with District Grounds Supervisor a minimum of three (3) working days in advance.

3.03 CONDITION OF PLANTING AT END OF MAINTENANCE PERIOD

Ground cover, shrub, and other planting areas shall be free of weeds (broadleaf and grass weeds). Plantings that do not conform to specifications shall be replaced and brought to a satisfactory condition before final acceptance of the work.

END OF SECTION

SECTION 32 17 23

PAINTED PAVING MARKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field application of pavement marking on hot-mix asphalt paving and portland cement concrete paving.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each product specified. Include technical data and tested physical and performance properties. Provide recommended dry film and wet film thickness for each paint product type.
- C. Shop Drawings: Indicate pavement markings for sport courts. Show dimensions of court layouts. This section applies to all sport court markings other than the running track. For running track, see Specification 32 18 23.
- D. Product certificates signed by manufacturers certifying that their products comply with the specified requirements.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of pavement marking material from one source and by a single manufacturer.

- B. Installer Qualifications: Engage an experienced installer who has completed pavement marking similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a covered, clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products specifically formulated for pavement marking by one of the following:
 1. Dunn-Edwards Paints (Dunn-Edwards).
 2. Sinclair Paint (Sinclair).
 3. Sherwin Williams.

2.2 PAVEMENT MARKING MATERIALS

- A. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N, and suitable for use on both hot-mix asphalt and portland cement concrete paving.
- B. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952, and suitable for use on both hot-mix asphalt and portland cement concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.
- C. Pavement-Marking Paint: Epoxy fortified vinyl/acrylic or acrylic-emulsion water-based traffic paint suitable for use on both hot-mix asphalt and portland cement

concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.

1. Colors:
 - a. TBD.
2. Gloss: Flat.
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dunn-Edwards: Vin-L-Stripe W 801 Series.
 - b. Sinclair: Traffic Paint 160 (white), 161 (red), 162 (yellow), and 166 (blue).
 - c. Sherman Williams: Setfast Latex Traffic Marking Paints and Setfast Acrylic Waterborne Traffic Marking Paint.
 - d. Sherman Williams: Setfast Quick Dry Latex Traffic Paint.
- D. Glass Beads: AASHTO M-247 or California State Specification 8010-71L-22.
- E. Surface Cleaning Material: Cleaning agent or agents suitable for removing grease, oil, and other contaminants that will not damage asphalt or portland cement concrete paving and are acceptable to pavement marking paint manufacturer.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to cure for a minimum of 30 days before starting pavement marking. Comply with recommendations of the pavement marking paint manufacturer for longer cure periods.
- C. Sweep and clean surface to eliminate loose material and dust. Ensure all surfaces indicated to receive pavement marking are clean and free from grease, oil, concrete sealers and curing agents, and other contaminants that might interfere with paint adhesion.
 1. Comply with manufacturer's instructions for use of special cleaning agents.

2. For removal of substances that would interfere with paint adhesion use methods recommended by the paint manufacturer if applicable, or methods that will completely remove the substance without damaging or discoloring the underlying pavement substrate.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - E. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates based on substrate type and cure conditions. Do not exceed manufacturer's recommended application rates.
 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).
 - F. Comply with paint manufacturer's maximum drying time requirements before allowing traffic in order to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.
 - G. Paint pavement, curbs, and other surfaces as shown on the Drawings. Painting shall be straight, uniform, exact, and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical, and free of fuzziness.
 1. Edge Tolerance: 1/2 inch in 20 feet, maximum.
 - H. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, CCR. Painted lines and marking on pavement shall be 3" minimum wide. Parking spaces for the disabled shall be marked according to CBC Section 1129B.5. Tactile warning lines shall be in conformance to CBC Section 1133B.8.3 and 1133B.8.4.
 - I. Where work consists of modifications of, or additions to existing pavement marking, match existing color and line width.

3.2 ADJUSTING

- A. Touch up pavement markings not complying with requirements of this Section by painting out the errors with permanently opaque paint of the same color as the substrate pavement.
 1. Block out and eliminate all traces of splashed, tracked, and spilled pavement marking paint from the background surfaces.
 2. Paint over deviations in marking edges exceeding allowable tolerance and apply new marking meeting specified requirements.

- B. The Owner reserves the right to require sandblast removal of extensive defective pavement marking and application of new marking meeting specified requirements at no additional cost.

3.3 PROTECTION

- A. Provide traffic cones, barricades, and other devices needed to protect the pavement marking until it is sufficiently dry to withstand traffic without damage.

END OF SECTION

SECTION 32 18 16.13

PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Removal of existing protective surfacing and correction of grades as necessary.
- B. Resilient, interlocking, playground safety surfacing tiles.
- C. Subbase under resilient surfacing.

1.02 DEFINITIONS

- A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.
- B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292-09.
- C. High Play Activity Area: Areas where the fall height is especially great, such as at swings. A high play activity area is defined only where the protective surfacing of the entire playground area is not designed for the greatest fall height. High play activity areas are defined on the drawings.
- D. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.
- E. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.
- F. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.
- G. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.03 SUBMITTALS

- A. See Section 01 33 13 - Submittal Procedures.
- B. Product Data: For all manufactured surfacing products, provide

manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.

1. Include IPEMA certifications where required.
- C. Product Data: For natural surfacing materials, provide supplier's certification or mill certificate showing compliance with specified requirements.
- D. Shop Drawings: Detailed scale drawings showing locations of existing playground equipment and exposed footings, bases, and anchorage points.
1. Clearly identify footing and base elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing, surveyed by land surveyor licensed in California.
 2. Show locations of underground utilities, storm-drainage system and irrigation system.
 3. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
 4. Show measured fall height for each playground equipment item, determined in accordance with ASTM F1487.
 5. Show Use Zone perimeters, determined in accordance with ASTM F1487.
- E. Samples: Provide actual material samples for each item and color used.
- F. Test Reports: Submit certified test reports from qualified independent testing agency indicating results of the following tests:
1. Impact Attenuation: ASTM F 1292-09.
 2. Freeze Thaw: ASTM C 67.
 3. Rubber Deterioration/Air Oven: ASTM D 573.
 4. Slip Resistance: ASTM D 2047 and E 303.
 5. Tensile Strength: ASTM D 412.
 6. Elongation at Break: ASTM D 412.
 7. Tear Strength: ASTM D 624.
 8. Peak Load: ASTM D 624.

9. Density :ASTM D 3676.
 10. Taber Abrasion: ASTM C 501.
 11. Flammability: ASTM D 2859
- G. Percolation Test Report: Describing test method used and results.
 - H. Certificate of Compliance: Submit manufacturer's certificate of compliance indicating materials comply with specified requirements.
 - I. Manufacturer's Project References:
 1. Submit list of 10 successfully completed projects.
 2. Include project name and location, name of architect, and type and quantity of playground safety surfacing tiles furnished.
 - J. Installer's Project References:
 1. Submit copy of manufacturer issued installation certification
 - K. Maintenance Data:
 1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.
 2. For loose fill surfacing products, provide detailed re-ordering information to enable Glendale Unified School District to match installed material exactly.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.
- B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than ten years of experience.
 1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.
 2. Manufacturer's Representative: Provide name, company name and address, and qualifications.
- C. Installer Qualifications: Company certified by manufacturer for training and experience installing the protective surfacing; provide installer's company name and address, and training and experience certificate.

1.05 PRE-INSTALLATION MEETING

- A. Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
 - 1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
 - 2. Include representatives of Contractor.
 - 3. Notify Architect at least 2 weeks prior to meeting.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store protective surfacing to project site in accordance with manufacturer's recommendations.
- B. Store materials in a dry, covered area, elevated above grade.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Tile Temperature: Ensure surface temperature of playground safety surfacing tiles is a minimum of 50 degrees F (10 degrees C) at time of installation.
- B. Air Temperature: Ensure air temperature is a minimum of 40 degrees F (4 degrees C) for a minimum of 24 hours before and during installation.
- C. Tile or Air Temperatures: Consult manufacturer's installation instructions for modified installation procedure when tile or air temperatures are above 85 degrees F (29 degrees C).

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Materials and Workmanship: Playground safety surfacing tiles shall be warranted for defects in materials and workmanship for 10 years from date of completed installation.
- C. Performance: Playground safety surfacing tiles shall be warranted to meet drop height performance requirements of ASTM F 1292.09 for 10 years from date of completed installation.

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

- A. Because the safety of the playground depends on strict conformance to the design criteria, this information is provided for Contractor's information.

1. The protective surfacing constitutes a resilient layer installed over the subgrade, with the top of playground equipment footings and anchorage devices located below the surface of the subgrade.
 2. The total depth available for protective surfacing, from surface of subgrade, is indicated on the drawings.
 3. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
 4. Use Zone: Protective surfacing to be designed to have a critical height value to meet the maximum fall height for the specified equipment per ASTM F1487 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use, Section 8.
- B. If deviation from specified depth is required, it is the Contractor's responsibility to make all changes required to maintain specified top elevation and required impact attenuation at no extra cost to Glendale Unified School District; obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

2.02 MATERIALS

- A. Tile Surfacing: SofTile KrosLock, DuraSafe Series by SofSURFACES, Inc., wwwsofsurfaces.com, or equal.
1. Tile Size: 24 inches by 24 inches.
 2. Coefficient of Friction, when wet: 0.8, minimum, when tested in accordance with ASTM D2047.
 3. Series: TBD.
 4. Description: Resilient, interlocking, playground safety surfacing tiles.
 5. Compliance: Meet and exceed CPSC guidelines for impact attenuation.
 6. Material: Compression-molded, recycled rubber and binding agents.
 7. Tile Locking: U-shaped male and female configuration on all 4 sides to lock tiles to adjacent tiles.
 8. Top Edges: Chamfered.
 9. Tile Bottom: Hollow core stanchion pattern.
 10. Wear Layer: TBD
 11. Resilient Depth: As required to achieve specified Critical Fall Height as

defined in ASTM F1292.09 but not more than depth indicated; maintain top elevation flush with adjacent grades. Depth to be 2 inches.

12. Color: TBD.
13. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.
14. Test Results:
 - a. Impact Attenuation, ASTM F 1292-09:
 - 1) g-max Score: Less than 125.
 - 2) Head Injury Criteria (HIC) Score: Less than 600.
 - b. Freeze Thaw, ASTM C 67: No deterioration.
 - c. Rubber Deterioration/Air Oven, ASTM D 573: No deterioration.
 - d. Slip Resistance:
 - 1) ASTM E 303:
 - (a) Dry: 51 minimum.
 - (b) Wet: 44 minimum.
 - 2) ASTM D 2047:
 - e. Tensile Strength, ASTM D 412:
 - f. Elongation at Break, ASTM D 412:
 - g. Tear Strength, ASTM D 624:
 - h. Flammability:
 - i. Density, ASTM D 3676:
 - j. Taber Abrasion, Wear index, ASTM C 501:

2.03 ACCESSORIES

A. Corners:

1. Prefabricated outside and inside corners.
2. Material: Same as playground safety surfacing tiles.

B. Ramps:

1. Prefabricated Ramps: "SofRAMP Jr."
2. Prefabricated ADA-Compliant Ramps: "SofRAMP ADA".
3. Material: Same as playground safety surfacing tiles.
4. Adhesive: Furnished by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION FOR REPLACEMENT OF EXISTING LOOSE FILL SURFACING

- A. Remove existing loose fill.
- B. Measure the location of all playground elements, including perimeter of existing protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.
- C. Stake the layout of the entire Use Zone perimeter before starting any work, based on contract documents.
 1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
 2. Do not proceed until revised drawings have been provided, showing corrected layout.
- D. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.
- E. Make surface of subgrade smooth and evenly sloped.
 1. Fill holes and depressions with borrow from same area or soil of similar type.
 2. Make changes to grades as indicated on the drawings.
- F. After subgrade is correct, mark intended depth of surfacing on the base supports of each item of playground equipment using paint or tape in a manner that will be easily verifiable during installation of surfacing.
- G. Perform percolation test at the lowest elevation of the subgrade in the areas to be covered by protective surfacing.
 1. Report results to Architect/PM.
 2. If percolation is less than 1 inch in a 3 hour period, do not proceed.

3.02 EXAMINATION

- A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.
- B. Verify that playground equipment and site furnishings and irrigation system located within playground area are complete.
- C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.
- D. Verify that subgrades are at proper elevations and that smooth grading is complete.
- E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.03 PREPARATION

- A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.
- B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.
- C. Remove rocks, debris, and other similar items.

3.04 INSTALLATION

- A. Install playground safety surfacing tiles in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Ensure prepared subsurface and tiles are dry and clean.
- C. Layout tile surface in accordance with manufacturer's instructions.
- D. Apply adhesive in accordance with manufacturer's instructions for tile-to-tile as well as tile-to-base for all keystone and strategic tile rows.
- E. Installation to be completed by a factory trained and certified installer.

3.05 FIELD QUALITY CONTROL

- A. Installed Surface Performance Test: ASTM F1292.09
 - 1. Perform impact attenuation testing according to ASTM F1292.09 in presence of Owner's representative within 30 days of installation.
 - a. Confirm Impact Attenuation Performance of Surfacing Tiles:
 - 1) g-max Score: Less than 125
 - 2) Head Injury Criteria (HIC) Score: Less than 700
 - 2. Test Equipment Operator Qualifications:
 - a. National Recreation and Parks Association/National Playground Safety Institute (NRPA/NPSI) Certified Playground Safety Inspector (CPSI).
 - b. Trained in the proper operation of Triax test equipment by competent agency.
 - c. Determine compliance with ASTM F 1292.09, unless otherwise specified in this section.
- B. Glendale Unified School District or Glendale Unified School District's representative will inspect playground surfacing after installation to verify that surfacing is of proper type and depth and that playground meets specified design safety and accessibility requirements.
- C. Repair or replace rejected work until compliance is achieved.

3.06 CLEANING AND PROTECTION

- A. Restore adjacent existing areas that have been damaged from the construction.
- B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.
- C. Clean playground area of excess construction materials, debris, and waste.
- D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.
- E. Protect installed products until Substantial Completion.
- F. Replace damaged products before Substantial Completion.

3.07 PROTECTION

- A. Protect playground safety surfacing tiles from foot traffic for a minimum of 12 hours after installation.
- B. Protect completed tiles from damage during construction.

END OF SECTION

SECTION 32 18 23

EXTERIOR ATHLETIC SURFACE COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Installation of acrylic color coating system over concrete and asphaltic concrete pavement for playground and athletic court areas where slip resistance or game markings are required.

B. Related Requirements:

1. Section 32 12 16 - Asphaltic Paving.
2. Section 32 13 13 - Concrete Paving.

1.02 SUBMITTALS

A. Material Samples:

1. Submit chart showing full range of manufacturer's standard colors.
2. Submit Samples of selected colors, minimum 3-inch by 5-inch size.

B. Product Data:

1. List of materials to be provided in accordance with the Specifications.
2. Latest edition of the manufacture's specification and installation instructions for the selected substrate.
3. Letter from the proposed manufacturer stating that the manufacturer has a minimum of five years consistent experience in successfully producing the proposed surfacing system.

C. Shop Drawings:

1. Shop Drawings to show dimensions of court striping layout, width of court striping, and paving surface / striping colors.

1.03 QUALITY ASSURANCE

A. Installer qualifications:

1. Installer shall have at least five years experience in installing materials of types specified, and shall have successfully completed at least three projects of similar scope and complexity.
2. Installer shall submit a letter of certification from the material manufacturer, verifying installer is certified to install the products of this section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Athletic Court Surface Coating:
 - 1. California Product Corporation, Plexipave Surfacing System, Standard, ITF Category 3, Pace: Medium
 - 2. Sport Master Sport Surfaces, Standard ColorPlus System.
 - 3. Or Equal
- B. Line Paint: Striping shall be product of same manufacturer as athletic court surface coating. Compatible product as recommended by manufacturer for system submitted.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Prepare concrete and asphaltic concrete surfaces to receive coatings as recommended by the coating manufacturer. Fill hairline and minor cracks, depressions, and broken or chipped areas as recommended by the manufacturer.
- B. Remove loose surface coatings with a high pressure water wash.
- C. Surfaces to receive coating shall be clean, sound, smooth, and free from dust, dirt or oily residue.

3.02 INSTALLATION

- A. Install prime coat and subsequent coatings in accordance with manufacturer's recommendations for type of use and type of substrate.
- B. Primer: On concrete substrates install one coat of concrete primer.
- C. Acrylic Filler: Install one coat of Acrylic Resurfacer.
- D. Color Base and Finish Coat: Install three coats of base and finish coats according to manufacturer's recommendation for type of play.
- E. Court Markings:
 - 1. Install line paint as recommended by finish coat manufacturer.

3.03 PROTECTION

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

3.04 CLEANING

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

END OF SECTION

ARTIFICIAL TURF BASE CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. It shall be the responsibility of the successful turf contractor to provide all surveying, layout, staking, labor, materials, equipment and tools necessary for the complete installation of a vertically draining porous stone base, drainage system and perimeter edge attachment detail. The scope of the project shall consist of but not necessarily be limited to the following:
 - 1. A vertically draining porous aggregate base consisting of two layers of specifically sized stone. The finishing layer is specifically designed to provide a tight uniform finish surface over the base layer without settlement.
 - 2. A water evacuation system consisting of panel drains in a herringbone design with a properly sized perimeter drain connected to an existing storm system.
 - 3. An appropriately designed perimeter edge detail of recycled plastic, treated wood or concrete.

1.02 QUALIFICATIONS AND SUBMITTALS

- A. The Bidding entity shall meet the following experience criteria:
 - 1. The Bidder must have installed at least five porous stone base and drainage systems.
 - 2. All Bidders shall submit, with the bid, resumes of the Project Manager that will be utilized on the project.
 - 3. All Bidders shall submit, with the bid, a list of 25 completed installations of vertically draining porous stone base and drainage systems completed in the last five years. The list shall include names and phone numbers of the contacts.
 - 4. The Bidder shall provide evidence of a bonding capacity of no less than 10 million dollars from a best-rated surety.
- B. The Bidder shall submit the follow with the bid/proposal:
 - 1. Submit detailed specifications and other descriptive literature, as may be required, to insure the Owner is clear on the scope of the installation and the specific product proposed. Items such as cross-sections, edge detail, seaming plan, inlay and striping plan, drainage plan and proposed slopes may be necessary.
- C. The Bidder shall supply a Warranty on the vertically draining stone base and drainage system that guarantees the usability and specifically states that the installed system is suitable for its intended purpose.
 - 1. The Warranty period shall be one year from the date of substantial completion.

PART 2 - MATERIALS

2.01 GEOTEXTILE MEMBRANE

- A. Provide a semi-pervious geotextile fabric, Mirafi 140 N or equal. An impervious liner can also be used in certain soil conditions.

2.02 STONE AGGREGATE

- A. The stone shall be installed in two layers:
 - a. 5” Open Graded Stone (OGS) base aggregate.
 - b. 1” finish aggregate The aggregate shall conform to the following:

	BASE (OGS)	FINISH
<i>Sieve size</i>	<i>%PASSING</i>	<i>%PASSING</i>
* 1.24”	100	
* 3/4”	70-100	
* 3/8”	35-50	
* 1/4”		100
* 1/8”		80-100
* #4	20-35	
* #8		40-65
* #16	12-20	15-35
#100	2-7	2-7
#200	0-5	0-5

2.03 DRAINAGE PIPING

- A. Panel drains - 1” x 12” Multiflow™ or approved equal.
- B. Perimeter drain (perforated) - properly sized to 8” to 12” diameter, of HDPE, ADS N-12 or equal.

PART 3 - EXECUTIONS

3.01 EXCAVATION AND SUBGRADE PREPARATION

- A. In accordance with the plans approved by the Owner, the entire area shall be excavated. It shall be the Bidders responsibility to stockpile enough suitable material from the existing topsoil to be reused, as necessary, in the restoration process.
- B. All other excavated material shall be properly disposed of, off site or a designated area by owner. The Bidder shall provide the Owner with a cubic yard number for the removal and replacement, with suitable

compactable material, of unclassified material.

- C. The sub grade shall slope .5% toward the perimeter drain and shall not vary more than 1/2" in any 10' direction
- D. The entire excavated area shall be proof rolled to check for any soft spots or un-compacted areas. The sub grade shall test and must achieve a minimum of 98% compaction of a standard proctor.
- E. The geotextile fabric shall be installed over a compacted and prepared sub grade. Seams shall be overlapped a minimum of 12". The geotextile shall extend into and completely wrap the perimeter drainage ditch.

3.02 DRAINAGE SYSTEM

- A. Multiflow™ 1" x 12" panel drains shall be installed and secured over the geotextile, 15' to 30' on center (project specific), diagonally across the playing field in a herringbone design. The drains shall be terminated at the perimeter drain.
- B. A properly sized perimeter drain, 8" to 12" in diameter, shall be installed in a properly excavated ditch, lined with geotextile. The CPPP (corrugated perforated plastic pipe) shall be sloped .05" per lineal foot toward the exit point to the existing storm drain.
- C. One or more 2' x 2' catch basins may be installed at directional changes in the line, at the depth necessary to meet the elevation of the existing storm water evacuation line.

3.03 VERTICALLY DRAINING POROUS STONE BASE

- A. The base (OGS) aggregate layer shall be installed with care to avoid damaging the geotextile or the strip drains.
The stone shall conform to the sieve in Section 2.02, A. The base (OGS) layer shall be 5" thick. The surface planarity shall not vary more than 3/8" in any 10' direction.
- B. The finish aggregate layer is 1" thick and shall be installed in a single layer. The stone shall conform to the sieve in Section 2.02, A. The surface planarity must not vary more than 1/4" in any 10' direction. Enough finish stone shall be installed to insure a full 1" above the base (OGS) aggregate. All stone layers must be rolled in both directions to obtain maximum compaction and settlement.

END OF SECTION

SECTION 32 85 20

ARTIFICIAL TURF

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. General: comply with all of the Contract Documents. B.

Work Included:

- 1. Includes furnishing of all labor, materials, and equipment required for artificial turf surfacing, including vertically draining porous stone, aggregate base, vapor barrier, drainage, striping and line markings.
- C. Related Sections: The following sections are noted as containing requirements that relate to this section, but may not be limited to these listings:
 - 1. Section 31 10 00 – Site Clearing
 - 2. Section 31 20 00 – Earth Moving
 - 3. Section 33 41 00 – Storm Utility Drainage Piping

1.03 ACCEPTABLE MANUFACTURER AND INSTALLER

- A. Sprinturf - An ITS Company. Product is the Basis of Design (Board Adopted Standard 2011)
660 American Avenue, Suite 101
King of Prussia, PA 19406
1-877-686-8873
www.sprinturf.com

1.04 SCOPE OF WORK

- A. Furnish all labor, materials, tools and equipment necessary to install, in place, all artificial turf materials as indicated on the plans and as specified herein. The installation of all new materials shall be performed in strict accordance with the manufacturer's written installation instruction,

and in accordance with all approved shop drawings.

- B. Prior to order of materials, the artificial turf contractor shall submit the following:
 - 1. Product data including independent test lab results.
 - 2. Installation details
 - 3. Sample warranty
 - 4. Field layout and striping plan
 - 5. Color samples
 - 6. Details on construction, especially any details that may deviate from plans and specifications.
- C. Prior to the beginning of installation, the manufacturer/installer of the artificial turf shall inspect the sub base and supply a Certificate of Subbase Acceptance for the purpose of obtaining a manufacturer's warranty for the finished artificial playing surface.
- D. Prior to final acceptance, Contractor shall submit to the District three (3) copies of the maintenance manuals, which include necessary instructions for the proper care and preventative maintenance of the artificial turf system, including painting and striping.

1.05 SHOP DRAWINGS

- A. Shop drawings shall be prepared at the scale of the construction documents and contain all pertinent information regarding installation. These drawings shall be submitted to the District for approval prior to the manufacturing and shipment of materials.
- B. Submit drawings for:
 - 1. Installation details, edge details, other inserts and covers, etc.
 - 2. Striping plan, layouts showing any field lines, markings and boundaries, and field logos per project drawings.

1.06 DESCRIPTION

- A. These specifications relate to general areas for the Sports Surfacing Systems, which must be completed for proper installation of materials furnished by Sprinturf.
- B. The furnishings of material and/or complete installation of the Sport Surfacing System including: vertically draining porous stone, aggregate base, drainage system, material layout, seaming of material, marking of sports surface, installation of any impregnated layer, trimming of materials

and edge attachment are included in the Sports Surfacing Systems scope of work.

- C. Permeable Aggregate Bases: The General Contractor shall furnish and install the aggregate base depressing the base sufficiently to accommodate the Sports Surfacing System. The base shall be laser graded and compacted smooth to a tolerance of 1/4" in any 10' radius by the General Contractor. High spots shall be graded level, and low spots filled in with additional material and sufficiently compacted to be uniform with the entire base by the General Contractor to the full approval of Sprinturf or an authorized installer of Sprinturf.

1.07 STANDARD EQUIPMENT AND GAME INSERTS

- A. Standard inserts are to be provided by Sprinturf or approved by Sprinturf prior to installation. Standard inserts are to be installed by the General Contractor to Sprinturf specifications. Standard inserts are to be elevated or depressed based on the Sports Surface System being utilized. All standard inserts must be installed using a suitable size foundation and are to have adequate drainage from the depth of the insert.

1.08 THRESHOLDS

- A. The General Contractor and District Representative are jointly to identify all areas of egress from and to the Sports Surface System. These threshold locations are to be depressed to allow a level smooth and clean transition between surrounding surfaces and the Sports Surfacing System as provided by Sprinturf.

1.09 QUALITY ASSURANCE

- A. Manufacturer: Manufacturer of the Sports Surfacing System shall be a firm specializing and experienced in manufacturing products specified in this section. The manufacturer must have been in business for a minimum of 10 years and under the same ownership, and/or in business equal or more years than the warranty offered on the product, which ever is greater.
- B. Installer: The complete installation of the Sports Surfacing System, as described in the scope of these specifications and herein, shall be carried out by Sprinturf or a Sprinturf authorized installer.
- C. Performance Testing: The Sports Surfacing System shall have been independently tested and evaluated for athletic performance according to American Standard Testing Methods (ASTM).
- D. The artificial turf installer/manufacturer shall have the experience of at least twenty (20) acceptable installations of full-size football or soccer fields (minimum of 70,000 s.f.) in the United States within the past five (5) years of tufted, slit film polyethylene grass-like fabric that are infilled with SBR rubber or a layered system of 30% sand and 70% rubber. Provide this listing with the bid.
- E. The turf contractor shall employ only qualified, experienced supervisors and technicians skilled in the installation of the specified system.

- F. The turf contractor shall meet the following criteria:
1. Possess an active Class A California Engineering license in good standing, and have never had a license revoked.
 2. Have not had a surety or bonding company finish work on any contract within the last five (5) years.
 3. Have not been disqualified or barred from performing work for any public District or other contracting entity.
- G. The average G-max of the finished system shall be as follows:
1. All rubber: Under 150 G's for the life of the warranty.
 2. Sand and rubber: Under 175 G's for the life of the warranty.

1.10 FIELD QUALITY CONTROL

- A. Prior to installation, during installation, or at completion of installation of the artificial surfacing, if there is any question or doubt about the quality of formulation of the material, the product shall be tested. Any material failing to meet specifications will be replaced with new material at Contractor's expense.
- B. The Contractor shall, with the presence of the District, inspect the field surfacing each year until the end of the eight (8) year warranty period, or at any time requested by the District. Any defects in workmanship or materials (at no fault of the District) shall be repaired at the expense of the Contractor to the satisfaction of the District.

1.11 SUBMITTALS

- A. Product Data
1. Standard printed specifications of the artificial surfacing system that is being installed.
 2. Installation process and requirement for permeable aggregate base and any conditions that may limit the artificial surface installation or affect quality of installation.
 3. Submit manufacturer's product specifications and installation instructions for each track and field equipment item.
- B. Submit an affidavit attesting that the surfacing material to be installed meets the requirements defined in the manufacturers currently published specifications and any modifications outlined in these technical specifications prior to the commencement of work.
- C. Specification Sheets: Submit Sprinturf specification sheets.

- D. Samples: Submit one sample of specified Sports Surfacing System, if requested by Architect. Color sample may fluctuate slightly based on normal manufacturing tolerances.

Artificial Surfacing and Color: Submit a products sample 12" x 12" in size, the same color, texture, thickness, etc. of the same type of surfacing to be installed for this project. This must be a representative sample of the product. This sample must be submitted and approved by the District, prior to installation. At completion of the project this sample shall be used to judge the quality of the installed product.

- E. Maintenance Literature: Upon completion of the Sports Surfacing System installation, and execution of the Workmanship Satisfactory Acceptance Certificate, Sprinturf will send to the District, attendants or individuals in charge and responsible for the upkeep of the surface a care card. This care card spells out care and maintenance instructions.

- F. Shop Drawings: Submit plans, elevations, sections and details of custom-fabricated units and of assembled units made up of manufactured equipment. Show required substructures by size and location. Connections to structural elements shall be completely detailed. Submit a diagram/drawing depicting and identifying all line markings:

1. A key to the color codes
2. A chart for all symbols
3. Labels for all events.

- G. Warranty Certificate: Upon completion of the Sports Surfacing System installation, and execution of the Workmanship Satisfactory Acceptance Certificate, Sprinturf will send to the District, attendants or individuals in charge and responsible for the upkeep of the surface a Warranty Certificate.

1.12 EXISTING CONDITIONS

- A. If the surface on which the new artificial turf system is to be placed is a new base of porous aggregate, the Artificial Turf Contractor will be responsible for any damage to the sub base during installation of the artificial turf system after the deficiencies (if any) have been corrected as noted on the Certificate of Subbase Acceptability.

1.13 SCHEDULE

- A. Turf Contractor shall complete all work on the artificial turf system in accordance with the published project schedule.

1.14 SURFACE AREA

- A. The contractor is to verify all measurements.

1.15 UTILITIES

- A. General Contractor will supply necessary water, adequate lighting and electricity for installation.

1.16 WORKING CONDITIONS

- A. Preparation Work
 - 1. Outdoor Preparation Work: The Sports Surfacing System specified herein shall not be installed until all underground work, drainage, access and other work requiring access onto or over the Sports Surfacing System area has been complete. The trim and/or edge materials must be completed prior to the start of the Sports Surfacing System and ready to receive the Sports Surfacing System.
- B. Vertically Draining Permeable Aggregate Base: The base must be completed and approved by Sprinturf prior to the start of the Sports Surfacing System installation.
- C. Access: The installation of the Sports Surfacing System shall not begin until all sub-contract work, which would cause damage, dirt, dust or interruption of normal installation pace is complete. The General Contractor is to provide proper access to the area to be surfaced.

1.17 WARRANTY

- A. Materials: The materials shall be under warranty for a period of eight (8) years, unless otherwise stated on the Warranty Certificate, and further as described in the Warranty Certificate.
- B. Installation: The installation shall be under warranty for a period of eight years, unless otherwise stated on the Warranty Certificate, and further as described in the Warranty Certificate.
- C. Certificate: The Warranty Certificate is the final expression of warranty for the product sold. The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether express or implied, including, but not limited to any implied warranties of merchantability of fitness.
- D. The contractor shall submit its Manufacturer’s Warranty which guarantees the usability and layability of the artificial turf system for its intended uses for an eight (8) year period commencing with the date of Substantial Completion.
 - 1. The warranty submitted must have the following characteristics:
 - a. Must provide coverage for eight (8) years from the date of Substantial Completion.
 - b. Must warrant materials and workmanship.

- c. Must warrant that the materials installed meet or exceed the product specifications.
- d. Must have a provision or make a cash refund or repair or replace such portions of the installed materials that are no longer serviceable to maintain a serviceable and playable surface.
- e. Must be a manufacturer's warranty from a single source covering workmanship and all self-manufactured or procured materials.
- f. Must provide a third party insured or bonded warranty. g.

The average G-max of the finished system is as follows:

- a. All rubber: Under 150 G's for the life of the warranty.
- b. Sand and rubber: Under 175 G's for the life of the warranty.

In order to maintain the G-max, the Owner shall be required to maintain the synthetic grass by following the recommended maintenance and grooming procedures contained in the Sprinturf Maintenance Manual, provided to the Owner.

1.18 QUALITY ASSURANCE

A. Qualifications (Equipment)

- 1. Equipment in this section that is furnished by the Contractor shall be installed under the direct supervision of an authorized representative, or in strict compliance with printed instructions of the manufacturer of the equipment. Installer shall have successfully completed twenty (20) installations similar to that specified in this section.
- 2. Where indicated, units of equipment require shop/field custom fabrication, provide units fabricated and installed by shops which are skilled and which have a minimum of five (5) years experience in similar work.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Adhesive

- 1. HGS Adhesive – HGS is specified for all removable systems and Velcro adhesive, HGS, one-component adhesives are to be utilized in the completion of this Sports Surfacing System. One-Component adhesives provide a consistent chemical mixture and guarantee a professional bond. The GHS adhesive is to be a high green strength, high solids, and curing urethane adhesive. The adhesive is to be water resistant and must have minimum

peel strength of 40 lbs per inch wide at 75 degrees Fahrenheit. The adhesive is to be applied utilizing a model 7400 Graco sprayer with appropriate nozzle.

2. EC847 Adhesive – EC847 is the one component nitrile rubber based adhesive that is to be utilized in the completion of this Sports Surfacing System. One-component adhesives provide a consistent chemical mixture and guarantee a professional bond. The adhesive is to be water resistant and must have minimum peel strength of 40 lbs per inch wide at 75 degrees Fahrenheit. The adhesive is to be applied manually utilizing a 3/16” notched trowel. The adhesive is to have a bonding range up to 15 minutes and must be heat resistant (uncured) to 160 degrees Fahrenheit.
- B. Seaming Tape: Codura seaming tape is to be constructed of high tenacity, urethane coated, woven nylon. The manufacturer is Dupont. The Denier is to be a minimum of 500 by 1000. The Cordura seaming tape is to have a minimum of 2 oz. Urethane water resistance layer applied to its underside during manufacturing.
- C. Sports Surface (Sprinturf Ultrablade MM™)
1. Yarn – Polyethylene Mono-Spinneret 11,000 Denier, Mono-Tape 8000 Denier
 2. Pile Fiber Weight – 44 oz/YD²
 3. Primary Backing – Stabilon™ (Triple Backing) – 8.7 oz/YD²
 4. Secondary Backing – Polyurethane – 22 oz/YD²
 5. Tufting – Gauge 3/8” – StitchRate 10/3” – Pile Height 2.25”
 6. Total Product Weight – 77 oz/ YD²
 7. Colors – Green fiber blend. (Final color per District direction)
- D. Impregnated Layer – Rubber & Sand Mixture: The impregnated layer specified for this Sports Surfacing System must be 70% granulated rubber from tires and 30% kiln dried sand. Granulated Rubber: The granulated rubber is to be free of metal and fiber. The mesh size of the granulated rubber must be 14/30. The kiln-dried sand mixed in the impregnated layer specified for this Sports Surfacing System must be 100% kiln dried sand. The kiln-dried sand must be clean, dry, rounded silica sand. The mesh size of the kiln-dried sand used in the impregnated layer is completed with a mixture of 70% granulated rubber and 30% kiln dried sand. This mixture must be combined and mixed prior to application, using a professional method, to ensure consistency and uniformity. The mixture must then be spread in such a manner to ensure the authenticity of the mixture.
- E. In-Laid Line and Marking System: This Sports Surfacing System has been specified to have an in-laid line marking systems for optimum performance. In-laid line and marking systems are to be created using the same material specifications and are to be inset in such a manner to ensure a good bond, an even finished surface and physical strength equal to the material prior to

introduction of the line and marking system. F.

Trim and Edge (Per Plan Details)

1. Header Boards: Black Rhino Recycling Solid Structural Composite Wood as designated.
2. Field Edge Trim – Ramping: A pre-cast field edge trim ramping is utilized to transition from the existing base to the Sports Surfacing Surface. The field edge trim is produced in 96” by 12” strips. This field edge trim ramping is to be constructed utilizing the highest grade Ethylene Propylene Diene Monomer Rubber material and a UV stabilizer with a minimum of five (5) years. Custom thicknesses are available, ranging from 0.6” to 4” (15-100 mm). These field edge trim ramps have shock attenuation (ASTM F1292) Gmax less than 200, head injury criteria less than 1000. The tensile strength (ASTM D412) is to be 60 PSI (413 Kpa). The tear strength (ASTM D624) is to be 140 lbs per inch. The field edge trim ramping is to have good water permeability. The elasticity layer must bypass ASTM D 2859 standard test method for flammability of finished textile floor covering materials. The field edge trim ramping is precast and can be applied over concrete or asphalt sub floors that are level and uniformly sloped since variations in grade will be accentuated by the trim. The field edge trim ramping is fastened using Tapcon fasteners.
3. Vinyl Edge Guards: The vinyl edge guard that has been specified for this Sports Surfacing System is Johnsonite. Johnsonite vinyl transitions, reducers, adapters and edge guards are available in various colors and for various applications. Vinyl edge guards are fastened using Tapcon fasteners.

H. Fasteners

1. Tapcon: 3” Tapcon fasteners are required to fasten the vinyl edge guard pursuant to manufacturer’s recommendations (4” o.c. unless noted otherwise).
2. Staples: The staples for Sports Surfacing Systems are industrial strength pursuant to manufacturer’s recommendations.

I. Materials shall be tufted, slit film polyethylene grass-like fabric coated with a secondary backing of high-grade polyurethane. The fibers shall be tufted to a finished pile height of approximately 55 mm. The turf fabric shall be filled with a layered system of 30% silica or fractured sand and 70% ambient rubber.

J. All components and their installation method shall allow for use on outdoor athletic fields. The materials as hereinafter specified, shall withstand full climatic exposure in all climates, be resistant to insect infestation, rot, fungus and mildew; to ultra-violet light and heat degradation, and shall have the basic characteristic of low through-drainage allowing free movement of surface run-off through the turf fabric where such water may flow to the existing sub base and into the field drainage system.

K. The finished playing surface shall appear as mowed grass with no irregularities.

L. Pile yard (polyethylene) shall be a proven athletic caliber yarn designed specifically for outdoor use and stabilized to resist the effect of ultraviolet degradation, heat, foot traffic, water and airborne pollutants. The pile fiber shall possess the following physical characteristics:

1. Yard Denier Mono-Spinneret 11,000 Denier, Mono-Tape 8000 Denier **
2. PE Pile fiber Weight 44 ounces per sq. yd.**

**Pile yarn characteristics nominal +/- 5%

M. The pile fabric shall possess the following physical characteristics:

1. Finished Pile Height 2.25 inches**
2. Pile Yarn Thickness 235 microns (Spinneret)
115 microns (Mono-Tape)
3. Primary Backings 8.7 ounces per sq. yd.**
4. Secondary Backing 22 ounces per sq. yd.**
5. Tuft Gauge 3/8"
6. Tuft Bind Strength >10 pounds force

N. Infill material shall be layered system of silica or fractured sand and ambient rubber consisting of no more than 30% sand and 70% rubber in accordance with the manufacturer's recommendations and the District's preference.

O. Perimeter and interior edge details, underground storm sewer piping and connections, required for the system are detailed on the plans.

PART 3 - EXECUTION

3.01 GENERAL

- A. The installation shall be performed in full compliance with approved shop drawings.
- B. Only factory-trained technicians, skilled in the installation of athletic caliber artificial turf systems working under the direct supervision of the artificial turf manufacturer's installation supervisor shall undertake the placement of the system.
- C. The surface to receive the artificial turf shall be inspected and certified by the turf manufacturer as ready for the installation of the artificial turf system and must be perfectly clean as installation commences

depression, voids and irregularities. Install impermeable liner in accordance with liner and shall be maintained in that condition throughout the process.

3.02 EXCAVATION

- A. A single benchmark shall be established prior to any excavation and maintained by a licensed surveyor of record during the entire construction process. The sub-grade under the permeable aggregate base shall be prepared according to Specification Section 02200 Earthwork and Grading.
- D. The subgrade shall be constructed using approved select-fill material. This material shall be placed in lifts not greater than 6" in depth. Each lift (layer or course) shall be compacted separately. The moisture in the soil, at the time of compaction, shall be uniformly distributed and should be within 90 and 120% range of the optimum. Within these limits, the geotechnical engineer will determine the proper moisture level to be used, by standard proctor. (*)

(*) ASTM Test Method D698

- E. The select-fill material in the first layer shall be rolled until the course has been uniformly compacted to a minimum 95% of the maximum density. The second and succeeding courses shall be placed and mixed and then compacted as specified in the first course.
- F. The finished surface of the subgrade shall have a finished grade in accordance with the Plans and Specifications. The subgrade shall be established to within a tolerance of +/- 1/2" of the designed subgrade elevation.
- G. Excavate perimeter drainage collector trenches per the detailed plans and at a minimum of 18" wide and 20" deep. The trenches should be excavated with a minimum of 0.5% slope starting from the high point of the drainage system extending toward the storm drain connection outlet point(s). Design of the collector trenches should incorporate the following:
 - 1. All loose debris shall be removed from the trenches.
 - 2. The trenches shall then be compacted by hand tamping (or equivalent machinery) to a minimum 95% of the maximum density. (**)

(**) ASTM Test Method D698

3.03 UNDER DRAIN SYSTEM

Impermeable Liner – Entire Sports Field Area

- A. Verify surface elevations of the finished subgrade. The surface elevations must conform to the elevations shown on the drawings.
- B. Prior to under drain system construction, the subgrade surface is to be uniform and free of

manufacturer's written recommendations. Liner shall be UV resistant and shall have the following minimum properties:

PROPERTY REQUIREMENTS	TEST METHOD	
Appearance		Black/White
Nominal Thickness		12 mm
Weight per 1,000 sq ft		42 lb
Tensile Strength	ASTM D751-88	10,000 psi
% Elongation		40%
Grab Tensile	ASTM D751-89	220 lbs
Tongue Tear	ASTM D751-89	62 lbs
Trapezoid Tear	ASTM D751-89	37 lbs
Hydrostatic Bursting Point	ASTM D751-89	123 lbs
Mullen Burst	ASTM D751-89	250 lbs
Puncture	FTMS 101 C (Method 2065)	73 lbs
Dimension Stability	ASTM D1204	+/-3%

1. The liner should be placed in the perimeter trench first. The trench liner should be separate from the liner on the field. Overlap field and trench sections a minimum of 18" in the direction of water flow.
2. Overlap joints a minimum of eight inches. All laps shall be overlapped in direction of water flow.
3. Place a suitable amount of ballast on the liner to prevent movement by wind. The ballast shall be in a form which will not damage liner.
4. Direct loading on the fabric by traffic shall not be allowed. A minimum of 6" of material cover must be placed prior to traffic.
5. Punctured or torn fabric shall be repaired by overlapping additional fabric and jointing in accordance with manufacturer's recommendations.
6. The liner must completely line the perimeter trench in a continuous manner.

3.04 PERIMETER COLLECTION DRAINS

- A. Place all under drainpipes in the perimeter collector trenches per Civil Drawings and Details. The centerline of the pipe shall coincide with the centerline of trench. The pipes shall be per drainage specification section 02720 and capable of withstanding the anticipated loading without deformation.

Note: See Civil Engineering Plans for layout and elevation.

1. A minimum of 2" of 1-1/2" diameter (minimum) clean, drainable crushed stone

aggregate shall be placed in the bottom of the collector trenches, on top of the moisture barrier. The crushed stone aggregate should be compacted suitably.

2. Place a minimum of 4" of 1-1/2" diameter (minimum) clean, crushed stone aggregate on the sides of the under drain pipes and headers, and 6" minimum of the aggregate on top of the pipe network. Compact suitably.

B. Refer to Section 02860 – Sports Field Equipment.

3.05 AGGREGATE LAYER

- A. Aggregate or aggregate blends acceptable as a processed stone drainage course shall conform to the following gradation:

Sieve	Sieve Sizes Metric (mm)	Percent Passing by Weight
1-1/2"	38.1	100
1"	25.4	95 – 100
3/4"	19.0	80-100
1/2"	12.7	60 – 80
3/8"	9.52	30 – 50
No. 4	4.75	20 – 40
No. 8	2.38	10 – 30
No. 40	0.42	5 – 17
No. 200	75 mm	1 - 4

Aggregate acceptable for Top Stone binder/leveler shall meet the following gradation criteria:

The permeable base shall be two layers of crushed stone, a base stone of a minimum of 4" and a top stone of 2", which meet the following gradation criteria:

% PASSING			
<u>Sieves</u>	<u>Base Stone Type 1*</u>	<u>Base Stone Type 2*</u>	<u>Top Stone</u>
2"	100		
1-1/2"	90-100		
1"	75-100	100	
3/4"	65-95	90-100	
1/2"	55-85	80-100	100
3/8"	40-75	70-100	85-100
1/4"	25-65	60-90	75-100
#4	15-60	50-85	60-90
#8	0-40	30-65	35-75
#16	0-20	10-50	10-55

#30	0-10	0-35	0-40
#60	0-8	0-15	0-15
#100	0-6	0-8	0-8
#200	0-5	0-2	0-2

*NOTE: Either Type 1 or Type 2 Base Stone is acceptable, depending on availability.

RESTRICTIONS:

To ensure structural stability: $D_{60}/D_{10} > 5$ and $1 < \frac{D_{30}^2}{D_{60}D_{10}} < 3$

To ensure separation of both stones:
 $\frac{D_{85} \text{ of top sand}}{D_{15} \text{ of base stone}} > 2$

And $3 < \frac{D_{50} \text{ of base stone}}{D_{50} \text{ of top sand}} < 6$

To ensure proper drainage:
 Permeability of top stone > 10 in/hr (0.007 cm/sec)
 Permeability of base stone > 50in/hr. (0.035 cm/sec)
 Porosity of both stones > 25%
 (When stone is saturated and compacted to 95% Proctor.)

Depending on the type of rock present in the crushed stone mix, other mechanical characteristics might be necessary for approval.

“Dx” is the size of the sieve (in mm) that lets pass x% of the stone. For example D60 is the size of the sieve that lets 60% of the stone pass. These sizes, for calculation purposes, may be obtained by interpolation on a semi-log graph of the sieve analysis.

D. Soft limestone and shale materials are not suitable. Questionable materials should be evaluated using a sulfate soundness test (ASTM C-88 and LA Abrasion Test (ASTM C-131)).

Test Method	Criteria
Sulfate Soundness (C-88)	Not to exceed 12% Loss
LA Abrasion (ASTM C-131)	Not to exceed 40

3.06 TESTING PROTOCOL

A. The testing agent must be accredited by the American Association for Laboratory Accreditation (A2LA) and must have at least five years experience in similar projects and test protocols. The testing agent must be A2LA accredited to perform all of the following testing protocols:

1. ASTM C 136: Sieve Analysis of Fine and Coarse Aggregates

2. ASTM D 854: Specific Gravity of Soils
3. ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock
4. ASTM D 4972: pH of Soils
5. ASTM D 1632: Standard Test Method for Particle Size Analysis and Sports Field Root Zone Mixes.
6. Water Release Characterization
7. Infiltration Rate (Saturated Hydraulic Conductivity (KSAT))

B. The crushed stone samples shall initially be submitted to the District's Representative and Sprinturf for testing and approval 45 calendar days prior to scheduled placement on the playing fields. Sprinturf must provide written approval to the District and Contractor that the Permeable Aggregate Base meets and /or exceeds their requirements for use under their sports turf product. Contractor shall not import any Permeable Aggregate Base to the site without prior written acceptance of the base material by Sprinturf.

The Contractor shall include the following items:

1. Identification of proposed source and supplier.
2. Current lab mechanical analysis of the proposed stone using standards for sieve analysis.
3. Sample sizes as determined by the District or District's Representative.
4. Certification that the supplier can deliver the total quantity of material needed to complete the project in a timely manner.

C. All crushed stone must come from one supplier only. During construction, samples will be taken and analyzed periodically by the District or District's Representative to assure strict compliance with the specifications. The District shall have the option of sampling and testing either at the source or from incoming trucks at the project site. Material delivered to the site not meeting specifications shall be rejected by the District. All material rejected by the District shall be removed from the site at the Contractor's expense.

D. The Contractor shall initially submit a one-gallon sample of each size of crushed stone. The District's testing agent will evaluate these materials for conformance to material specifications. The criteria for the accepted submittals will become the basis for the acceptance or rejection of materials during the quality control phase of the project.

E. Quality Control Testing during construction shall be as follows:

1. The surface of the processed stone course shall be well drained at all times. The permeability of the aggregate shall be checked per Din 8035 Part 7 (preferred), ASTM 2434 (constant head), or ASTM D3385 (double-ring) testing methods. Test samples shall be taken (at a minimum of) one sample per every 5,000 square feet or as otherwise directed by the District's Representative and Sprinturf.
2. All test results will be logged and documented by the District's Engineer/Soils Technical Representative. If at any time the processed stone base does not meet specifications, it shall be the Contractor's responsibility to restore, at his expense, the processed stone base to the required grade, cross section and density.
3. After the Contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, & permeability verified by Engineer/Soils Technical Representative), he shall notify the District and schedule a final inspection by the District and Sprinturf for approval. The Contractor shall make available an orbital laser system to the Inspection Team for the inspection process.
4. The Contractor shall submit one-gallon composite sample of each size of crushed stone representing every 500 tons of material placed to the testing agent for comparison with the approved material. No materials should be relocated until the lab has approved the submitted samples.
5. Based on initial submittals, the crushed stone materials approved by the District or District's Representative for the field construction shall supercede the baseline specification established in the design document. The Contractor shall be responsible for all failed testing and will be back charged by the District.
6. 500 ton piles of crushed stone shall be tested by the District or District's Representative and released only after all piles are confirmed uniform and consistent to the approved sample submitted to the lab.

3.07 PLACING THE CRUSHED STONE

- A. Delivery Moisture Content: Processed stone must contain 90% to 100% of the optimum moisture content to ensure that fines do not migrate and to facilitate proper compaction. The Constructor shall ensure aggregate leaving the source plant meets this requirement and is required to apply water to the processed stone on site to attain and maintain this minimum moisture content.
- B. The crushed stone must be laid without damaging the subgrade. It is very important to not create any depressions with heavy equipment. The specified stone or aggregate supplied must conform to the specifications, and must be stable and permeable.
- C. Should any separation of the materials occur, during any stage of the spreading or stockpiling, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.

- D. In performing this work, the Contractor shall avoid damage to any existing structures or features of the playing field or features under construction, such as drainage and irrigation systems. Any such damage shall be repaired by the Contractor at his own expense.
- E. As part of this work, the Contractor shall check all graded areas and assure that all features of the subgrade area at the proper finished grade, with no changes or damage to grades, as specified herein and on the grading plan.
- F. The Contractor shall utilize a laser plane control system for the grading of the processed stone to ensure accuracy in the grade tolerances of +0" to -1/4".
- G. Crushed stone trucked into the site must be done in such a manner as not to alter the subgrade and/or damage drainage and irrigation systems.
- H. The crushed stone shall be carefully and evenly spread. Excess water should not be applied when dumping and rough grading as it could create a soft sub-base that could alter constructed grades and damage the drainage system.
- I. Install processed stone base, from sideline toward centerline, parallel to the composite drain network, to the lines and grades shown on the drawings. Under no circumstance shall the material be pushed more than 30' from the point of discharge.
- J. The crushed stone shall then be carefully smoothed and uniformly compacted to the finished grade by alternately raking, watering, and rolling. All surfaces shall then be checked for irregularities due to settling and brought back to a uniform grade.
- K. The Contractor shall shape the complete surface of the processed stone to receive the elastic layer component and continue until the deviation from the required elevation does not exceed a maximum deviation from grade of -0" to -1/4" in ten (10) feet, when measured in any direction using a 10' straight-edge.
- L. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation of the aggregates), preferably a self-propelled paving machine or small laser controlled low ground pressure (LPG) dozer.
- M. The Contractor shall contact Sprinturf prior to the placement of the Permeable Aggregate Base and schedule at a minimum two (2) site observation visits by the Sprinturf installer. Subsequent to the site observation visits, Sprinturf shall make any recommendations they deem necessary to the installation procedure in writing to the District, the Contractor and the Architect.

3.08 COMPACTION AND PLANARITY

- A. The processed stone shall be compacted to a minimum density of not less than 95% of maximum density as determined by ASTM D698 and measured using a nuclear method.

- B. Proof roll wherever possible and mark "soft spots" for additional compaction. Use static tandem drum-type roller of not less than five (5) tons weight.
- C. The finished surface shall not deviate (tolerance-to-grade) from designated compacted grade. This means that the surface shall not deviate more than ¼" in 10' (any direction? When placed under a 10-foot straight edge. This tolerance is required over the entire field. Areas that deviate should be marked with spray paint and corrected with 3/8" limestone or granite chips and rolled tight to achieve proper density. Such remedial actions should be done by hand.

3.09 INSPECTION

- A. Inspect Base for Tolerance and Moisture

The General Contractor is responsible to inspect the base to ensure the base is smooth and finished properly to a tolerance of 1/8" in any 10' radius. The General Contractor is responsible to ensure the base is cured properly and that the moisture content is appropriate prior to installation.

- B. Inspect Base for Finish and Smoothness

Sprinturf or an authorized installer of Sprinturf is to inspect the base to ensure the base is smooth and finished properly. If the base is acceptable then the installation will proceed. If the base is not acceptable, Sprinturf or an authorized installer of Sprinturf will inform the General Contractor immediately, so that the base can be refinished.

- C. Inspect for Compliance with General Conditions

Sprinturf or an authorized installer of Sprinturf is to inspect the facility to ensure compliance with the general conditions. If the general conditions are not complied with, Sprinturf or an authorized installer of Sprinturf will inform the General Contractor immediately, so that the situation can be rectified. The permeable base material must be certified and accepted by the turf manufacturer also.

- D. Examine final grades and installation conditions. Do not start installation and equipment work until unsatisfactory conditions are corrected.

3.10 INSTALLATION

- A. Pre-Installation Preparation: Sprinturf or an authorized installer of Sprinturf will unload the necessary materials to perform the installation of the Sports surfacing System and place it along the perimeter of the area to be surfaced.
- B. Trim and Edge: Sprinturf or an authorized installer of Sprinturf will inspect the trim and edge work to ensure its correctness. Any trim or edge work required by Sprinturf or its agent will be performed at this time.
- C. Initial Layout of Field Material: Sprinturf will locate the perimeter of the area to be surfaced and

determine its accuracy. If any discrepancies exist in the layout of the area to be surfaced, Sprinturf or an authorized installer of Sprinturf will inform the General Contractor immediately. The Sports Surfacing System will then be unwrapped and placed in accordance with the approved seam diagram.

- D. Seaming of Material: Sprinturf or an authorized installer of Sprinturf will cut and seam the Sports Surfacing System to ensure a professional finish, utilizing approved methods and procedures. E.

Marking of Field

1. In-Laid: Sprinturf or an authorized installer of Sprinturf will apply any game line markings as indicated on the approved Sports Surfacing System layout drawing. Sprinturf or its agent will perform this work utilizing approved materials, methods and procedures.
 2. Field markings and decorations shall be installed in accordance with approved project shop drawings.
- F. Impregnated Layer – Rubber/Sand Mix: Sprinturf or an agent of Sprinturf will spread consistently and impregnate the mixture of granulated rubber and sand into the Sports Surfacing System. Sprinturf or its agent will ensure the granulated rubber and kiln dried sand layer is impregnated consistently over the entire Sports Surfacing System. Sprinturf or its agent will perform this work utilizing approved materials, methods and procedures.
- G. Trim and Edge Attachment: Sprinturf or an authorized installer of Sprinturf will complete the attachment or install the trim edge surrounding the Sports Surfacing System as specified in the approved Sports Surfacing System layout drawing.
- H. Break In Period: Sprinturf or an authorized installer of Sprinturf will explain the break in period to the District and General Contractor. The break in period is a time of increased maintenance and care to bring the surface to its optimum playing condition.
- I. The sub base shall be inspected by the Engineer or Sitework Contractor by means of a laser level and plotted on a 10-foot grid. Based upon the Contractor's inspection of the topological survey, the Sitework Contractor shall fine grade the sub base suitably – including properly rolling and compacting the base to achieve a surface planarity with 1/4" in 10 feet.
- J. The Turf Project Superintendent shall thoroughly inspect all materials delivered to the site both for quality and quantity to assure that the entire installation has sufficient materials to maintain the schedule and proper mixing ratios.
- K. Artificial turf shall be loose laid across the field, stretched, and attached to the perimeter edge detail. Turf shall be of sufficient length to permit full cross-field installation. No dead or cross seams will be allowed, except as required for inlaid fabric striping or to accommodate programmed cutouts.

- L. The full width rolls shall be laid out across the field. Utilizing standard state-of-the-art sewing procedures, each roll shall be attached to the next. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing field turf. **GLUING OF ROLLS SHALL NOT BE ACCEPTABLE.**
- M. Infill materials shall be properly applied in numerous thin lifts using special broadcasting equipment to produce a layered system of recycled SBR rubber particles or 30% sand and 70% rubber. The turf shall be raked and brushed properly as the mixture is applied. The infill material shall be installed to a depth of about 1.50 inches. The infill materials can only be applied when the turf fabric is bone dry.
- N. This is a 99% sewn installation. Gluing of rolls shall not be acceptable. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in any logos or inlaid lines as required by the specifications. All seams shall be sewn using double bagger stitches and polyester thread (per the manufacturer's standard procedures). Seams shall be flat, tight and permanent with no separation or fraying.
- O. The infill system shall be on the only cushioning system. E-layers and formed rubber pads shall be deemed unacceptable as enhancements to meet the necessary safety requirements.
- P. The turf constructor shall provide the necessary data to the District that the finished field meets or exceeds the required shock attenuation.
- Q. Thread for sewing seams of turf shall be as recommended by the artificial turf manufacturer.
- R. Seaming fabric for inlaying lines and markings shall be as recommended by the artificial turf manufacturer.
- S. Artificial turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard projects.

3.11 FINISHING

- A. Final Groom: Sprinturf or an authorized installer of Sprinturf will complete the final grooming of the surface. The final grooming shall consist of four passes by grooming equipment in each of the four directions. This process will ensure that the impregnated layer has been installed uniformly throughout the Sports Surfacing system. The final groom will ensure the surface is available and safe for play.
- B. Final Inspection of Surface: Sprinturf or an authorized installer of Sprinturf will conduct a final inspection of the Sports Surfacing System with the District, General Contractor or facility representative as directed. During this final inspection, the entire surface will be inspected by, Sprinturf will rectify or explain any concerns regarding the surface to the General Contractor. Upon acceptance of the surface the General Contractor will signify acceptance of the surface by signing the "Workmanship Satisfaction Acceptance Certificate and Warranty Request Form".

- C. Clean Up and Removal
1. Upon execution of the "Workmanship Satisfaction Acceptance Certificate and Warranty Request Form", Sprinturf will remove excess and waste materials from the area of work.
 2. Turf contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items.
 3. All usable remnants of new materials shall become the property of the District.
 4. The turf contractor shall keep the area clean throughout the project and clear of debris.
 5. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use the District.
 6. After completion of installation, and completion of other major work in areas, remove protective coverings, if any, and clean equipment internally and externally. Restore exposed and semi-exposed finishes to remove abrasions and other damages and touch-up painted surfaces. Replace work which cannot be successfully restored.
- D. Acceptance of Surface: The Acceptance of Surface occurs upon the execution of the "Workmanship Satisfaction Acceptance Certificate and Warranty Request Form". This acceptance includes the agreement of the District/General Contractor to follow the procedures for the break in period, acceptance of a working knowledge of the maintenance procedures, and the agreement to keep the Sports Surfacing System closed and secure throughout the curing period and until first use.
- E. Presentation of Warranty Certificate: Upon execution of the "Workmanship Satisfaction Acceptance Certificate and Warranty Request Form" Sprinturf will issue by priority post the official Warranty Certificate directly to the District.

4.0 OTHER MATERIALS AND EQUIPMENT

4.01 MAINTENANCE EQUIPMENT

- A. The artificial turf vendor shall furnish a tow behind sweeper units with hitch, excluding prime over vehicle. The sweeper attachments shall be of sufficient size to cover a 72" wide swath in a single pass. The sweeper attachment shall be fitted with artificial bristle brushes as recommended by the artificial turf manufacturer and shall be used primarily to collect surface debris.
- B. The sweeper unit shall be a Parker Suburbanite model 89580300.
- C. The turf contractor will train the District's facility maintenance staff in the use of the turf manufacturer's recommended sweeper/groomer equipment.

4.02 SPORTS FIELD EQUIPMENT

- A. Assemble and install equipment in strict accordance with manufacturer's recommendations.

4.03 SURPLUS MATERIALS

- A. Turf fabric – 500 square feet green plus 100 square feet of each additional field color. B.

Infill Material: as required infill 250 square feet to the minimum depth.

4.04 SITE CLEAN UP

- A. The premises shall be kept free from accumulation of waste and rubbish by the turf contractor. At the completion of the work and as necessary during the progress of the work, remove from the premises all surplus materials, rubbish and debris created by the turf contractor.

END OF SECTION

SECTION 32 93 00 PLANTING

PART 1 – GENERAL

1.4 RELATED DOCUMENTS:

The provisions of the "GREENBOOK Standard Specifications for Public Works Construction," latest edition, shall apply except as modified herein.

1.4 SCOPE:

- A. Work of this Section includes all material, equipment, and labor necessary for and incidental to completing all Landscape Planting work as indicated on the Drawings, or as reasonably implied, or as designated herein, including, but not limited to, the following.
- B. Carefully inspect the site and verify all existing conditions and dimensions prior to proceeding with any work under this contract.
- C. Apply for all permits and pay for same.
- D. Clear and remove from the site all construction debris, surface growth, or other undesirable material.
- E. Installation of deep root barriers as specified on the plan.
- F. Fine grading of all planting areas and weed abatement.
- G. Preparation of all planting holes.
- H. Furnishing and installation of all plant materials, shrubs and Sod turf areas unless otherwise noted.
- I. Furnishing and installation of all required planting backfill materials, top dressing, edging, deep root barriers, topsoil, and miscellaneous materials.
- J. Obtain an agronomic/ germination soil test after rough grading of the site is complete. Take a minimum of – (2) two samples from the planting areas area Obtain an agronomic/germination soils test for any imported soil brought in to finish off or add to landscape areas on site. The contractor shall review the agronomic soils test results and recommendations and comply with its findings.
- K. Provide one hundred-twenty (120) continuous calendar days Maintenance Period.
- L. Project clean up and de-weeding of all planting areas.

M. Provide one-year guarantee for all plant material.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

Landscape Maintenance Section 32 01 90

1.4 QUALITY ASSURANCE:

- A. The Contractor shall provide at least one person who shall be present at all times during execution of this portion of the work, who shall be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation, and who shall direct all work performed under this Section.
- B. All plants and planting material shall meet or exceed the specifications of Federal, State and County laws requiring inspection for plant disease and insect control.
- C. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience and which is regularly inspected by the State Department of Agriculture.
- D. Installer's Qualifications: Landscaping Work shall be performed by a single firm specializing in commercial landscaping.
- E. Source Quality Control:
 - 1. General: Ship landscape materials with certificates on inspection required by governing authorities. Comply with regulations applicable to landscape materials.
 - 2. Do not make substitutions. If specified landscape materials are not obtainable, submit proof of non-availability to Landscape Architect or Owner together with propose plant substitution. For equivalent use of material as specified.
 - 3. Analysis and Standards: A Package standard product with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Agriculture Chemists wherever applicable.
 - 4. Topsoil: Before delivery of topsoil, submit independent laboratory analysis of topsoil fill. Analysis shall indicate percentage of nitrogen, phosphorus, potash; soluble salts content, organic matter content, and pH value. Submit data to independent testing and inspection agency for Project a specified in Sub-section 1.04E.
 - 5. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size , genus, species and variety shown and scheduled for landscaping and complying with recommendations and requirements of ANZI Z60.1 – American Standard for Nursery Stock. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions or disfigurement
 - 6. Label at least one tree and one shrub of each variety with a securely attached waterproofed tag bearing legible designation of botanical and common name.

- a. Dimensions: The height and spread of all plant material shall be measured with branches in their normal positions. The caliper of other dimensions of any plant materials shall be of standard quality and size for type listed. When the same species of tree is shown in a group planting on the plan, all trees in the group shall match in height, spread and appearance. The height of balled and burlapped Palm trees shall be measured from the base of the palm above the finish grade to the bottom of the first green frond projecting upward from the palm pineapple. Refer to the Palm tree planting detail on the detail sheet.
 - 7. Inspection: The Landscape Architect reserves the right to inspect box size trees at place of growth or upon delivery to the site prior to planting for compliance with requirements for genus, species, variety, size and quality. Owner retains the right to further inspect trees and shrubs for size and condition of root-balls, root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from project site.
- F. The Applicator of all weed control materials shall be licensed by the State of California as a Pest Control Operator and a Pest Control Advisor in addition to any subcontractor licenses that are required.
- 1. Provide certificate of compliance from governing authority having jurisdiction indicating approval of herbicide mixture.
 - 2. Ensure that all abatement or herbicide treatments are conducted in accordance with the Healthy Schools Act, as well as all other Federal, State and Local Regulations.
- G. All materials and methods used for Weed Abatement must conform to Federal, State, and Local Regulations.
- H. Industry Standards: The following standards shall be referenced from a part of this Section.
- 1. Standardized Plant Names latest edition, issued by the American Joint Committee on Horticulture Nomenclature.
 - 2. American Standard for Nursery Stock for Stock, latest edition issued by American Association of Nurserymen, Inc.
- I. The Contractor shall obtain soil samples from the following areas after rough grading but prior to soil preparation and fine grading: Submit Samples to Wallace Laboratories: 365 Coral Circle. El Segundo, Ca. 90245. Tel: (310) 615-0116 or an approved Soils Lab. Samples shall be taken at a minimum depth of 12 inches below the rough finish grade.

1.6 SUBMITTALS:

- A. Materials lists: Within five (5) days after award of the Contract, submit a

complete list of all materials proposed to be furnished and installed under this Section, demonstrating complete conformance with the requirements specified.

1. Materials list shall include the weed control materials and quantities per acre intended for use in controlling the weed types prevalent and expected on the site, as supplied by the Landscape Contractor. Landscape Contractor shall furnish the general contractor and landscape Architect data to demonstrate the compatibility of the weed control materials and methods with the intended plant and seed varieties.
 2. Samples: Topsoil. Submit three 10-lb samples of topsoil fill to testing laboratory, in air-tight containers and submit to an approved Soils Laboratory for agronomic soil testing.
 3. Planting Schedule: Proposed Schedule: proposed planting schedule, indicating dates for each type of landscaping work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of Substantial Completion review. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
 4. Selection, Tagging and Ordering Plant Material:
 - a. Submit request for inspection and documentation to the Landscape Architect and Owner at least one month prior to start of landscape planting work, certifying that all plant materials have been ordered.
 - b. Plants shall be subject to inspection and rejection by the Landscape Architect and Owner at place of growth and after delivery, for conformance to specifications.
 5. Product Data
 - a. For each type of product listed in Part 2 of this specification.
 - c.
- B. Certificates: Deliver all certificates to the Landscape Architect upon delivery to job site. Include:
1. Quantity of commercial fertilizers
 2. Quantity of soil amendments.
 3. Quantity and quality of plant material.
 4. Quality and purity of seed germination.

1.6 PRODUCT HANDLING:

A. Delivery and Storage:

1. Deliver all items to the job site in their original containers with all labels intact

- and legible at time of Landscape Architect's review.
2. Plants damaged during transit or delivery, or exhibiting broken limbs, defoliation or damaged from heat, frost or wind shall be rejected at the project site and replaced with new stock at no charge in Contract Time or Sum to the Owner.
 3. Handle plant in a manner to avoid any damage to the plant. Protect plants at all times from sun or drying winds. Plants that cannot be planted immediately upon delivery shall be kept in the shade, well protected and adequately watered. Do not store plants on asphalt paving for a period no longer than a full work day.
 4. Trees and Shrubs: Deliver trees and shrubs after preparations for planting have been completed and plant immediately. Keep Plants moist
 - a. Do not prune prior to delivery unless otherwise approved by the Landscape Architect.
 - b. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark break branches or destroy natural shape.
 - c. Provide protective covering during delivery.
 - d. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.
 5. Groundcovers: Deliver plant materials immediately prior to placement. Keep plants moist. Do not remove container-grown stock from containers until planting time.

1.7 RESPONSIBILITY AND COORDINATION DURING WEED ABATEMENT:

- A. During Weed Abatement procedures, the landscape contractor is responsible for the erection of all signs and barriers required to prevent intrusion into the treated areas and to notify the public.
- B. No material or methods used for Weed Abatement shall affect the landscape planting or turf establishment. No material or method shall render the job site unusable for more than ten (10) days from date of application.
- C. Weeds: Include Dandelion; Jimsonweed; Quackgrass; Horsetail; Morning Glory; Rush Grass; Mustard, Lambsquarter; Chickweed Cress; Crabgrass, Canadian Thistle, Nutgrass, Posion Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass. Poison Ivy, Nut Sedge, Nimble Will, Bent weed, Wild Garlic, Perennial Sorrel and Brome Grass.

1.8 PROJECT CONDITIONS:

- A. Utilities- Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- B. Excavation – When conditions detrimental to plant growth are encountered, such as rubble fills, adverse drainage conditions, or obstructions, notify Architect/Engineer before planting.

1.9 SEQUENCING AND SCHEDULING:

- A. Planting Time - Proceed with and complete landscaping work as rapidly as portions of site become available.
 - 1. Correlate planting with specified maintenance periods to provide maintenance from date of Substantial Completion review.
 - 2. All irrigation work shall be inspected and approved before start of any work of this section.
- B. Coordination with lawns/turf areas – Plant trees and shrubs after grades are established and prior to planting lawns –hydro seeded or sodden- unless otherwise acceptable to Architect/Engineer. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.
- C. Observations:
 - 1. All field observations herein specified shall be made by the Landscape Architect/District. The Contractor shall request at least 48 hours in advance of the time observations are required.
 - 2. Field Observations will be required for the following parts of the work:
 - a. After rough grading is complete and the landscape contractor has crossed rip and tilled the planting areas and removed rocks in excess of one (1) inch.
 - b. When fine grading is complete per Civil Engineers precise grading plans and all rocks in excess of one (1) inches are removed and completion of soil amendments.
 - c. Boulder placement. When material is delivered onsite and is ready to be placed in landscape areas.
 - d. Plant material selection prior to site delivery –as time permits for review by Landscape architect. The contractor shall submit plant photographs of each material specified from the nursery of procurement. The contractor shall also submit the name of the nursery, the location and the name of the contact person along with a phone number of the nursery contact person.
 - e. When plant material is spotted for installation but before planting holes are excavated and when specimen tree locations are staked.

- f. Specimen trees at source before delivery. All tree shown in tree masses or in row formation shall be matched in height and form, general appearance and shall be approved at the nursery before delivery.
- g. When finished grading is complete in groundcover and other planting areas prior to conducting an irrigation coverage test.
- h. Lawn areas prior to seeding or sodding.
- i. Thirty day establishment period after initial Hydroseed and issuance of landscape maintenance period.
- j. Final acceptance and project turn over.

PART 2 – MATERIALS

All materials shall conform to the requirements of Section 212 of the Standard Specifications, except as modified herein.

- 2.1 **GENERAL:** All materials shall be standard, first grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer’s guaranteed analysis.
- 2.2 **SOIL CONDITIONERS AND FERTILIZERS:** Soil conditioners may include any or all of the specified conditioners herein specified and shall be applied at rates indicated in the soils report or special conditions.
- 2.3 **TOP SOIL:** Import Class ‘A’ Soil. Tested for agronomic and germination recommendations. Free from infestation with nematodes or other undesirable insects, plant diseased organisms and petroleum bi-products.
- 2.4 **PRE-PLANTING HERBICIDES:**
 - A. All Chemicals used for weed control shall be registered by the State of California Department of Food and Agriculture and the Environmental Protection Agency with registration identification on the label. Label shall be at job site at all times.
 - B. All chemicals shall be applied as per registered label instruction and manufacturer recommendations.
 - C. Chemicals requiring a licensed applicator must be applied by persons registered with the County Department of Agriculture’s Commissioner’s Office as possessing a current, valid, qualified pest control applicator’s license.
 - D. The use of any restricted materials is forbidden unless a special use permit is obtained from the County Department of Agriculture.
 - E. The non-selective, translocative herbicide shall be “Round-Up” or equal.
- 2.5 **SELECTIVE HERBICIDES:** Selective pre-emergent herbicides – “Ronstar-G or equal.

2.6 SHAVINGS:

- A. Nitrogen stabilized organic amendments derived from redwood sawdust, fir sawdust containing the following physical properties:

percent passing	sieve size
95 - 100	6.33 mm (1/4 inch)
80 - 100	2.38mm (No. 8, 8 mesh)
0 - 30	500 micron (No. 35, 32 mesh)

Chemistry shall be: nitrogen content - dry weight 0.56% - 0.84%

Iron content - minimum 0.08% dilute acid soluble Fe on dry weight basis.

Soluble salts - maximum 3.5 milliohms centimeter at 15 degrees C. as determined by saturation extract method.

Ash - (dry weight) 0 - 6.0%

- B. Gypsum: To be agricultural grade gypsum and shall conform to section 212-1.2 of the standard specifications for Public Works Construction, latest edition.
- C. Non-Staining Iron Sulfate: Pelletized or granular form containing not less than 18.5% expressed metallic iron and shall be registered as an agricultural mineral, with the State Department of Agriculture in compliance with Article 2 - “Fertilizer Materials”, Section 1030 of the Agricultural Code as “Green Iron” manufactured by Gro-Power.
- D. Ammonium Sulfate: Granular form containing not less than 21% nitrogen and 24% sulfur and shall be registered as an agricultural mineral, with the State Department of Agriculture in compliance with Article 2 - “Fertilizer Materials”, Section 1030 of the Agricultural Code.

2.7 MYCORRHIZAL SOIL CONDITIONER AND HUMIC ACIDS

- A. Mycorrhizal inoculum / soil conditioner: Mycorrhizal fungi shall be added in all planting areas, regardless of soils report. Mycorrhizal inoculum consists of a combination of : inculum shall be both endo and ecto (granular), with consiting of propagules (spores, fragments of fungal mycelium, and pieces of mycorrhizal roots capable of colonizing host plant roots) of the vesicular arbuscular mycorrhizal species glomus intraradices, glomus aggregatum, glomus mosseae, combined with other species and/or additional genera including, sclerocystis, gigaspora, scutellospora, entrophospora, and acaulospora. Ectomycorrhiza include pisolithus and 4 species of rhizopogon. Soil conditioner portion shall consist of organic materials consisting of higher plant form life, composted

beyond the fibrous stage, to humus. Also shall have humic acids and beneficial soil bacteria strains. It shall not contain poultry, animal or human waste (i.e., sewage sludge), pathogenic viruses, fly larvae, insecticides, herbicides, fungicide or poisonous chemicals that would inhibit plant growth.

Nutrient Composition:

Ingredients	percentage (minimum)
Mycorrhizal Inoculum	6,500/55,00 progagules per lb.*
Humus	65%
Humic Acids	25%

Acceptable Manufacturers

“GroLife Granular”, Gro-Power®, Inc (800) 473-1307.

B. Humic Acids (from Leonardite) 70 .00 %

Nutrient Composition: Per random sample of material.

Organic matter	40.00	%
Carbon	40.00	%
Nitrogen	0.05	%
Phosphoric Acid	0.07	%
Potash	0.13	%
Sulfur	0.21	%
Magnesium	0.18	%
Calcium	0.32	%
pH		4.0
Soluble Salts	1.8	

Acceptable Manufacturers

“Tri-C Premium Humate” (800) 927-3311.

2.7 FERTILIZERS: Commercial fertilizers with an analysis of 5-3-1 Gro-Power Plus, Gro-Power Controlled Release Nitrogen, 16-20-0, 12-8-8 Urea formaldehyde as designated herein, or **approved substitute as required by the Agronomic soils report.**

C. Fertilizer shall be delivered to the site in the original unopened container, bearing the manufacturer’s guaranteed analysis. Any fertilizer that becomes caked or damaged, making it unsuitable for use, will not be accepted and shall be removed from site.

- 2.8 TREE STAKES: Tree stakes shall be two inch (2") diameter, lodge pole stakes copper naphthenate treated, driven a minimum of two feet (2') into firm soil, long enough to firmly support tree head. Tree stakes shall be a diameter of 2" x 10' long and shall be free of knots, checks, splits or disfigurements. (Refer to typical tree installation details.)
- 2.10 TREE TIES: Tree ties shall be as specified on tree planting detail and shall be uniform throughout the project.
- 2.11 DEEP ROOT BARRIERS: Deep Root barriers shall linear style as manufactured by Deep Root Products and install per manufacturer recommendations. Contact Deep Root Products at 1 (800) 458-7668 or 1 (800) 766-8835 for technical support.
- 2.11 PLANTING TABLETS: Fertilizer planting tablets shall be tightly compressed commercial grade planting tablets having a 12-8-8 formula, weighing 7 grams each. The planting tablets shall be delivered to the site in the original, unopened containers, bearing the manufacturer's guaranteed analysis.
- 2.14 PLANT MATERIAL: The scientific and common names of plants herein specified conform to nursery standard for plant identification; in the event of a discrepancy, the landscape architect shall decide all questions as to interpretation. (Refer to plant legend on drawings). Each group of plant materials delivered to the site shall be clearly labeled as to species and variety and nursery source. All plants shall have normally well-developed branch structure, with vigorous and fibrous root systems which are not pot bound and surface exposed. The size of the plants shall correspond with that normally expected for species and variety of available nursery stock, or as specified on the drawings. Plants larger in size than specified may be used with the approval of the landscape architect, but the use of larger plants will make no change in contract price.
- A. Rejection: All plants not conforming to the requirements herein specified shall be considered defective, and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site and replaced with new plant(s) at the contractor's expense. The plants shall be of the species, variety, and size as specified on the drawings or pre-selected at the nursery. Under no condition will there be any substitution of plants or sizes for those listed on the drawing.
- B. Pruning: At no time shall a tree or shrub be pruned, trimmed or topped prior to delivery, and any alteration of their shape shall be conducted only with the approval and when in the presence of the landscape architect.
- C. Groundcover plants grown in flats shall be healthy vigorous rooted cuttings grown in flats for at least 3 months but not over six months. Obtain inspections, and secure

permits or certificates required by City, County or State authorities prior to delivery to the site.

- D. Succulents: Succulents shall be acquired from a licensed nursery. Succulents shall be free of insects, mottled leaves, broken or split branches or trunks, scarring or any other uncharacteristic growth patterns.
- E.
- F. Protection: All plants shall be handled and stored so that they are adequately protected from drying out, from windburn, or from any other injury.
- G. Right of Inspection: The landscape architect reserves the right to approve or reject at anytime upon delivery or during installation any or all plant material not conforming to plan specification, size, variety or condition.

2.13 MULCH MATERIAL

- H. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - i. Type: "Pacific Mulch: Appearance grade, composed organic forest products, free of trash and other deleterious materials, with pathogens and weeds removed by temperature treatment."
 - 1. Size Range: 1"-3"
 - 2. Acceptable Manufacturer:
 - a. Greenways Environmental (949)380-8301

2.14 AERATION TUBES

- A. Tubes: 4" dia. Schedule 40 PVC perforated pipe cut to lengths as shown on the Drawings.
 - a. Acceptable Manufacturer: Pacific Plastics Inc. (714) 990-9050.
- B. Grates: 4" dia.
 - a. For Bark Chip Planting areas: round, black, plastic atrium drain grates;
 - b. For Lawn areas: round, green, flat plastic drain grates;
 - c. For Gravel and stone mulch planting areas: round, brown, flat plastic drain grates.
 - d. Acceptable Manufacturer: National Diversified Sales (NDS).
- C. Filter fabric "sock": Spunbond, Typar 3341, Geoscape Landscape Fabric - 2.5 oz., Commercial Grade"
 - a. Acceptable Manufacturer: ADS (800) 821-6710.

PART 3 – EXECUTION

Installation shall conform to the requirements of Section 308 of the "Standard Specifications," except as modified herein:

3.1 GENERAL: Prior to the start of work of this Section, all trash and deleterious materials on the surface of the ground shall be removed and legally disposed of. Verify the following information prior to commencement wit work:

- A. Verify that topsoil material to be reused is acceptable and has been tested pursuant to all state and local requirements for lead, mercury or any other contaminants.
- B. Verify that building and trench backfilling has been completed and inspected.
- C. Verify that the subsoil base has been scarified, contoured and compacted.
- D. Verify that all existing utilities have been protected and are in good working condition prior to commencement of seeding. Make necessary repairs as required.
- E. Verify that drainage and grading has been completed per Civil Engineers precise grading plans.

3.5 WEED ABATEMENT:

- A. Prior to the installation of the irrigation system, all weed growth shall be removed within the areas designated to be cleared and grubbed. Refer to plans for limit of work.
 - 1. Perennial grasses and weeds existing in the planting areas require control prior to removal, spray these areas per Pest Control Adviser's or landscape contractor's recommendations (Round-up or other approved herbicide.) Physically remove all weeds and undesirable material from the site.
 - 2. Remove all dead weeds by rake or hoe to a depth of one to two inches (1" to 2") below the surface of the soil. Remove all weed and/or undesirable grass residue and top growth and dispose of in a legal manner.
 - 3. Upon completion of all fine grading work and prior to soil preparation, perform weed control measures.
 - 4. Apply a pre-emergent (Roundstar G or approved equivalent) at a minimum rate of 150 lbs per acre.
 - 5. Irrigate all areas designated to be planted on which pre-emergent is applied for a minimum of 10 minutes per setting, two settings per applications.

3.3 SOIL PREPARATION AND FINE GRADING:

- A. Soil Preparation: Prior to amending the surface, soil should be cross-ripped or otherwise tilled to a depth of twelve inches (12"). All planting areas to receive soil preparation. All rock one inch (1") and larger shall be removed to a depth of four inches (4"). Dispose of all debris off-site in a legal manner.
- B. Planting Areas: To all planting areas (turf), uniformly broadcast soil amendments and thoroughly incorporate to a minimum six inch (6") depth by means of a rototiller or equal.

Soil Amendments are to be thoroughly incorporated at the following rates per one thousand square feet (1,000 sf.) by rototilling or other approved method: **BID PURPOSES ONLY REFER TO SOILS REPORT AND COMPLY WITH FINDINGS**

4 cu. yds.	Nitrogen stabilized organic amendment
200 lbs.	5-3-1 Commercial fertilizers
10 lbs.	Iron Sulfate
50 lbs.	Agricultural Gypsum

- C. Finish Grade:
 1. Rough grade shall be within one tenth (1/10) of one foot (1') of finish grade.
 2. Work such as fine grading and light cultivation are required of all planting areas indicated on plan to prepare grades prior to seed or stolon planting.
 3. After approximate finished grades have been established, all soil areas shall be compacted and settled by application of heavy irrigation to a minimum depth of twelve inches (12").

3.8 PLACEMENT OF TOPSOIL: Refer to Earthwork Section

- A. Place topsoil in raised planter areas as shown on the plans.
- B. Fine grade area(s) to desired elevations and contours as referenced on the plans.
- C. Compact area to desired compaction.

3.5 FINAL GRADES:

- A. After the foregoing specified deep watering, minor modifications to grade may be required to establish the final grade. These areas shall not be worked until the moisture content has been reduced to a point where working it will not destroy soil structure.

- B. Finished earth berm surfaces shall be smooth and even between contours; shapes shall be to the satisfaction of the Landscape Architect.
- C. Eliminate all erosion scars.
- D. Refer to the Civil Engineers Grading Plans for drainage and grading.

3.9 TREE AND SHRUB INSTALLATION:

- A. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally acceptable horticultural practices.
- B. All irrigation work shall have been reviewed by the Landscape Architect prior to beginning any planting.
- C. Installation of all plant material shall be in accordance with the planting details.
- D. Locations for plants and outlines of areas to be planted shall be marked on the ground by the Landscape Contractor before any plant pits are dug. The landscape architect shall review all locations. If any underground utilities are encountered in the excavation of the planting areas, notify the Landscape Architect immediately so that other locations for planting may be selected.
- E. Excavation for Planting:
 - 1. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds.
 - 2. Protect all areas from excessive compaction when trucking plants or other material to the site.
 - 3. All excavated holes shall have vertical sides with rough surfaces and shall be of a size is at least twice the width and depth of the original plant container. The holes shall be, in all cases, large enough to permit planting without damage to the rootball. Compact soil so depth of rootball is three (3") higher than existing grade.
- F. Planting:
 - 1. No planting shall be done in any area that is under construction, where the grades have not been established or fine graded until the area concerned has been satisfactorily prepared in accordance with these specifications.

2. No more plants shall be distributed in the planting area on any day than can be planted and watered on that day.
3. Containers shall be cut and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken, and they shall be planted and watered as herein specified immediately after the removal from the containers. Containers shall not be cut or broken prior to placing the plant in the planting areas.
4. The amended surface shall be used for backfill around trees and shrubs; use the following formula (thoroughly blended):

Native on site soil (Refer to soils report. Import soil may be used)

	6 parts
Nitrolized Wood Shavings	4 parts
Commercial Fertilizer 5-3-1	15 lbs/cy
Iron Sulfate	2 lbs/cy.

Note: Mix proportions are for bid purposes only. If mix proportions differ from agronomic soils test results notify the architect and or general contractor immediately.

5. Three inches of amend backfill shall be thoroughly mixed with three inches of native or import soil at the bottom of each hole to provide a transitional soil mix of at least six inches between the native soil and backfill.
6. Backfill shall be placed at the bottom of each hole, and thoroughly compacted to a height that when a plant is placed in the hole, its root crown is three inches (3") above the established final grade. Any plants, which settle deeper than specified above, shall be raised back to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately one-half the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.

After the water has completely drained, fertilizer tablets shall be place as indicated:

- 3 tablets per one-gallon container
- 6 tablets per five-gallon container
- 12 tablets per fifteen-gallon container
- 14 tablets per 24" box

18 tablets per 36" box

The remainder of the hole shall then be backfilled.

3.7 GROUND COVERS:

- A. Groundcover will be hand planted in the areas indicated on the plans.
- B. After preparation of the soil in accordance to section 3.04 the areas to be planted with hand planted Ground covers only shall be given additional pre-fertilizer of six pounds (lbs.) per thousand square feet (1,000 sft.) of commercial fertilizer, 16-20-0 as specified in Section 2.07 evenly broadcast over the area.
- C. Ground cover plants shall be grown in flats or peat pots as indicated on plant legend. Flat grown plants (rooted cuttings) shall remain in those flats until transplanting. The flats' soil shall contain sufficient moisture so that it will not fall apart when lifting the plants. If plants from peat pots are used, the pots shall be protected at all times prior to planting to prevent unnecessary drying of the rootball.
- D. Each plant shall be planted with its proportionate amount of flat soil or in a peat pot, in a manner that will ensure minimum disturbance of the root system, but in no case shall this depth be less than finished grade. To avoid drying out, planting shall be immediately sprinkled after planting until the entire area is soaked to the full depth of each hole, unless otherwise noted on the drawings.

3.9 WATERING:

- A. Apply water to all planted areas during operations and thereafter, until acceptance of the work.
- B. Apply water in sufficient quantities and as often as seasonal conditions require keeping the planted areas sufficiently moist at all times, well below the root system of grass and plants.
- C. All turf areas shall be kept damp at all times and irrigation should be adjusted accordingly. This normally would involve four (4) to six (6) watering periods daily, each watering period (ON) regulated to just dampen the mulch without creating run off.
 - 1. Intervals between irrigation (OFF) sequences should be judged by the length of the time mulch remain damp. Once the mulch begins to dry out, the water (ON) sequence should be repeated.

3.11 ESTABLISHMENT AND MAINTENANCE PERIOD:

- A. The Contractor shall continuously maintain all areas involved in this contract during the progress of the work and during the 30 day establishment period for all turf and Ground cover areas and (90) day maintenance period.
- B. Plant establishment period: The contractual establishment period shall be for no less than thirty - (30) continuous calendar days. The contractual establishment period begins on the first day after all planting in this project is completed and accepted and the planted areas are brought to a neat, clean and weed free condition. (All turf areas and Ground cover areas installed by flats shall be reviewed under the establishment period).
- C. Landscape maintenance period: *Upon the acceptance of the substantial completion of the landscape and irrigation installation the landscape maintenance period may begin* .The Contractor shall request an on site review of the landscape at the end of the establishment period. The turf areas shall show an even, healthy stand of grass free of patches or spare spots. The contractor will be notified in writing the acceptance of the establishment period and commencement of the maintenance period. If such criteria are met to the satisfaction of the District, a field notification shall be issued to the Contractor from the District, to establish the effective beginning date of the Maintenance Phase. The District has the ultimate authority in setting the beginning date for the maintenance period.
1. Any day when the Contractor fails to adequately maintain plants replace unsuitable plants or do weed control or other work, as determined necessary by the Landscape Architect and/or owner's field representative will not be credited as one of the landscape maintenance working days.
 2. In order to carry out the landscape maintenance work, the Contractor shall furnish protective barriers/fences around landscape areas, sufficient men and adequate equipment to perform the work during the maintenance period. The Contractor shall be responsible for maintaining adequate protection of the entire project area. Damaged areas caused by erosion, tire damage, graffiti, pests or other damage as deemed by the District shall be repaired at the Contractor's expense.

All sidewalks, paved areas and other areas adjacent to the planting areas shall be cleaned of all debris, soil, or other materials at intervals of not more than seven (7) days.
 3. Improper maintenance or possible poor condition of any planting during the scheduled landscape maintenance period may cause postponement of the final acceptance of the landscape maintenance period. Contractor shall bear all costs for extension of the Landscape maintenance period.

4. In the event there is evidence of poor-100% germination of the turf grass seed or poor performance of the sod or shrub/groundcover areas, the contractor shall obtain an agronomic soils test for each area and provide copies of the test results to the District to verify the appropriate use and incorporation of amendments per agronomic soils reports and appropriateness of all maintenance work performed. If additional fertilizers are needed, up to a maximum of 25% beyond the amount specified, such amendments shall be provided by the Contractor at no additional cost to the District.
5. Depressions caused by vehicles, bicycles, or foot traffic shall be filled and leveled. Replant damaged areas with same material unless area was prior seed with turf grass or a Hydroseed mix –plant area with sod or select shrub species identified in seed mix at one (1) gallon minimum or as readily available. Replant at no expense to District unless damaged was caused by other trade contractors.

D. Plant Maintenance:

1. All areas shall be kept free of debris, and all planted areas shall be weeded at intervals of not more than ten (10) days. Watering, mowing, fertilization, spraying and pest control, as may be required, shall be included in the maintenance period. Maintenance shall include gopher control.
 - a. All personnel on the project shall be well trained, clean, and neat at all times and be conversant with these specifications.
 - b. All work shall be performed in accordance with the best landscape maintenance practices and in keeping with the high aesthetic level of facilities being maintained.
 - c. Contractor shall be responsible for removing all weeds in joints of sidewalks, curbs, and hardscape throughout the project.
 - d. All landscape areas shall be patrolled weekly to check for vandalism damage, broken tree branches, rodents, insects, pest and diseases.
 - e. Water Management:
 1. Water only as required to allow penetration into the soil and avoid excess run-off. Once plant material is established, water only as needed to maintain healthy plant material.
 2. Avoid water waste by setting controllers appropriately for current season and weather.
 - f. Avoid blocking the clear view of signs, illumination of light poles fixtures, the airflow out of vents and conflict with pedestrian and vehicles and their views.
 - g. Safety of users shall be a prime goal of maintenance especially in regard to pruning of trees and trimming of ground covers away from walkways and/or structures.
 - h. The Contractor, at his own expense, shall replace all dead or damaged plant material during the maintenance period and prior to final acceptance of the maintenance period.

2. Pruning Trees – prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk branch to which they are attached that have vertical spacing from 18” to 48” and radial orientation. Other pruning shall be performed to correct the following:
 - a. So permanent scaffold branches do not overlay one another.
 - b. To eliminate diseased or damaged growth.
 - c. To eliminate narrow V-shaped branch forks that lack strength.
 - d. To reduce toppling and wind damage by thinning out crowns.
 - e. To maintain growth within space limitation
 - f. To maintain natural appearance.
 - g. To balance crown with roots.
 - h. All tree pruning shall be done with hand equipment operated from the ground. If trees are larger than able to be pruned in such a manner, the condition will be brought to the attention of the District.
 - i. Remove no more than 50% of a plant’s foliage during pruning operations.
 - j. Topping of trees will not be tolerated unless approved by the District.
3. Under no circumstances shall stripping of lower branches, (raising up or skirting) of young trees be permitted. Lower branches shall be retained in a pinched back condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support. No stubbing of major branches will be accepted.
4. Evergreen trees shall be thinned out and shaped when necessary in prevent wind and storm damage. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety problems shall be pruned at any time of the year as required.
5. Post fertilize all turf areas at the end of every 45-60 days (of maintenance) at the rate of three pounds (3 lbs.) per one thousand square feet (1,000 sf.) using ammonium sulfate, 21-7-14, evenly applied and thoroughly watered in. The first application should occur 14 days after planting. Thirty (30) days after planting fertilize with 20-6-10 fertilizer at rate of three to four (3 to 4) lbs per 1,000 square feet. Water thoroughly. In early fall and spring, substitute a complete fertilizer such as 16-6-8 or equal for the ammonium sulfate at a rate of 6 lbs. per 1000 sf.
6. Mowing of turf will commence when turf grass has reached a height of one inch (1"). The height of cut will be ½" to ¾" as directed by the Grounds Supervisor. Mowing will be at least weekly after the first cut. Turf must be well established and free of bare spots and weeds to the satisfaction of the Landscape Architect prior to final acceptance by the Owner.
 - a. Excess grass clippings shall be picked up and removed from site. Don not leave grass clipping on newly cut turf grass, remove immediately.

7. The Contractor shall maintain the irrigation systems in a like new operating condition; adjusting head heights and spray arcs as necessary. The Contractor is responsible for proper watering of all planting areas, for providing any necessary supplemental water as may be required, and shall replace any material damaged due to improper moisture.
8. During the maintenance period, the Contractor shall be responsible for maintaining adequate protection for all planting areas. Removing all litter and foreign debris from planters and planting areas. Any damaged areas shall be repaired and any plant materials replaced at the Contractor's expense. Replace all shrubs, trees and groundcover deemed to be in poor health or dead during the maintenance period.
9. Weed Control:
 - a. Keep basins and areas between plants free of weeds. Use recommended legally approved pre-emergent herbicides and removal by hand methods. Avoid frequent soil cultivation that destroys shallow roots. Use mulches to help prevent weed seed germination. Avoid post-emergent herbicides in groundcover areas where overspray may kill young rooted cuttings.
 - b. Use of chemical spraying maybe necessary to rid turf areas of noxious weeds.
10. Insect Control:
 - a. Maintain a reasonable control with approved materials and methods that are legally accepted in the area.

The Contractor's maintenance period will be extended past the (90) days if these provisions are not filled.

3.12 GUARANTEE AND REPLACEMENT:

- A. Any turf/groundcover area found to be dead or in poor condition due to such improper weed abatement practices and/or methods, as determined by the Landscape Architect and/or Owner, shall be replaced by the Contractor at his expense.
- B. Material and Labor involved in the replacing of material shall be supplied by the Landscape Contractor at no additional cost to the Owner.
- C. All plant material installed under the contract shall be guaranteed against any and all poor health, inadequate or inferior materials and or improper installation for a period of one (1) year. This guarantee shall commence on the date of final acceptance of the project after the completion of the contracts maintenance period. Any plant found to be dead or in poor condition resulting from improper planting; fertilization as determined by the District/Landscape Architect shall be replaced by the contractor at no expense to the District.

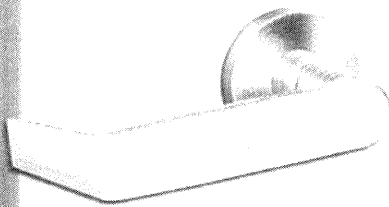
- D. Any plant material –trees, shrubs, groundcover and/or turf –found to be dead, missing or in poor condition as determined by the Landscape Architect during the contract maintenance period shall be replaced immediately and not at the end of the contract maintenance period. The Landscape Architect shall be the sole judge as to the condition of plant material. Material replaced within the guarantee period shall be replaced by the contractor within seven (7) days.

- E. All plant material shall have new growth trimmed neatly, turf shall be mowed, and all hardscape shall be cleaned prior to final acceptance.

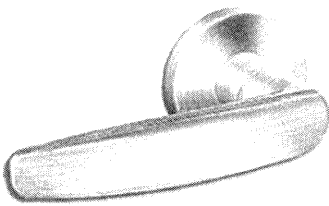
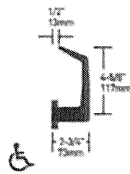
END OF SECTION

Appendix A

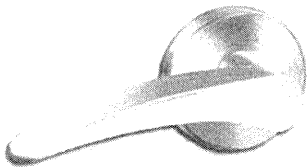
Door Hardware Cut Sheets



06 
Material: Forged brass, bronze and cast stainless steel **Finishes:** 605, 606, 609, 610, 611, 612, 613, 616, 619, 625, 626, 629, 630



07
Material: Forged brass, bronze and cast stainless steel **Finishes:** 605, 606, 609, 610, 611, 612, 613, 616, 619, 625, 626, 629, 630



12
Materials: Forged brass, bronze and cast stainless steel **Finishes:** 605, 606, 609, 610, 611, 612, 613, 616, 619, 625, 626, 629, 630 Specify door hand



605 Polished Brass

606 Satin Stainless Steel

609 Bright Stainless Steel

610 Polished Chrome

611 Polished Brass

612 Polished Chrome

613 Polished Brass

616 Polished Chrome

619 Polished Brass

625 Bright Chrome Plated

626 Bright Chrome Plated

629 Bright Chrome Plated

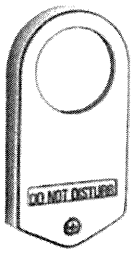
629 Bright Chrome Plated

629 Bright Chrome Plated

630 Satin Stainless Steel

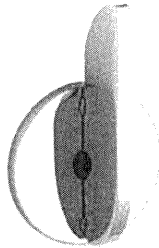
Trim Options

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



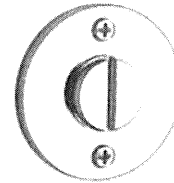
Hotel Occupancy Indicator
09-611

For lock function L9486P, L9496, this unit can be used with A or B roses. Requires a 13/8" (35 mm) cylinder for 13/4" (44 mm) doors. Specify finish when ordering separately.



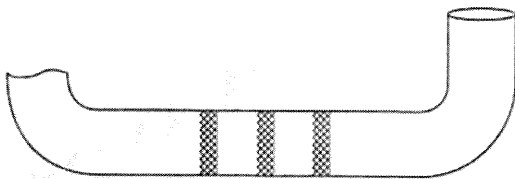
Optional EZ Turn
L583-363

Available for rose and escutcheon trim. Disability turn (ADA) option to standard thumbturn. Can be used with thumbturn-function L-Series lock except L9463 and L463. Specify lock per L583-363 when ordering.



Coin Turn

For lock functions L9044 and L9444 with rose trim. Specify 09-509 and finish per L283-124 when ordering.



03 Lever Shown

Products featuring a knurled surface will be indicated by adding the prefix "8" to the model number. For example, L905P 803/03A.

Tactile Warning (Knurling)

Schlage L-Series commercial levers feature knurling only on the outside lever unless otherwise specified.

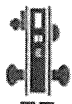
This feature is available on lever models 01, 02, 03, 05, 06, 07, 12, 17, 18, and 93, and knob models 41 and 42.

Tactile warning is applied to outside knob or lever only unless otherwise specified.

Tactile warning is not available on stainless steel knobs 41 and 42; finish codes 629 and 630.

Lock Functions | Single Cylinder Deadbolt Functions

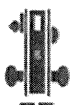
Schlage ANSI



L9453 **F20**

LV9453
Entrance Lock

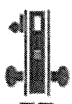
Latchbolt retracted by knob/lever from either side unless outside is locked by 20° rotation of thumbturn. Deadbolt thrown or retracted by 90° rotation of thumbturn. When locked, key outside or knob/lever inside retracts deadbolt and latchbolt simultaneously. Outside knob/lever remains locked until thumbturn is restored to vertical position. Throwing deadbolt automatically locks outside knob/lever. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever is always free for immediate egress.



L9456 **F13**

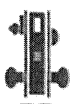
LV9456
Corridor Lock

Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key outside or inside thumbturn. Throwing deadbolt locks outside knob/lever. Turning inside knob/lever simultaneously retracts deadbolt and latchbolt and unlocks outside knob/lever. Inside lever is always free for immediate egress.



L9465
Closet/Storeroom Lock

Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key outside.



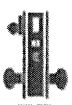
L9473 **F21**
Dormitory/Bedroom Lock

Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key outside or thumbturn inside.



L9480
LV9480
Storeroom Lock With Deadbolt

Latchbolt retracted by key outside or by lever or knob inside. Outside knob/lever always fixed. Deadbolt thrown or retracted by key outside or thumbturn inside. Turning inside knob/lever simultaneously retracts both deadbolt and latchbolt. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever is always free for immediate egress. [Previously XL11-591]



L9485
LV9485
Prison Function Lock

Latch retracted by key outside or knob inside. Outside knob always free spinning. Deadbolt only thrown or retracted by guard's key. Inside knob becomes fixed when deadbolt is thrown. Prisoner's key only retracts latchbolt. Furnished standard with tamper resistant Torx® screws. Specify per XL11-557.

Schlage ANSI



L9485
LV9485

Hotel or Restroom Lock

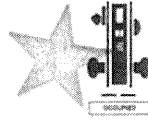
Latchbolt retracted by key outside or by knob/lever inside. Outside knob/lever always fixed. Deadbolt thrown or retracted by inside thumbturn. When deadbolt is thrown, all keys become inoperative except emergency or display keys. Turning inside knob/lever retracts both deadbolt and latchbolt simultaneously. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever is always free for immediate egress.



L9486 **F15**

LV9486
Hotel or Restroom Lock with "Do Not Disturb" Indicator

Latchbolt retracted by key outside or by knob/lever inside. Outside knob/lever always fixed. Deadbolt thrown or retracted by inside thumbturn. When deadbolt is thrown, "DO NOT DISTURB" plate is displayed. All keys become inoperative except emergency or display keys. Turning inside knob/lever retracts both deadbolt and latchbolt simultaneously. Auxiliary latch deadlocks latchbolt when door is closed. Inside lever is always free for immediate egress.



L9486 x L583-375
LV9486 x L583-375

L9486 with "Occupied" Indicator

Latchbolt retracted by key outside or by knob/lever inside. Outside knob/lever always fixed. Deadbolt thrown or retracted by inside thumbturn. When deadbolt is thrown, "OCCUPIED" plate is displayed and all keys become inoperative except emergency keys. Turning inside knob/lever simultaneously retracts both deadbolt and latchbolt. Auxiliary latch deadlocks latchbolt when door is closed. [Previously XL11-580] Inside lever is always free for immediate egress.

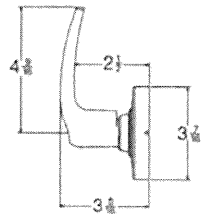
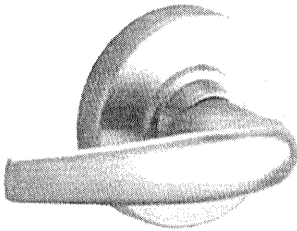


L9496
Privacy with "Occupied" Indicator

Knob/lever retracts latchbolt from either side. Deadbolt thrown or retracted by key outside [retraction by key required in the event of an emergency] or inside thumbturn. Throwing deadbolt locks outside knob/lever and displays "OCCUPIED" plate. Rotating inside knob/lever simultaneously retracts both deadbolt and latchbolt and unlocks outside knob/lever. Inside lever is always free for immediate egress. [Previously XL11-885]

Lever Designs

Athens

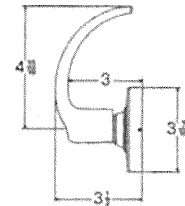
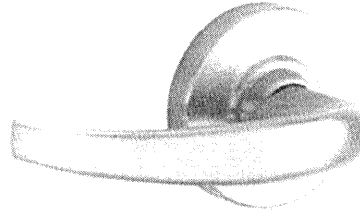


Symbol: ATH (L-Series 07)

Material: Pressure cast zinc lever; wrought brass rose



Sparta

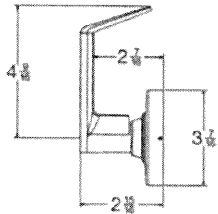
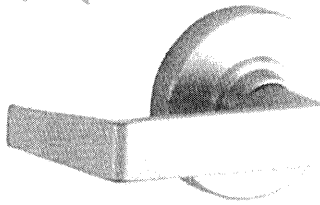


Symbol: SPA (L-Series 17)

Material: Pressure cast zinc lever; wrought brass rose



★ Rhodes

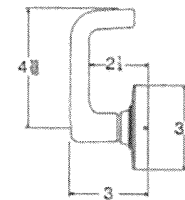
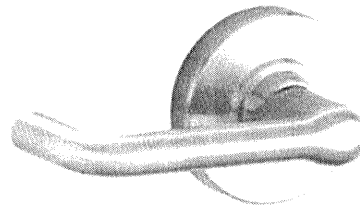


Symbol: RHO (L-Series 06)

Material: Pressure cast zinc lever; wrought brass rose



Tubular

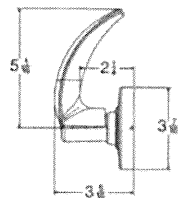
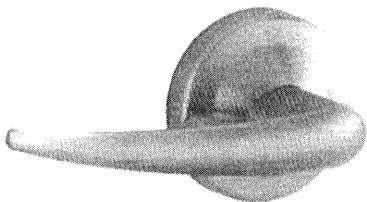


Symbol: TLR (L-Series 03)

Material: Pressure cast zinc lever; wrought brass rose



Omega



Symbol: OME (L-Series Omega)

Material: Pressure cast zinc lever; wrought brass rose



Tactile Warning

Milled



Order as follows:

8AT for Athens

8RO for Rhodes

8SP for Sparta

Knurled



Order as follows:

8TR for Tubular



Only available on outside lever, unless otherwise specified

All designs shown in 626 Satin Chrome

- = Standard cylinder.
- = FSIC - Full size interchangeable core option.
- = SFIC - Small format interchangeable core option.
- = Complies with ADA Accessibility Guidelines.

- = Antimicrobial coating available on 626 finish only.
- = Meets California code for 1/2" or less return to the door.
- = Extended factory lead time.

Lock Functions | ANSI A156.2 Series 4000 Grade 1

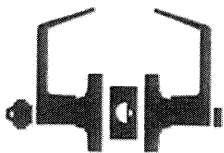
Keyed Locks (continued)

SCHLAGE ANSI
ND73PD 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 is always unlocked.

Outside Inside

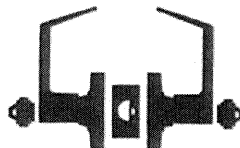


SCHLAGE ANSI
ND75PD -

Classroom Security Lock

- Key in either lever locks or unlocks outside lever.
- Inside lever is always unlocked.

Outside Inside



SCHLAGE ANSI
ND80PD F86

Storeroom Lock

- Outside lever is fixed.
- Entrance by key only.
- Inside lever always unlocked.

Outside Inside

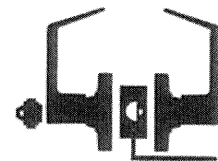


SCHLAGE ANSI
ND80PDEL -

Electrically Locked (Fail Safe)

- Outside lever continuously locked electrically.
- Unlocked by key outside or by switch or power failure.
- Auxiliary latch deadlocks latchbolt when door is closed.
- Inside lever always free for immediate exit.

Outside Inside

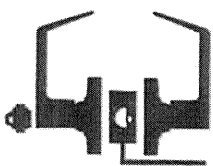


SCHLAGE ANSI
ND80PDEU -

Electrically Unlocked (Fail Secure)

- Outside lever continuously locked until unlocked by key or electric current.
- Auxiliary latch deadlocks latchbolt when door is closed.
- Inside lever always free for immediate exit.

Outside Inside

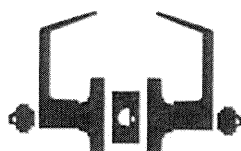


SCHLAGE ANSI
ND82PD F87

Institution Lock¹

- Both levers are fixed.
- Entrance by key in either lever.

Outside Inside

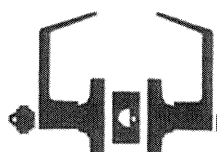


SCHLAGE ANSI
ND85PD -

Faculty Restroom Lock

- Outside lever is fixed.
- Entrance by key only.
- Push-button in inside lever activates visual occupancy indicator, allowing only emergency master key to operate.
- Turn inside lever or close door to release visual occupancy indicator.
- Rotation of inside spinner-button provides lock-out feature by keeping indicator thrown.

Outside Inside



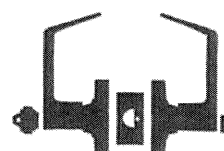
Vandlgard Functions

SCHLAGE ANSI
ND91PD F82

Entrance/Office Lock

- Push-button locking.
- Push-button disengages outside lever until locked with key or by turning inside lever.
- Vandlgard is designed to disengage outside spindle from latch when locked.

Outside Inside



Deadbolt Designs

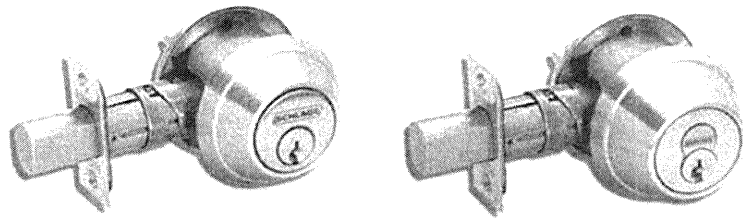
B600-Series

Schlage's toughest heavy duty Grade 1 commercial deadbolt.

Furnished with conventional cylinder standard.

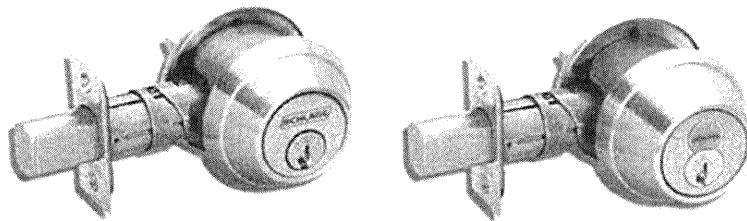
Also available with full size interchangeable core cylinder or small format interchangeable core (SFIC) cylinder.

Requires 2 1/4" (55mm) prep. UL10B listing standard for auxiliary lock on A Label fire doors.



B700-Series

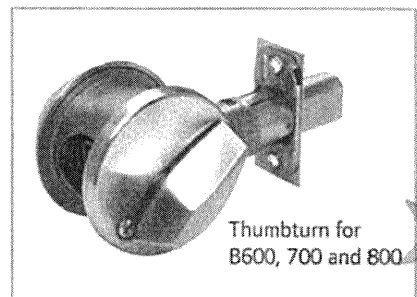
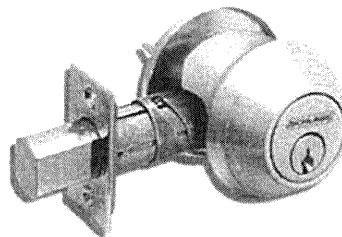
Same lock as B600-Series but furnished with Primus XP Controlled Access cylinder for patented key control, geographical exclusivity and resistance to picking and impressioning. Also available with Primus XP full size interchangeable core cylinder.




B800-Series

Same lock as B700-Series but Primus XP high security cylinder is UL437 Listed to resist drilling and other forms of physical attack. Not available in interchangeable core.

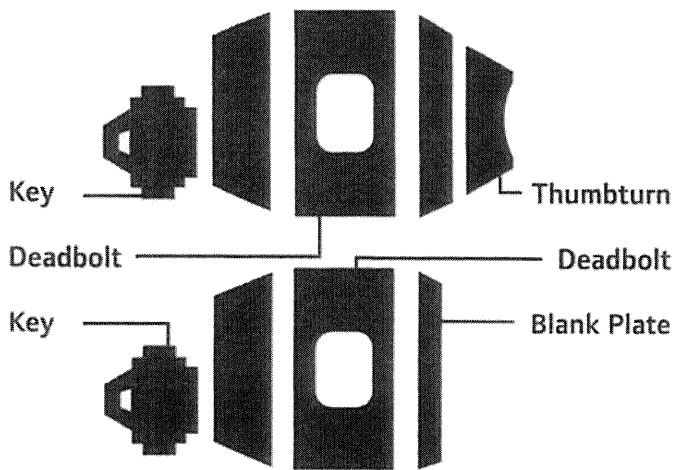
All designs shown in 626 Satin Chrome



Thumbturn for B600, 700 and 800 

B-600 / B-700 / B-800

Deadbolt Functions | ANSI A156.5 Bored Deadbolt Locks Grade 1



B-600 Series

SCHLAGE  ANSI
B660P  E1251

Single Cylinder Deadbolt

- Deadbolt thrown or retracted by key outside or thumbturn inside.

Outside Inside



SCHLAGE ANSI
B661P E2161

Cylinder Only x Blank Plate Deadbolt


- Deadbolt thrown or retracted by key outside.
- Blank plate with exposed screws inside.

Outside Inside



 Standard cylinder.

 FSIC - full size interchangeable core option.

 SFIC - small format interchangeable core option.

 Complies with ADA Accessibility Guidelines.

B-700 Series

SCHLAGE ANSI
B760P E1251

Single Cylinder Deadbolt

- Deadbolt thrown or retracted by key outside or thumbturn inside.

Outside Inside



SCHLAGE ANSI
B761P E2161

Cylinder Only x Blank Plate Deadbolt

- Deadbolt thrown or retracted by key outside.
- Blank plate with exposed screws inside.

Outside Inside



ADA Compliant:

Schlage Lock Company offers a wide selection of locks designed to meet the Americans With Disabilities Act.

B-800 Series

SCHLAGE ANSI
B860P E1251

Single Cylinder Deadbolt

- Deadbolt thrown or retracted by key outside or thumbturn inside.

Outside Inside



SCHLAGE ANSI
B861P E2161

Cylinder Only x Blank Plate Deadbolt

- Deadbolt thrown or retracted by key outside.
- Blank plate with exposed screws inside.

Outside Inside



Product information and specifications contained in this catalog are subject to change without notice. Please consult the factory.

*** Caution:**

Double cylinder locks on any door 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 ANSI
B662P* E2141

Double Cylinder Deadbolt

- Deadbolt thrown or retracted by key on either side.

Outside Inside



SCHLAGE ANSI
B663P E2171



Classroom Deadbolt

- Deadbolt thrown only by key outside.
- Deadbolt retracted by key outside or thumbturn inside.

Outside Inside



SCHLAGE ANSI
B664P E2101

Cylinder Only Deadbolt

- Deadbolt thrown or retracted by key one side.
- No trim on inside.

Outside Inside



SCHLAGE ANSI
B680 E2191

Door Bolt

- Deadbolt thrown or retracted by thumbturn inside.
- No outside trim.

Outside Inside



SCHLAGE ANSI
B762P* E2141

Double Cylinder Deadbolt

- Deadbolt thrown or retracted by key on either side.

Outside Inside



SCHLAGE ANSI
B763P E2171

Classroom Deadbolt

- Deadbolt thrown only by key outside.
- Deadbolt retracted by key outside or thumbturn inside.

Outside Inside



SCHLAGE ANSI
B764P E2101

Cylinder Only Deadbolt

- Deadbolt thrown or retracted by key one side.
- No trim on inside.

Outside Inside



SCHLAGE ANSI
B862P* E2141

Double Cylinder Deadbolt

- Deadbolt thrown or retracted by key on either side.

Outside Inside



SCHLAGE ANSI
B863P E2171

Classroom Deadbolt

- Deadbolt thrown only by key outside.
- Deadbolt retracted by key outside or thumbturn inside.

Outside Inside



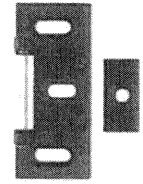
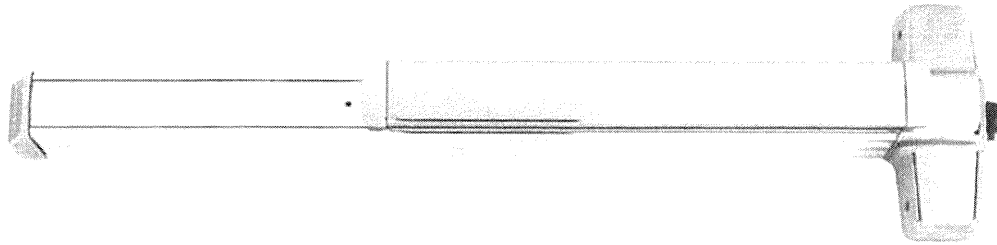
SCHLAGE ANSI
B864P E2101

Cylinder Only Deadbolt

- Deadbolt thrown or retracted by key one side.
- No trim on inside.

Outside Inside





The 299 Strike ships standard, optional strikes available

98 and 99 rim exit devices for all types of single and double doors with mullion, UL listed for Panic Exit Hardware. Devices are ANSI A156.3 – 2001 Grade 1. The 98 device has a smooth mechanism case and the 99 device has a grooved case. The rim device is non-handed except when the following device options are used: SD (Special Dogging), -2 (Double Cylinder) or SS (Signal Switch). See Opposite page for available outside trim and device functions. Covers stock hollow metal doors with 86 or 161 cutouts on single doors (may cover cutouts on pairs – consult template).

Finishes – US3, US3A, US4, US4A, US10, US26, US26D, US26D-AM Antimicrobial, US28, 313, 315 & 643E. US15 and US32D available with 98 Series only.

Hex key dogging

comes standard on 98/99 Rim Exit Devices



Specifications

Device Functions	Device ships EO/DT/NL. Field selectable. For TP, K or L remove NL drive screw from device.
Device Lengths	3' 2'4" to 3' (711mm to 914 mm) Door Size 4' 2'10" to 4' (864 mm to 1219 mm) Door Size
Device Centerline from Finished Floor	39 ¹³ / ₁₆ " (1011 mm) 39 ¹ / ₁₆ " (1008 mm) with Mullion
Center Case Dimensions	8" x 2 ³ / ₄ " x 2 ³ / ₈ " (203mm x 70mm x 60mm)
Mechanism Case Dimensions	2 ¹ / ₄ " x 2 ¹ / ₄ " (57mm x 57mm)
Projection	Pushbar Neutral – 3 ¹³ / ₁₆ " (97 mm) Pushbar Depressed – 3 ¹ / ₁₆ " (78 mm)
Latch Bolt	Deadlocking, 3/4" (19mm) throw
Fasteners & Sex Bolts (SNB)	Includes screw pack for 1 ¹ / ₄ " (44mm) and 2 ¹ / ₄ " (57mm) thick metal or wood doors. Optional 425 SNB available, see page 9 for quantities.
Electric Options	<p>LX Latchbolt Monitor Switch</p> <p>RX Pushpad Monitor Switch</p> <p>RX2 Double Pushpad Monitor Switch</p> <p>E Electric Locking & Unlocking Trim</p> <p>EL Electric Latch Retraction</p> <p>QEL Quiet Electric Latch Retraction</p> <p>SS Signal Switch</p> <p>CX Chexit Delayed Exit</p> <p>ALK Alarm Exit Kit</p> <p>WP-RX Waterproof Request to Exit</p>
Mechanical Options	<p>-2 Double Cylinder</p> <p>GBK Glass Bead Kit</p> <p>PN Pneumatic Latch Retraction</p> <p>XP Extra Protection</p> <p>SNB Sex Bolts</p> <p>SEC Security Screws</p>
Dogging Feature	Hex key dogging standard
Dogging Options	<p>CD Cylinder Dogging</p> <p>SD Special Center Case Dogging</p> <p>LD Less Dogging</p> <p>DI Dogging Indicator</p> <p>CDI Cylinder Dogging Indicator</p>
Strikes	299 – Dull Black

XP **Extra Protection**

- 90° latch-to-strike contact
- Force resistance of 2,000+ lbs.

EB **Electrified Breakaway Lever**

- Electrified remote locking/unlocking
- Standard in fail safe condition

QEL **Quiet Electric Latch Retraction**

- Bolt retraction via switch
- Converts exit door to push-pull operation

CD **Cylinder Dogging**

- Replaces hex key dogging
- Requires standard 1¹/₄" mortise cylinder

CX **Chexit Delayed Exit**

- Meets NFPA 101 requirements
- Self-contained controls, locking, alarm

PM **Pushpad Monitor Switch**

- Signals use of an opening
- SPDT switch to monitor pushpad

ELR **Electric Latch Retraction**

- Enables remote unlatching
- Alternative to manual dogging

AEK **Alarm Exit Kit**

- Unauthorized opening triggers 85-decibel horn
- Set in armed or disarmed mode by key

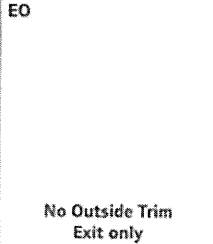
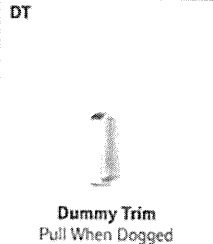
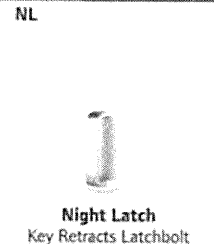
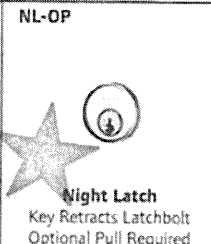
PN **Pneumatic Latch Retraction**

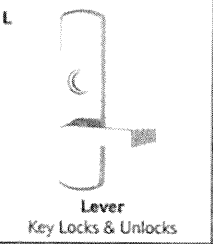
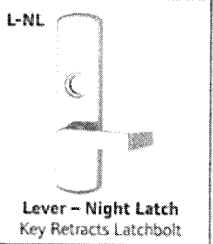
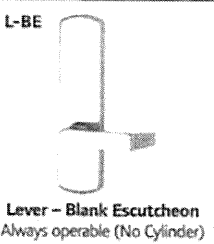
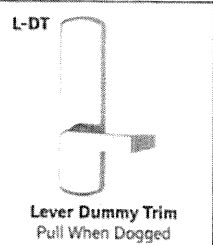
- For areas where electrical devices banned
- Special linkage for mechanical or pneumatic dogging

EMK **Braille, Embossed and Knurled Touchpads**

- Braille touchpad embossed with "Caution Stairwell"
- Other messages available by special order

Standard Trim

	EO	DT	NL	NL-OP
				
Product Description	98EO 99EO	98DT 99DT	98NL 99NL	98NL-OP 99NL-OP
Trim Description	—	990DT	990NL-R/V	110NL-MD 110NL-WD
Escutcheon Plate Size	—	3" x 14 ³ / ₁₆ " x ³ / ₃₂ " (76x360x2mm)	3" x 14 ³ / ₁₆ " x ³ / ₃₂ " (76x360x2mm)	—
Pull Center to Center	—	5 ¹ / ₂ " (140mm)	5 ¹ / ₂ " (140mm)	—
Projection	—	2" (51mm)	2" (51mm)	—
ANSI Function	01	02	03	03
Cylinder Type	—	—	Rim	Rim
Handing	—	—	—	—
Optional Trim	x990EO x996EO	x996K-DT x996L-DT x696DT x697DT	x996K-NL x996L-NL x696NL x697NL	
Optional #425 Sex Bolt Quantity for Device	6	2	2	6

	L	L-NL	L-BE	L-DT
				
Product Description	98L 99L	98L-NL 99L-NL	98L-BE 99L-BE	98L-DT 99L-DT
Trim Description	996L-R/V*	996L-NL-R/V	996L-BE-R/V*	996L-DT
Escutcheon Plate Size	2 ³ / ₄ " X 10 ³ / ₄ " X ²⁷ / ₃₂ " (70x273x21mm)	2 ³ / ₄ " X 10 ³ / ₄ " X ²⁷ / ₃₂ " (70x273x21mm)	2 ³ / ₄ " X 10 ³ / ₄ " X ²⁷ / ₃₂ " (70x273x21mm)	2 ³ / ₄ " X 10 ³ / ₄ " X ²⁷ / ₃₂ " (70x273x21mm)
Pull Center to Center	—	—	—	—
Projection	2 ⁷ / ₈ " (73mm)	2 ⁷ / ₈ " (73mm)	2 ⁷ / ₈ " (73mm)	2 ⁷ / ₈ " (73mm)
ANSI Function	08	03	14	02
Cylinder Type	Rim	Rim	—	—
Handing	Handed/Reversible	Handed/Reversible	Handed/Reversible	Handed/Reversible
Optional #425 SNB Quantity for Device	2	2	2	2

* Electrified lever operation available

Notes

98/99

Exit Device

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.

To order, specify: Use prefix XP, example XP99EO.

WS Surface Vertical Rod Exit Device

WS9827/9927 Surface Vertical Rod exit device designed, tested and certified to comply with ICC 500 Standard for the Design and Construction of Storm Shelters, and the Federal Emergency Management Agency's publication FEMA 361 - Design and Construction Guidance for Community Safe Rooms.

Dimensionally the device matches with the standard 98/99 surface vertical rod exit device, and is listed with Steelcraft Paladin™ PW-Series doors for tornados, and Steelcraft H-Series doors hurricane applications.

UL Listed - Panic hardware UL 305; and Fire exit hardware UL 10C; 3 hour pairs of doors double egress, 90 minutes swinging same direction. 8'0" x 8'0" (2438mm x 2438mm).

BHMA Grade 1, ANSI A156.3-2001g1

Windstorm ratings:

Door applications - 8'0" x 8'0" (2438mm x 2438mm) pairs swinging same direction and 4'0" x 8'0" (1219mm x 2438mm) single non-fire rated flush hollow metal.

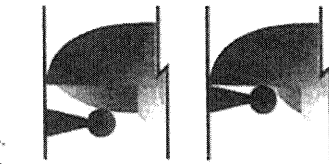
Miami-Dade County/FBC compliance to TAS 201, TAS 202, TAS203 (NOA pending); design load rating +150/-150 PSF (245 MPH wind zone); Enhanced Hurricane Protection (EHPA) ASTM E1996, ANSI/ICC 500 (245 MPH wind zone).

UL-FEMA 361 certified 8'0" x 8'0" (2438mm x 2438mm) pairs swinging same direction and 4'0" x 8'0" (1219mm x 2438mm) single non-fire rated flush hollow metal.

UL-ANSI/ICC 500 certified for F5 tornado applications.

To order, specify:

WS prefix, example WS9927-F



LBR Less Bottom Rod, Panic and Fire Rated

LBR option is available, using a spring loaded auxiliary latch bolt installed in the lower door edge. When exposed to heat the auxiliary latch bolt releases, keeping the doors in alignment and closed during a fire. UL listed 3 hours on hollow metal doors double egress, 90 minute swinging same direction, and 20 minutes wood doors (consult wood door manufacturer). Fits door stiles as narrow as 3/8".

LBR devices must be ordered in pairs or must be used in conjunction with an approved automatic or constant latching flush bolt.

PL Pullman Latch

When PL is specified the standard latches are replaced with pullman style latches. Pullman latches are always extended and are most commonly used in conjunction with electric strikes and LBR-less bottom rod application. Not available with Fire rated devices. Not recommended where security is of the utmost importance since latches do not deadlock.

Dummy Pushpad

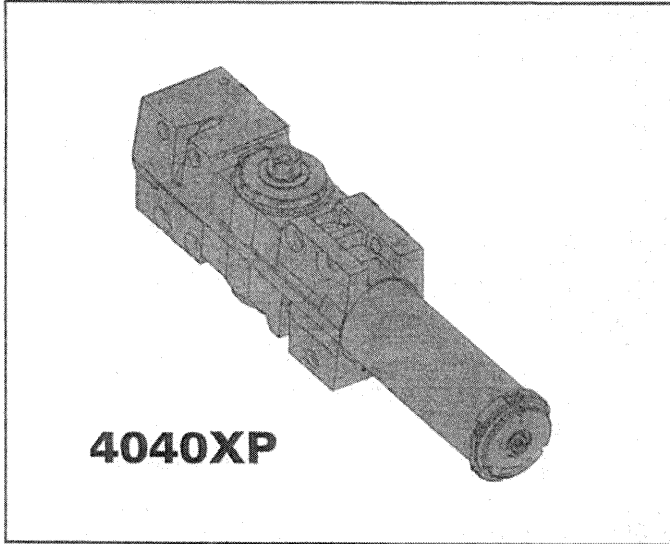


The 330 dummy pushpad is designed as a companion unit for all 99 devices. The 350 dummy pushpad is a companion unit for all 98 devices. The pushpad is rigid or nonfunctioning. A push/pull operation can be accomplished by using 990DT, 996DT trim or any Ives Pull.

The 330/350 can be equipped with a functional pushpad and will accommodate an RX or WP-RX switch. Specify RX-330. May also be equipped with the RX2, double RX switch. Specify RX2-330

To order, specify:

1. 330 or 350.
2. Size 3' or 4' (914mm or 1219mm)
3. Finish, US3, US4, US10, US26, US26D, US28, 313 & 315.
US32D - 350 only.
4. Specify RX, WP-RX or RX-2 if desired.



4040XP

- ▶ 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.
- ▶ 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.

4040XP

The 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 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



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	NON-HANDED	NON-SIZED	ACCESSIBILITY	DELAYED ACTION	AVB***	XP	REGULAR (DOUBLE)	STANDARD (SINGLE)	HOLD-OPEN	FUSIBLE LINK	EDA/EDA	CUSH/HICUSH	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

LCN 4040 SERIES

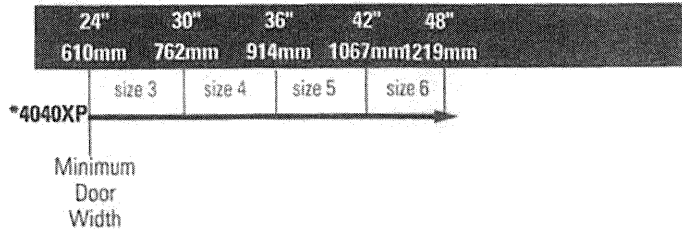
TABLE OF SIZES

4040XP cylinders are adjustable from size 1 through size 6 and is shipped set to size 3.

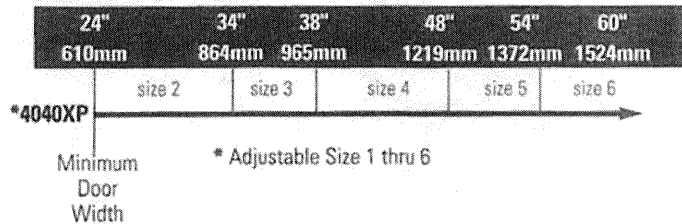
Closing power of 4040 series closers may be adjusted 50%.

→ Indicates recommended range of door width for closer size

EXTERIOR (and VESTIBULE) DOOR WIDTH




INTERIOR DOOR WIDTH



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 4040XP SERIES CLOSERS

1. SELECT FINISH.

- Standard Powder Coat _____
Aluminum, Dark Bronze, Statuary,
Light Bronze, Black, Brass.

Closer will be shipped with:

- STANDARD CLIP-ON COVER,
 - SPECIFY ARM WHEN ORDERING,
 - SELF-REAMING and TAPPING SCREWS,
- unless options listed below are selected.

CLOSER OPTIONS

COVER

- Metal (specify right or left hand) (MC)

FINISH

- Custom Powder Coat (RAL) _____
(handed metal cover required)
- Plated Finish, US _____
(handed metal cover required)
- SRI primer

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)
- HEDA (specify right or left hand, optional-62G)
- 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
- CUSH Shoe Support, 4040-30
- Blade Stop Spacer, 4040-61
- Auxiliary Shoe, 4040-62A
- PA Flush Panel Adapter, 4040-419

SPECIAL TEMPLATE

- ST- _____

ORDERING INFORMATION

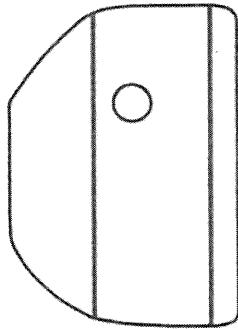
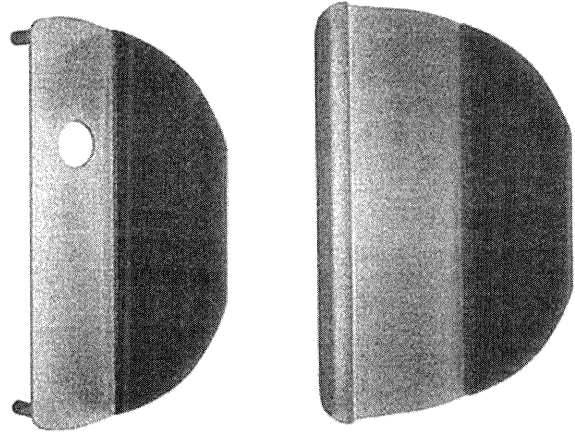
Vandal Resistant Trim



VR900 Series

Features:

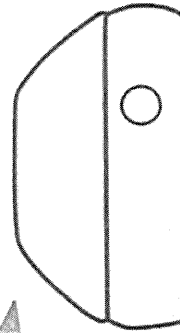
- Stainless Steel construction, 11 gage (0.120" thick).
- Thru-bolts and rugged mounting screws for maximum fastening strength.
- 1/4-20 screws and stainless steel finishing washers supplied with VR900 models; 10-24 screws supplied with VR910 models.
- Built-in lock protector prevents vandalism to mortise latchbolt (available on certain models).
- Extra-tough stainless steel cylinder collar prevents pipe wrench or similar tool from damaging cylinder. Tapered design prevents side impacts from transferring directly to cylinder. Collar spins freely.
- Sleek, attractive design.
- Furnished with mounting screws for door thicknesses of 1-3/4" to 2-1/4".
- Finish: US32D.
- Grip coated in black plastisol for softer touch and resilience to temperature extremes. Grip designed for comfortable operation.
- Meets ANSI/BHMA 156.13, Trim Security Test and California State Accessibility Standards Title 24.



VR900-RHR VR900-LHR

- For use with most mortise locks on outswinging doors, including Schlage L9000 Series locks with interior L escutcheon, N escutcheon, and rose trims.
- Includes built-in lock protector and cylinder cutout.
- Handed design allows trim to be positioned to coordinate with the centerline of inside hardware.

Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR900	7-1/4"	11"	2" W X 10" H	1-1/2"	1-7/8"

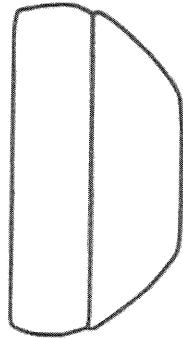


VR900LLP-RH VR900LLP-LH

- For use with most mortise locks on inswinging doors, including Schlage L9000 Series locks with interior L escutcheon, N escutcheon, and rose trims.
- Includes cutout for cylinder, less lock protector (LLP).
- Handed design allows trim to be positioned to coordinate with the centerline of inside hardware.

Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR900LLP	5-1/4"	11"	1-3/4" W X 10" H	1-1/2"	1-7/8"

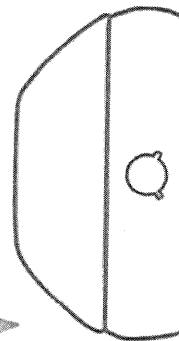
Vandal Resistant Trim



VR910-DT

- For use with Von Duprin 98/99 Series Rim and Vertical exit devices.
- Thru-bolts directly to device.
- Pull operation only. No cylinder cutout.

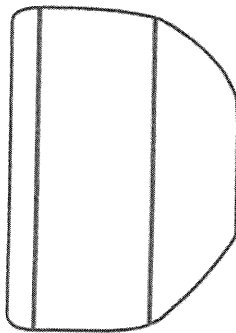
Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR910DT	5-1/4"	11"	1-3/8" W X 7" H	1-1/2"	1-7/8"



VR910-NL

- For use with Von Duprin 98/99 Series Rim and Vertical exit devices.
- Thru-bolts directly to device.
- Includes cylinder cutout.
- Tailpiece guide and cylinder cup provided.

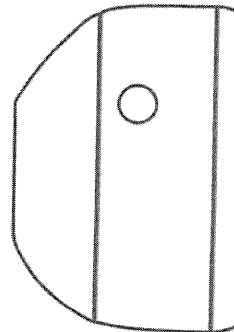
Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR910NL	5-1/4"	11"	1-3/8" W X 7" H	1-1/2"	1-7/8"



VR910M-DT

- For use with Von Duprin 98/9975 Series Mortise exit devices.
- Thru-bolts directly to device.
- Includes built-in lock protector.
- Pull operation only. No cylinder cutout.

Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR910M-DT	7-1/4"	11"	1-3/8" W X 7" H	1-1/2"	1-7/8"



VR910M-NL RHR VR910M-NL LHR

- For use with Von Duprin 98/9975 Series Mortise exit devices.
- Thru-bolts directly to device.
- Includes built-in lock protector and cylinder cutout.

Prod. No.	Width	Height	Thru-Bolt Pattern	Clearance Grip to Door	Proj.
VR910M-NL	7-1/4"	11"	1-3/8" W X 7" H	1-1/2"	1-7/8"

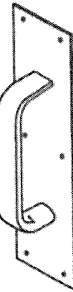
PULL PLATES



TRIMCO#	1013-2	1013-2B	1013-3	1013-3B
OA	3-1/2 x 15"	3-1/2 x 15"	4 x 16"	4 x 16"
P	2"	2"	2"	2"
G	1193-1	1193-2	1193-1	1193-2
CL	1-1/2"	1-1/2"	1-1/2"	1-1/2"
CTC	5-1/2"	8"	5-1/2"	8"
BHMA	J405	J405	J405	J405

Pull Plate - ADA

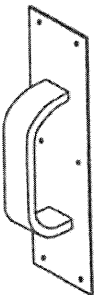
Br, Bz, SS



TRIMCO#	1014-2	1014-2B	1014-3	1014-3B
OA	3-1/2 x 15"	3-1/2 x 15"	4 x 16"	4 x 16"
P	2"	2"	2"	2"
G	1199-1	1199-2	1199-1	1199-2
CL	1-1/2"	1-1/2"	1-1/2"	1-1/2"
CTC	6"	8"	6"	8"
BHMA	J405	J405	J405	J405

Pull Plate - ADA

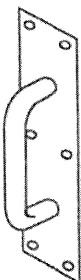
Br, Bz, SS



TRIMCO#	1015-2	1015-2B	1015-3	1015-3B
OA	3-1/2 x 15"	3-1/2 x 15"	4 x 16"	4 x 16"
P	2"	2"	2"	2"
G	1139-1	1139-2	1139-1	1139-2
CL	1-1/2"	1-1/2"	1-1/2"	1-1/2"
CTC	6"	8"	6"	8"
BHMA	J405	J405	J405	J405

Pull Plate - ADA

Br, Bz, Al, SS



TRIMCO#	1017-2	1017-2B	1017-3	1017-3B
OA	3-1/2 x 15"	3-1/2 x 15"	4 x 16"	4 x 16"
P	2-3/4"	2-3/4"	2-3/4"	2-3/4"
G	1194-1	1194-2	1194-1	1194-2
CL	2"	2"	2"	2"
CTC	6"	8"	6"	8"
BHMA	J405	J405	J405	J405

Pull Plate - ADA

Br, Bz, Al, SS

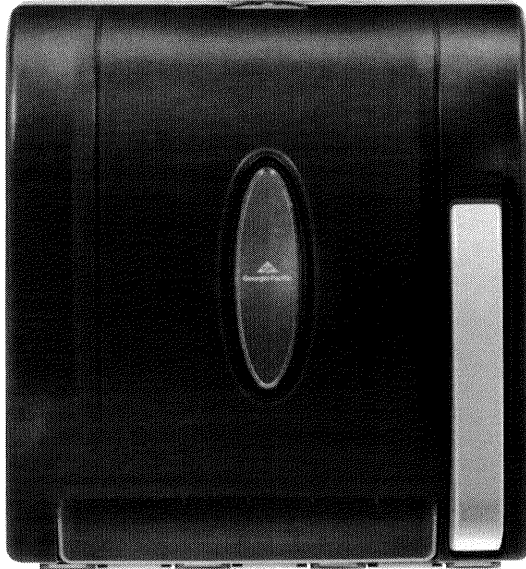
NOTE: All Plates this page are .050" thick.
 B Suffix indicates next larger size grip
 Custom sizes available.

Appendix B

Toilet Accessory Cut Sheets

® Push Paddle Roll Paper Towel Dispenser

Offering a great combination of portion control for operational efficiency and an enhanced push paddle design.



Description:

Put the simple, clean performance of the push paddle towel dispenser to work for you. This high-capacity dispenser, which holds an 8" diameter roll, will cut down on labor costs and help maintain user satisfaction. The contemporary design fits perfectly in a variety of market segments including manufacturing, schools, and high-traffic areas. This dispenser meets ADA guidelines when properly installed, giving you peace of mind while enjoying reliable, consistent performance from this dispenser.

Features & Benefits:

- » Contemporary design fits perfectly into a variety of market segments
- » Dispenses high capacity 8 Inch diameter rolls to help reduce costs and maintain user satisfaction
- » Durable dispenser provides consistent performance for peace of mind
- » ADA compliant when mounted properly

Product Details

Brand Owner	Georgia-Pacific
Brand	®
MFG Part#	54338
Color	Translucent Smoke
UP - UPC	073310543383
Each Per Ship Unit	1 Each
Items Per Each	0 Each
Case Total	1 Each
Dispenser (WxDxH)	13.375" x 15.625" x 10.250"
UNSPSC	47131701
Replaces Item	58553, 58353
Buy Multiple	1 EA

Case Shipping Info

Case GTIN	10073310543380
Case Gross Wgt	7.620 LBS
Case Net Wgt	6.500 LBS
Case Dimensions (LxWxH)	15.625" x 13.375" x 10.250"
Case Volume	1.240 CFT

Unit Shipping Info

TI-Qty/Layer	9
HI-Layers/Unit	9
Unit Qty	81
Unit Dimensions (LxWxH)	47.000" x 39.875" x 91.500"





FINALLY... A FAST HAND DRYER.

FAST! Dries Hands *Completely* in 10-15 Seconds

Excel's research team has developed the XLERATOR® with **patented technology** that delivers **three-times-faster** hand drying performance. Conventional hand dryers take from 30 to 45 seconds to get a user's hands totally dry, and very few of us are willing to wait that long. With the automatic sensor-activated XLERATOR, not only do your hands get dry in 10 to 15 seconds, but consumer test participants report that their hands also felt *warm, soft and really dry.*

Uses 80% Less Energy.

Not only does the XLERATOR dry hands in one third of the time required by conventional hand dryers, our hand-drying system is designed to run on 15-amp service (making it great for older buildings). The combination of these two factors results in 80% less energy cost per use vs. conventional hand dryers.

GreenSpec® Approved and Qualifies for LEED® Credits.



XLERATOR is the first hand dryer to be GreenSpec Listed because it meets a number of GreenSpec standards; conserves energy, has low maintenance requirements and reduces waste.



XLERATOR helps your facility qualify for several different LEED (Leadership in Energy and Environmental Design) Credits in the new 2009 Rating Systems including EA Credit 1 - Optimize Energy Performance, now a mandatory credit for any LEED-certified facility.

XLERATOR also *lowers a facility's Carbon Footprint.* Ask to see our Life Cycle Assessment (LCA) Study Results.

95% Cost Savings vs. Paper Towels

Converting to the XLERATOR hand dryer will result in more than a 95% savings vs. paper towel costs. In addition to paper towels, the following costs are also eliminated: ordering, storing, replenishing, collecting and disposing of bacteria-laden paper towel waste. This results in a **Payback of Less Than One Year!**

Setting a New Standard

After seven years in the marketplace, the XLERATOR hand dryer has received numerous awards and designations, appeared in case study articles done by prestigious trade publications, and been featured on national television programs! Because of its proven performance and customer satisfaction, XLERATOR is being specified in many high-profile facilities and has become... **THE NEW INDUSTRY STANDARD!**



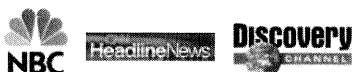
XLERATOR® IS RECEIVING A LOT OF ATTENTION

Ask about our Promotional Video
As seen on CNN Headline News
hosted by Terry Bradshaw.



(Available on CD. Or view this and other videos on our web site.)

TELEVISION APPEARANCES



AWARDS

Best New Product - Technology
(International Hotel, Motel and Restaurant Show)

Top Ten Green Product
(Environmental Building News)

Award for Design Excellence (ADEX)
(Design Journal ADEX Platinum Award)

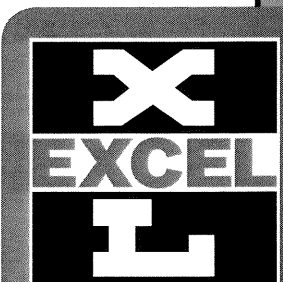
Citation of Excellence
(Buildings Product Innovations Awards)

FEATURED ARTICLES

The Wall Street Journal
Architectural Record
American School and University
Environmental Design and Construction

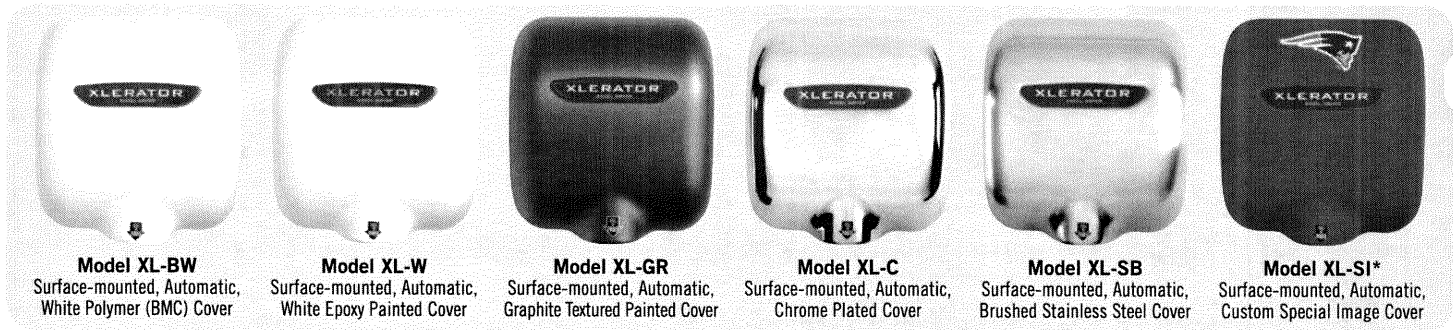
GSA Contract Holder
#GS-07F-0017T

Excel Dryer has been awarded a contract by the GSA (General Services Administration) which offers special pricing to all Federal Government Agencies.



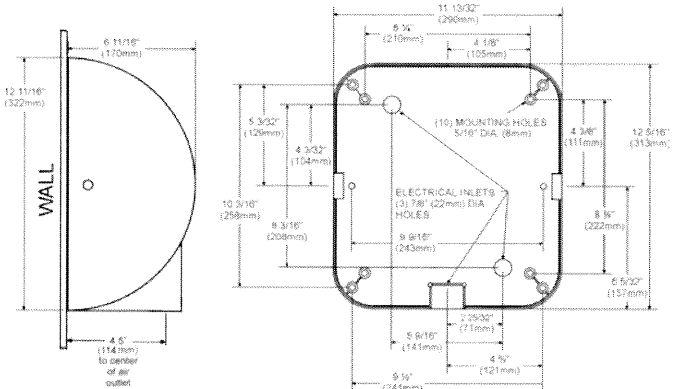
TIME TO THROW IN THE TOWEL.

XLERATOR® HAND DRYER SPECIFICATIONS



*Note: Exclusive digital image technology allows for the addition of Company, School or Team logos with any color, design or a 'green message'

Suggested Mounting Heights From floor to Bottom of Dryer		Units are 1500 Watts and available as Specified in:		
	Hand Dryers	110/120V	12.5 Amp	60 Hz
Mens'	45" (114 cm)	208V	7.0 Amp	60 Hz
Ladies'	43" (109 cm)	220/240V	6.5 Amp	60 Hz
Teenagers'	41" (104 cm)	277V	5.5 Amp	60 Hz
Sm. Children	35" (89 cm)	220/240V	6.5 Amp	50 Hz
Handicapped	37" (94 cm)			



Dimensions: 11 3/4" lg. X 12 11/16" high x 6 11/16" deep
(298 mm lg. X 322 mm high x 170 mm deep)

Weight: XL-BW - 15 lbs. (6.80 kgs.) XL-SB 16 lbs. (7.26 kgs.)
XL-W, XL-GR, XL-C, XL-SI - 17 lbs. (7.71 kgs.)

MECHANISM

- Motor shall be a thermally protected, series commutated, through-flow discharge vacuum motor/blower (5/8 hp / 20,000 rpm) which provides air velocity of up to 19,000 lfm (linear feet per minute) at the air outlet and 16,000 lfm at the hands (4 inches [102 mm] below air outlet).
- Heating element (970 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).
- 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.

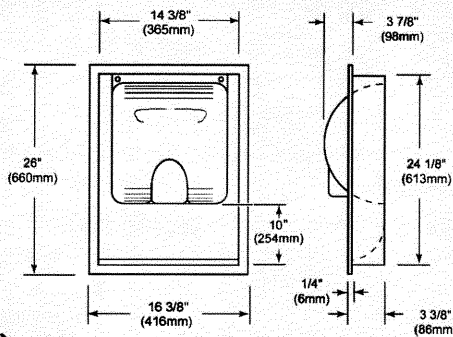
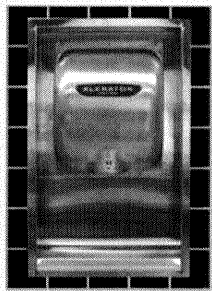
LIMITED WARRANTY

The dryer shall be guaranteed to be free from defects for a period of five (5) years. Warranty shall include labor performed at factory as well as the repair or exchange of defective parts, at manufacturer's option.

QUANTITY RECOMMENDATIONS

One dryer for every two washbasins is sufficient for most applications. If restroom traffic is unusually heavy, we suggest one dryer per washbasin in small installations and two dryers for every three washbasins in larger installations. When a 54" washfountain is used, we suggest four to five dryers.

Recess Kit - Meets ADA Protrusion Requirement of 4 inches (102 mm)



RECESS KIT (Optional)

Dimensions: 16 3/8" wide x 26" high x 3 3/8" deep
(416 mm wide x 660 mm high x 86 mm deep)
Weight: 11 lbs. (4.99 kgs.)

Note: Bottom of recessed wall box should be 10" (254 mm) below suggested mounting height for dryer (see chart).

XLERATOR® HAND DRYER CONSTRUCTION

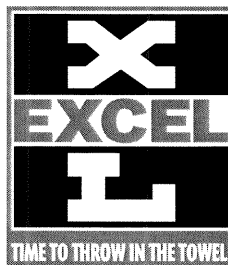
- Cover shall be one of the following: **Die-cast zinc alloy** - One-piece, heavy-duty, rib-reinforced, lightweight, unbreakable, rustproof and all exposed surfaces shall be bright chrome plated or finished with chip-proof, electrostatically applied epoxy paint. **Bulk Molding Compound (BMC)** - White reinforced thermoset polymer. **Stainless Steel** - with a brushed finish. **Special Image** - Digital image applied to cover using patented Kolorfusion Sublimation Decoration process. All covers will be fastened to a wall plate by two chrome plated tamper-proof bolts.
- 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.
- All internal parts shall be coated according to Underwriters' Laboratories, Inc. requirements.
- Entire mechanism shall be internally grounded.
- Optional recess kit includes a wall box (22 ga) and dryer mounting plate (16 ga) made from 18-8 Type 304 brushed stainless steel. A stainless steel tether is connected to the dryer mounting plate to hold the dryer in position when servicing.



See us in Sweet's
CD Online Catalog Files



Printed on recycled paper
Printed in the U.S.A.



EXCEL DRYER Inc.

357 Chestnut Street • P.O. Box 365
East Longmeadow, MA 01028 U.S.A.
Tel: (413) 525-4531, Fax: (413) 525-2853
Email: sales@exceldryer.com
www.exceldryer.com



DPX™ Foam & PRO™ TDX™ Systems

Durable, high-capacity dispensing

Rugged, high-capacity PRO TDX dispensers are engineered to withstand the toughest environments. Features new modern design with diamond-plate etching.

All PRO TDX Series dispensers are constructed of high impact ABS plastic and guaranteed for life.

PRO dispensing system features:

- High capacity refills for high volume areas
- Enhanced site window shape to show refill inside
- ADA compliant, one-hand push operation
- Modern design with diamond-plate effect looks great in tough soils environments
- SANITARY SEALED™ refills
- Easy to load, store and handle
- Portion control helps reduce waste
- Fresh dispensing valve with each refill



7200-01

7500-01

GOJO PRO Series Dispensers

SKU	DESCRIPTION
7200-01	GOJO PRO TDX 2000 Dispenser – Gray
7500-01	GOJO PRO TDX 5000 Dispenser – Gray



GOJO DPX Dispenser

Diamond-plate design connects with workers. Rugged dispenser stands up to the toughest conditions. Refills are SANITARY SEALED™ to prevent germs from contaminating the product. Simple, convenient push-bar actuation. Large sight window clearly displays product level. Lifetime Guarantee.



5254-06

SKU	DESCRIPTION
5254-06	GOJO DPX Dispenser 2000 mL



5268-03

GOJO ECO SOY™ Foaming Hand Cleaner

SKU	DESCRIPTION	FITS DISPENSER NO.
5268-03	2000 mL DPX Refill	5254-06

Sanitary Napkins & Dispensers

Maintex Seat Covers

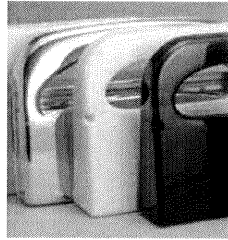
White, fold toilet seat covers provide maximum sanitary protection. Safe for all septic systems.

269104 1/2 fold 250/pack 20/case
269103 1/4 Fold 200/pack 25/case



Fold Seat Cover Dispenser

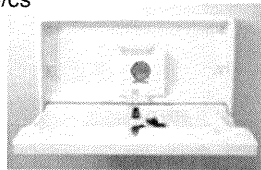
269101 1/2 fold Chrome plastic
269105 1/2 fold White plastic
269120 1/2 fold Smoke plastic
2691042 1/2 fold Stainless steel



Koala Baby Changing Station

Deep bed is constructed of high density polyethylene with reinforced steel on steel hinge mechanism. Complete with nylon safety straps and bag hooks.

2267009 Changing table kb100-00
2267014 Replacement Liners 500/cs



Classic Maxi Pads

Brand-name, maxi-size quality pads that offer comfort and protection. Packed in individual boxes for use in vending machine dispensing. Available in two sizes, #4 and #8.

270110 #4, 250/case
270109 #8, 250/case



Tampons

Biodegradable and 100% flushable cardboard applicator, with all natural, fragrance-free odor absorber.

270112 500/case Naturelle
22678116 500/case Tampax
270118 500/case Playtex (plastic applicator)



Panty Liners

Pantyliners provide everyday light protection and are preferred for comfort and freshness. Boxed individually for vending machines.

270113 200/case



Tampon Vendor

White enamel tampon vendor with separate locked coin box. Equipped with all metal parts and holds 22 tampons.

270115 Tampon Vendor

J6N Dual Vendor

White enamel dual vendor with separate locked coin box manufactured with all metal parts. Holds 17 #4 napkins and 26 tampons.

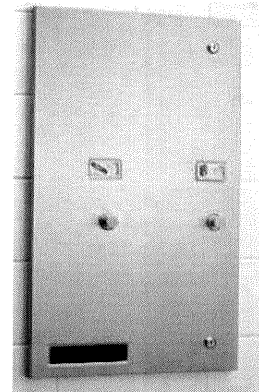
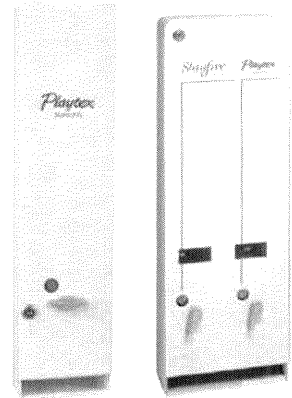
Complimentary, single, dual or triple coin dispensing available upon ordering.

270122 J6N Dual Vendor

Bobrick Dual Vendor

Surface mounted sanitary napkin/tampon vendor. Dispenses 31 napkins & 22 tampons. Single coin mechanism convertible for 25 cent operation, or specify free operation (no-coin) mechanism. Two tumbler locks. Separate lock and key for coin box.

270144 B2800 vendor



Courtesy Bag

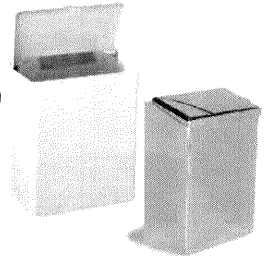
Necessities courtesy bag for female hygiene products.

2668112 500/case

Sanitary Napkin Receptacle

Used for quick and sanitary disposal of feminine hygiene products. For use with waxed liner.

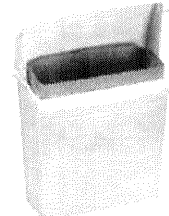
270140 Stainless Steel
2701250 White
2668110 Waxed liners 500/case



Sanitary Napkin Receptacle

Sanitary napkin wall receptacle. Space saving and easy to service. Tight fitting lid helps contain odor. Uses the 6141 waxed wall bags.

264140 6140 Receptacle
264141 6141 Waxed bags 250/case

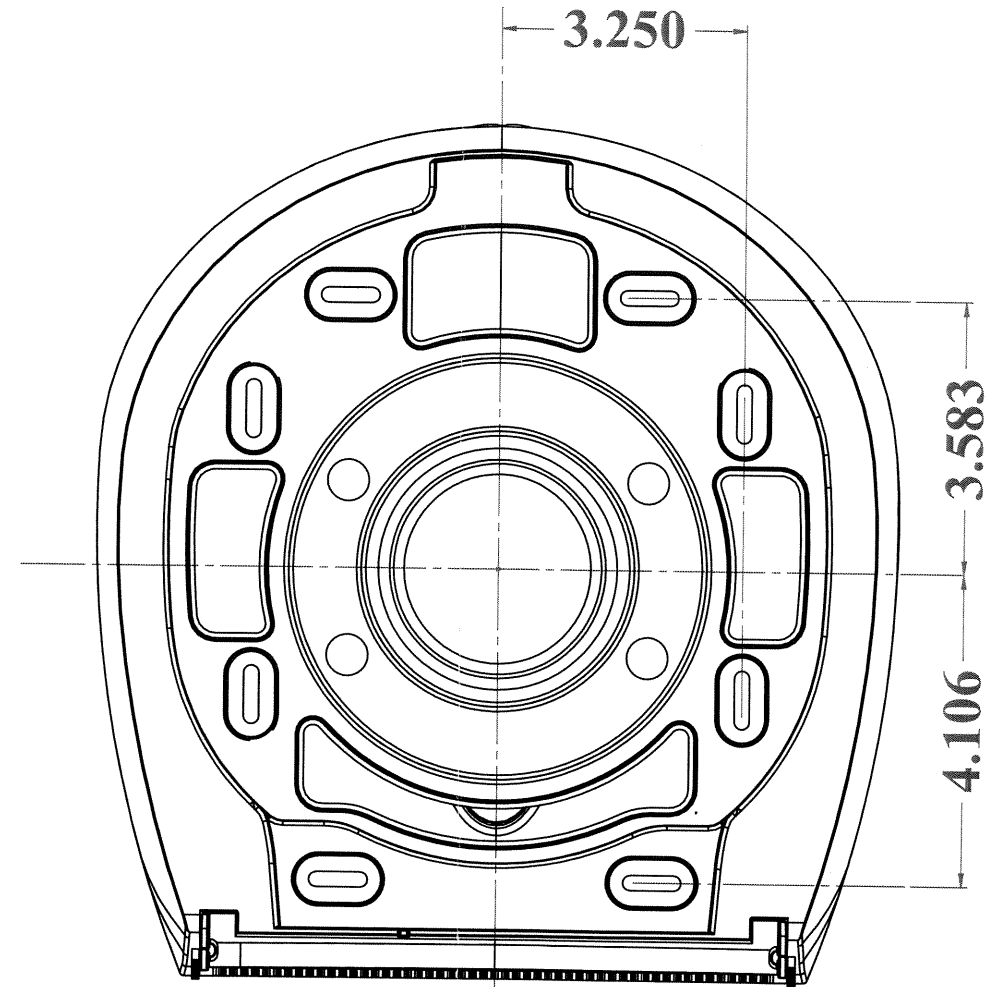
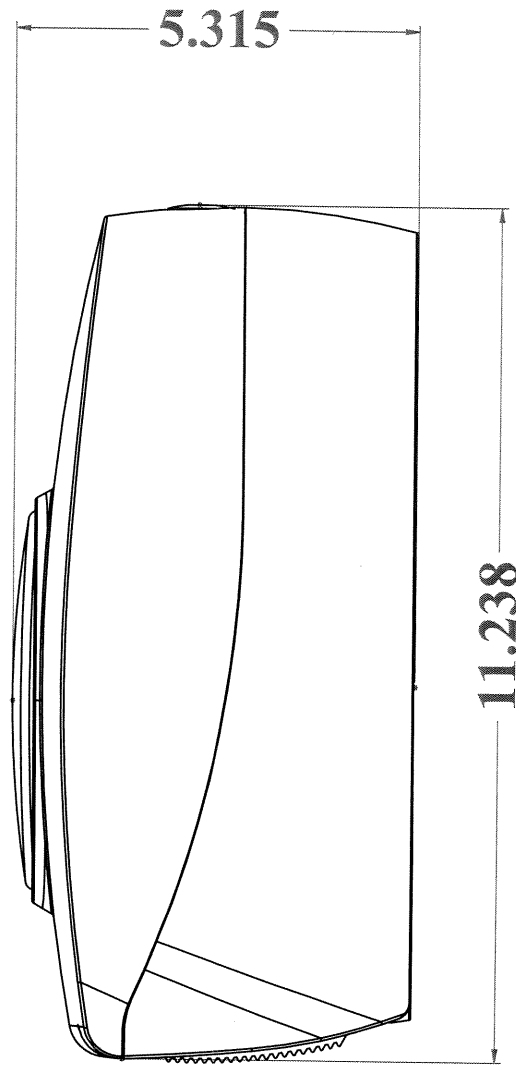
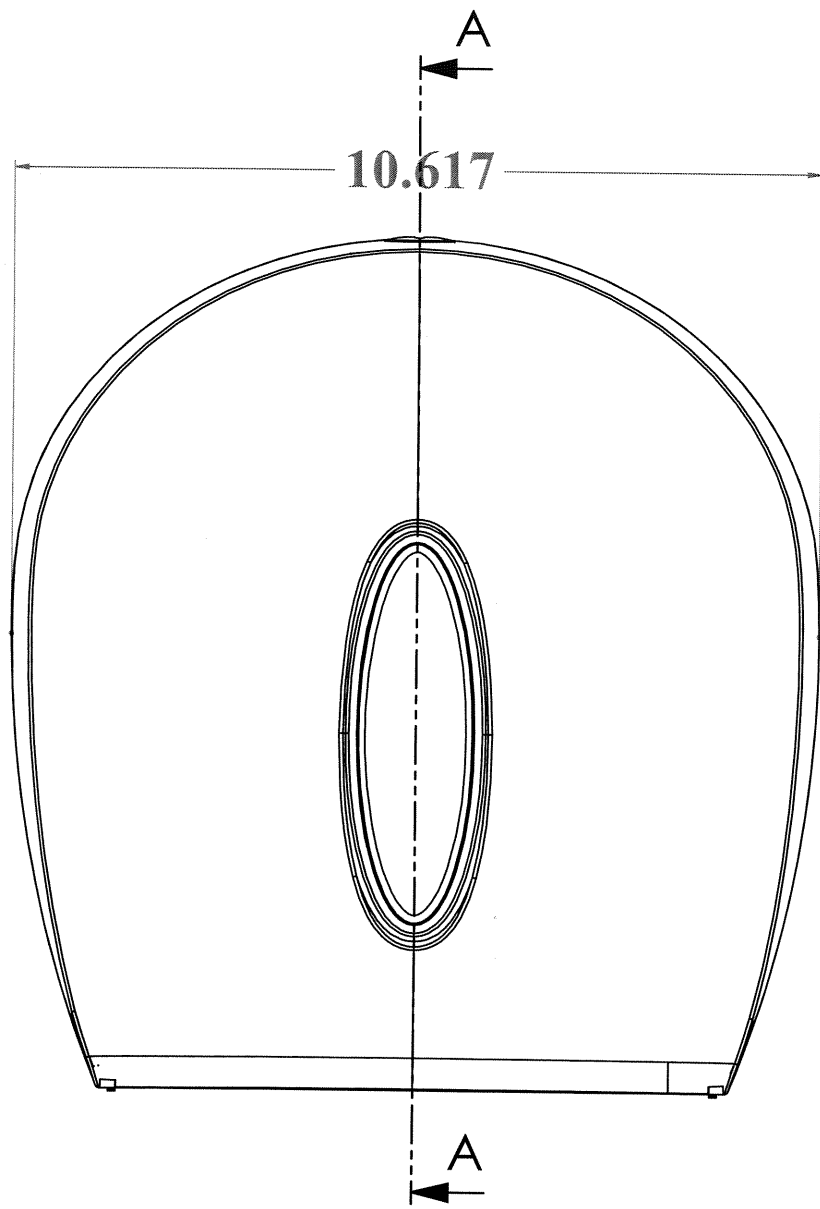


Sanitary Napkin Receptacle

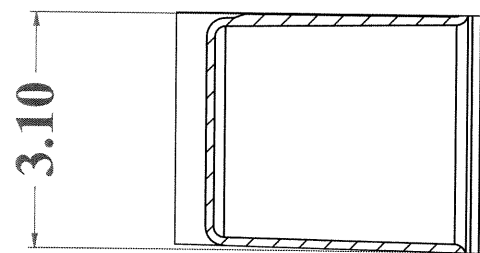
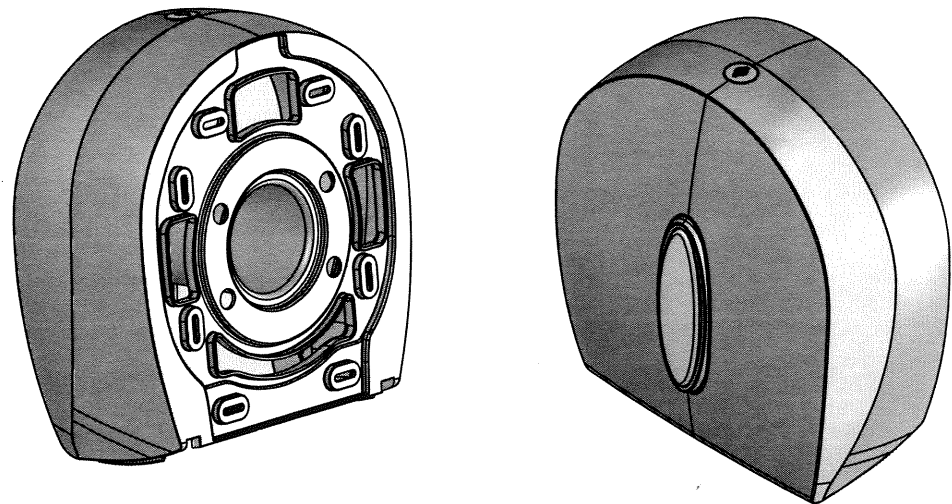
Heavy gauge steel with flip top lid. Door at base makes disposal quick and sanitary. Chrome available through special order only.

270147 250W, White, each
2668022 Saniliners for receptacles 500/cs





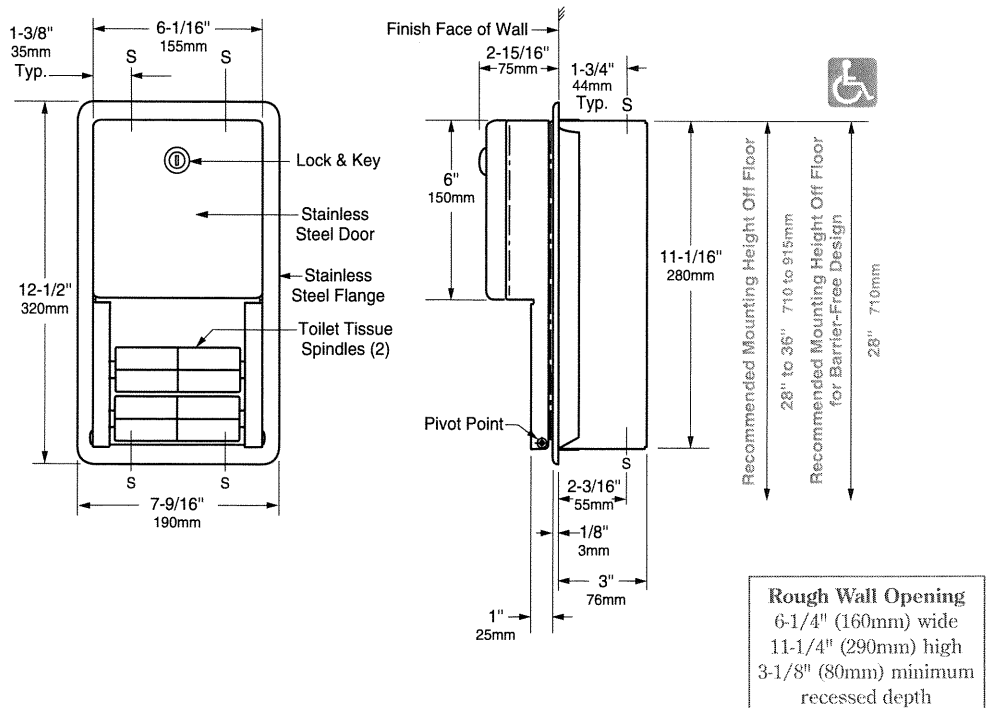
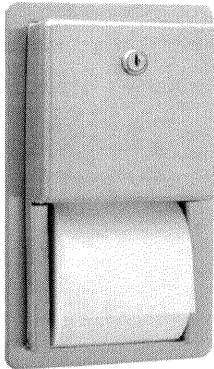
SCREW PATTERN



CORE SIZE

59009

9" SINGLE ROLL TISSUE DISPENSER

BOBRICK**Technical Data****RECESSED
MULTI-ROLL TOILET
TISSUE DISPENSER****B-3888****MATERIALS:**

Cabinet — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel. Welded construction. Exposed surfaces have satin finish.

Flange — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn, one-piece, seamless construction.

Door — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel with 18-gauge (1.2mm) stainless steel door frame. Exposed surfaces have satin finish. Front of door is drawn, one-piece, seamless construction. Secured to cabinet with two rivets. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

Dispensing Mechanism, Inner Housing and Cam — 18-8 S, type-304, 18-gauge (1.2mm) stainless steel.

Spindles (2) — Heavy-duty, one-piece, molded ABS. Theft-resistant, spindles retained in dispensing mechanism when door is locked.

OPERATION:

Unit holds two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops in place when bottom roll is depleted. Depleted rolls can only be removed after unlocking door.

INSTALLATION:

Provide framed rough wall opening 6-1/4" wide x 11-1/4" high (160 x 290mm). Minimum recessed depth required to finish face of wall is 3-1/8" (80mm). Allow clearance for construction features that may protrude into opening from opposite wall. Coordinate with mechanical engineer to avoid pipes, vents, and conduits. Mount unit with shims between framing and cabinet at all points indicated by an S, then secure unit with sheet-metal screws (not furnished).

SPECIFICATION:

Recessed multi-roll toilet tissue dispenser shall be type-304 stainless steel with welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction. Door shall be secured to cabinet with two rivets and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Flange shall be drawn, one-piece, seamless construction. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two heavy-duty, one-piece, molded ABS spindles. Theft-resistant, spindles retained in dispensing mechanism when door is locked.

Recessed Multi-Roll Toilet Tissue Dispenser shall be Model B-3888 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.



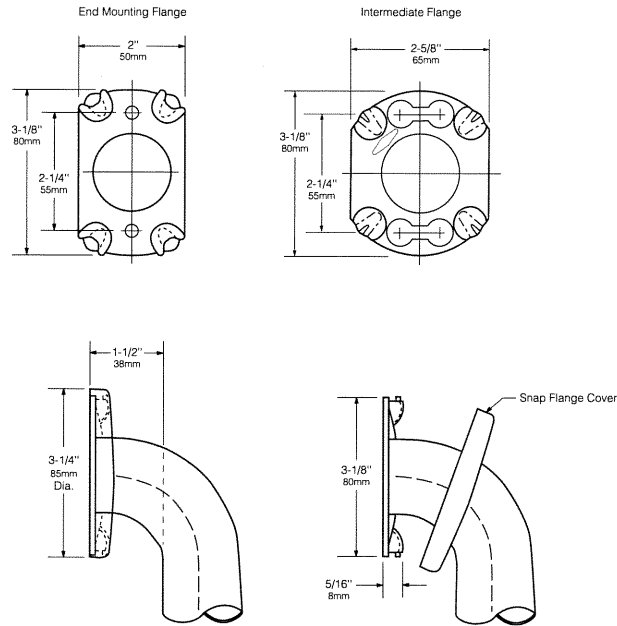
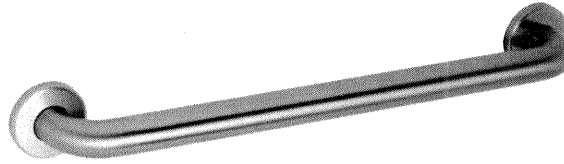
Technical Data

**1½" (38mm) DIAMETER
STAINLESS STEEL GRAB
BARS WITH SNAP FLANGE**

**B-6806
SERIES**

Specify Finish Required:

- Satin finish
- Satin finish with peened gripping surface; add suffix .99 to model number



<p>HORIZONTAL</p>	<p>VERTICAL</p>	<p>TWO-WALL WHEELCHAIR TOILET COMPARTMENT</p>
<p>B-6806 x 12, 18, 24, 30, 36, 42, 48</p>		<p>B-68137</p>
<p>HORIZONTAL TUB / SHOWER / TOILET COMPARTMENT BAR 24 x 36</p>	<p>HORIZONTAL TWO-WALL BAR for Shower Stall</p>	<p>TWO-WALL TOILET COMPARTMENT BAR 42 x 54</p>
<p>B-68616</p>	<p>B-6861</p>	<p>B-6897</p>

continued ...

MATERIALS:

Grab Bar — 18-8 S, type-304, 18-gauge (1.2mm) stainless steel tubing with satin-finish. 1-1/2" (38mm) outside diameter. Ends are heliarc welded to flanges. Clearance between the grab bar and wall is 1-1/2" (38mm).

Concealed Mounting Flanges — 18-8 S, type-304, 1/8" (3mm) thick, stainless steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with two holes for attachment to wall. Intermediate flanges 2-5/8" x 3-1/8" (65 x 80mm) wide x 3-1/8" (80mm) diameter.

Snap Flange Covers — 18-8 S, type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 1/2" (13mm) deep. Each cover snaps over mounting flange to conceal mounting screws.

STRENGTH:

Bobrick grab bars that provide 1-1/2" (38mm) clearance from wall can support loads in excess of 900 pounds (408kg) if properly installed. Other grab bar configurations can support loads in excess of 250 pounds (113kg) if properly installed, complying with accessible design (including ADAAG in the U.S.A.) for structural strength

Safety Warning: Grab bars are no stronger than the anchors and walls to which they are attached and, therefore, must be firmly secured in order to support the loads for which they are intended. To avoid potential injury, the building owner or maintenance personnel should remove the grab bar from service if the grab bar is not adequately secured to wall or if there is any observed damage to the welds.

INSTALLATION:

Provide concealed anchor device or backing as specified or required in accordance with local building codes before wall is finished. Fasten concealed mounting flanges to anchor device or backing with two screws in each flange. Snap flange covers over each mounting flange to conceal mounting screws. Concealed anchor devices and mounting screws are not included with Bobrick grab bars and must be specified as an accessory.

For Grab Bars with an Intermediate Flange(s), Pull Snap-Flange Covers away from mounting flanges. Place grab bar in desired mounting location. Use intermediate flange as a template to mark location of mounting screws at intermediate flange only. Mark screw locations at the center of the slot in the middle of the double-keyhole shaped mounting holes (2) in the intermediate flange. Remove grab bar from wall. Drive the intermediate flange mounting screws into wall at marked locations. **Note:** Make sure to leave a space of just over 1/8" (3.17mm) between the underside of the screw head and the wall. Install grab bar on the wall by placing the round ends of the intermediate flange double-keyhole shaped mounting holes over the mounting screws (2) are located in the middle of the flange slots. Install the mounting screws into the wall at the end flanges and secure tightly. Tighten the mounting screws at the intermediate flange. Press all snap-flange covers into place to conceal mounting flanges.

Note: Recommend use of 1/4" or #14 sheet metal or wood screws to install Intermediate Flange. #12 screws may also be used.

Important Notes:

- Mounting Kits** — Bobrick offers a mounting kit for installing grab bars; **one Bobrick mounting kit is required for each flange.**

Mounting Kit No.	Description
252-30	Consists of #14 x 2½" type-304 stainless steel, Phillips round-head, sheet-metal screws.

- Grab Bar Fastener** — Bobrick offers a grab bar fastening system that secures all Bobrick grab bar series; **one Bobrick fastener is required for each flange.** Install grab bar without backing in wall requires minimum 5/8" (16mm) thick painted or tiled drywall.

WingIt™ Fastener No.	Description
251-4	Consists of 10–32 x 5/16" round-head, Phillips 18/8 stainless steel screws. (1) WingIt grab bar fastener.

- Optional Anchor Device** — Bobrick grab bar anchor device includes stainless steel machine screws to be used for attaching grab bars to anchors. **one Bobrick concealed anchor device is required for each flange.**

Optional Anchor No.	Description
2583	Anchor for 3/4" to 1" (19-25mm) panel 1 anchor required for each flange.
2586	Anchor for 1/2" to 1" (13mm) panel 1 anchor required for each flange.

SPECIFICATION:

Grab bar shall be type-304 stainless steel with satin-finish. Grab bar shall have 18-gauge (1.2mm) wall thickness and 1-1/2" (38mm) outside diameter. Clearance between the grab bar and wall shall be 1-1/2" (38mm). Concealed mounting flanges shall be 1/8" (3mm) thick stainless steel plate, 2" x 3-1/8" (50 x 80mm), and equipped with two screw holes for attachment to wall. Flange covers shall be 22 gauge (0.8mm), 3-1/4" (85mm) diameter x 1/2" (13mm) deep, and shall snap over mounting flange to conceal mounting screws and/or WingIt fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Grab bar shall comply with accessible design (including ADAAG in the U.S.A.) for structural strength.

Grab Bar shall be Model _____ (insert model number) 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.



Technical Data

**GLASS MIRROR WITH
STAINLESS STEEL
ANGLE FRAME**

**B-290
SERIES**

**SNAP LOCKING DESIGN
(Rear View)**

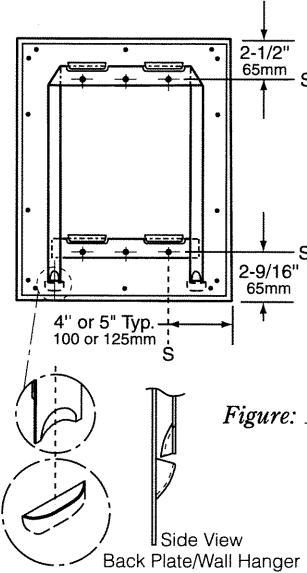
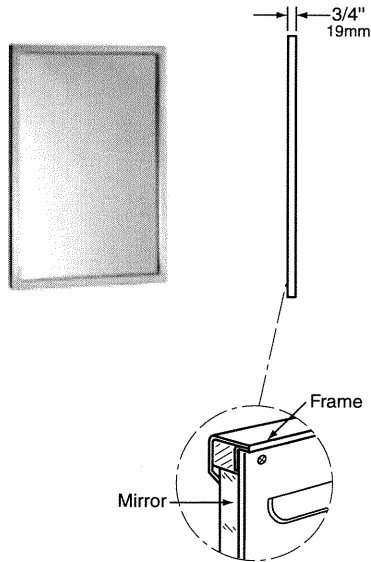


Figure: 1

**SCREW LOCKING DESIGN
(Rear View)**

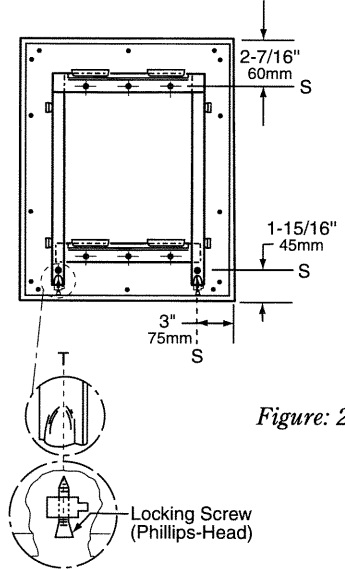


Figure: 2

STANDARD B-290 SERIES MIRRORS

MODEL NO.	OVERALL SIZE	
	W	H
B-290 1824	18" (46cm)	24" (61cm)
B-290 1830	18" (46cm)	30" (76cm)
B-290 1836	18" (46cm)	36" (91cm)
B-290 2430	24" (61cm)	30" (76cm)
B-290 2436	24" (61cm)	36" (91cm)
B-290 2448	24" (61cm)	48" (122cm)
B-290 2460	24" (61cm)	60" (152cm)
B-290 2472	24" (61cm)	72" (183cm)

STANDARD B-290 SERIES MIRRORS

MODEL NO.	OVERALL SIZE	
	W	H
B-290 3636	36" (91cm)	36" (91cm)
B-290 4836	48" (122cm)	36" (91cm)
B-290 7236	72" (183cm)	36" (91cm)

All Other Size Mirrors

Designer's Notes:

1. Special-order sizes available on request.
2. Maximum size one-piece angle-frame mirror, 144" x 72" (366 x 183cm); minimum size, 12" x 12" (30 x 30cm). Maximum frame size available, 180" x 72" (457 x 183cm) with two pieces of glass in one-piece frame. Stainless steel I-section with polished finish covers seam where two pieces of glass butt together.
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-290 2024.
5. Bobrick framed mirrors are manufactured to a tolerance $\pm 1/8"$ (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.

MATERIALS:

Frame — 18-8 S, type 304, heavy-gauge stainless steel, 3/4" x 3/4" (19 x 19mm) angle with vertical-grain satin finish. One-piece, roll-formed construction forms continuous integral stiffener on all sides. Bevel design on front of angle holds frame tightly against mirror. Corners of mirror frame are heliarc welded, ground and polish smooth. Galvanized steel back is fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror for hanging the mirror and to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. In Screw Locking Design (see figure 2), concealed Phillips-head locking screws securely fasten mirror to wall hanger.

Designer's Note: Type 304 stainless steel provides superior corrosion resistance, compared to 400 Series stainless steel, against environmental moisture, hose-down maintenance and strong cleaning solution.

continued . . .

Mirror — No. 1 quality, 1/4" (6mm) select float glass (standard glass): selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. All edges protected by plastic filler strips; back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding.

Concealed Wall Hanger — 20-gauge (0.9mm) galvanized steel. Incorporates lower support member, forming rigid rectangle, which engages lower backplate louvers to keep bottom of mirror against wall.

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 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. 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. 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 (see figure 3).

Screw locking Design — Lock mirror to wall hanger by tightening Phillips-head locking screws that are concealed in the bottom of frame at points indicated by a T. Mirror may be unlocked from wall hanger by loosening locking screws and lifting mirror off of concealed wall hanger (see figure 4).

SNAP LOCKING DESIGN

(Front View)

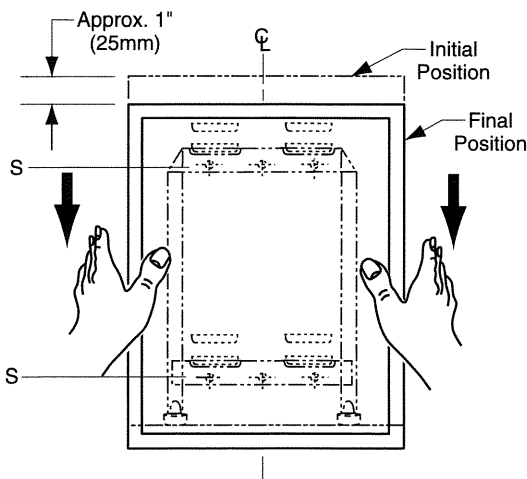


Figure: 3

SCREW LOCKING DESIGN

(Front View)

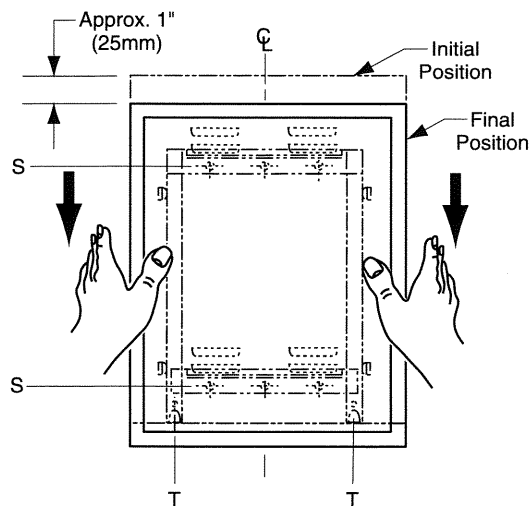
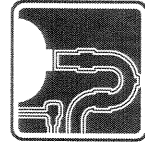


Figure: 4

SPECIFICATION:

Mirror shall have a one-piece, type 304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror; corners shall be heliarc welded, ground, and polished smooth; all exposed surfaces shall have satin finish with vertical grain. Reflective surfaces shall be guaranteed for 15 years against silver spoilage. All edges shall be protected by plastic filler strips and the back shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top and bottom for mounting on concealed rectangular wall hanger and to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. Mirror shall be removable from wall hanger for reglazing mirror.

Framed Mirror shall be Model B-290 _____ (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.



LAV GUARD²

FAST FIT UNDERSINK PIPING COVERS

Submittal Sheet

General Description:

LAV GUARD² E-Z Series waste and supply piping covers satisfy ADA compliance requirements. Built-in E-Z Grip internal fasteners and internal, E-Z Tear-To-Fit trimming feature allow for fast installation without tools. Series #100 E-Z kits are designed to fit on all tubular and cast brass P-trap assemblies. Series #400 kits are the "original" LAV GUARD design and fit schedule 40 ABS and PVC P-trap assemblies — regardless of their geometry or rotational offset. Valve cover completely encloses angle valve and supply tube for both handled and keyed type water stops.

Material	Molded vinyl
Nominal Wall	1/8" constant
Durometer	70-80 - Shore A
UV Protection	Will not fade or discolor
Durability	Virtually indestructible
Trimming (E-Z Series)	Internal, E-Z Tear-To-Fit trim feature
Fasteners (E-Z Series)	Internal E-Z Grip fasteners (reusable)
Color	China white
Paintability	Apply Latex paint
Burning Characteristics ASTM D-635	Self extinguished 0 sec (ATB) 0 mm (AEB)
Bacteria/Fungus Resistance	ASTM G21 and G22/ Result: 0 growth
Maintenance	Use common detergents

Manufactured under one or more of the following U.S. or Canadian patents.
Other patents pending.
5,303,730 5,360,031 5,524,669 5,564,463 5,678,598 5,699,828 5,915,412
5,915,413 5,901,739 5,860,820 2,075,324 2,119,427 2,136,027 2,158,083

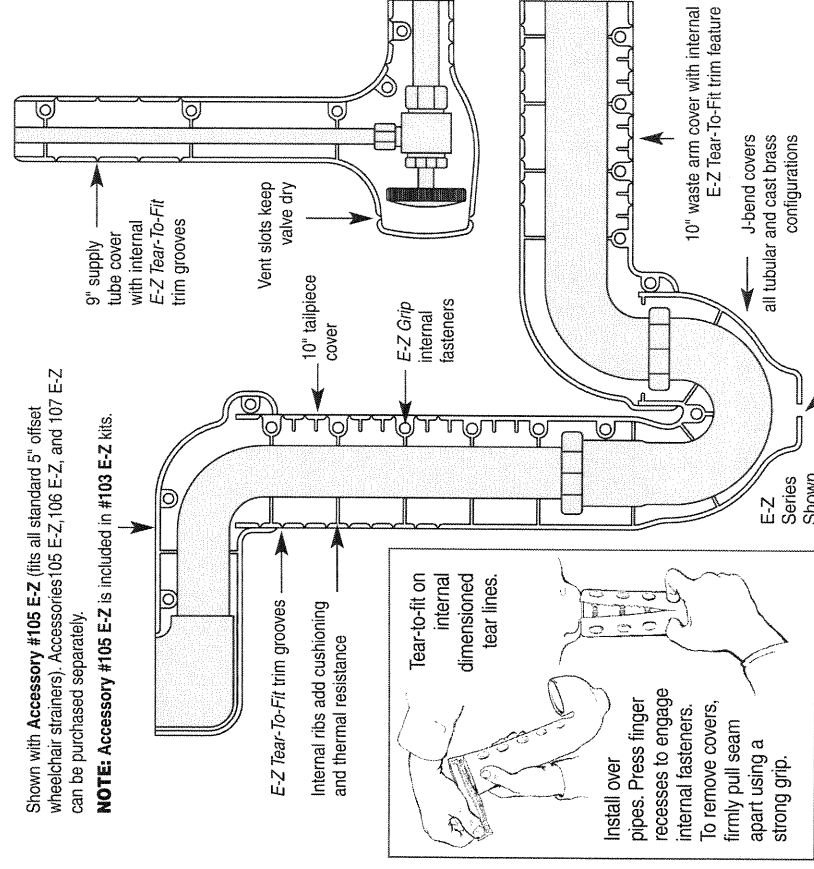


IPS Corporation, 202 Industrial Park Lane, Collierville, TN 38017
(901) 853-5001 (800) 340-5969 FAX: (901) 853-5008
e-mail: info@truebro.com Internet: http://www.truebro.com



All New
E-Z Series

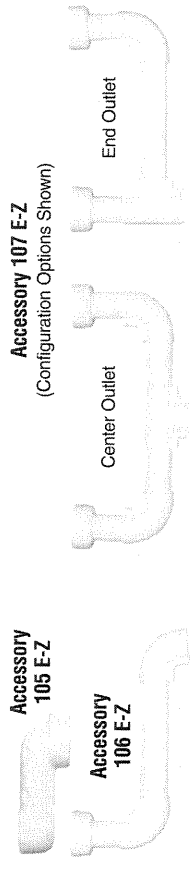
ADA-compliant undersink protection



#100 E-Z Series (shown above right) for tubular and cast brass P-trap assemblies.
#400W* Series (original design) for schedule 40 P-trap assemblies.

- | | | |
|---|---|--|
| <input type="checkbox"/> Model #99 E-Z
One angle valve and supply cover | <input type="checkbox"/> Model #102 E-Z
One P-trap cover, two angle valves and covers | <input type="checkbox"/> Accessory #105-K
Kohler 6" offset |
| <input type="checkbox"/> Model #100 E-Z
One P-trap cover | <input type="checkbox"/> Model #402W*
One P-trap cover, two angle valves and covers | <input type="checkbox"/> Accessory #106 E-Z
One basket strainer cover and offset waste cover (adjustable to 18") |
| <input type="checkbox"/> Model #400W*
One P-trap cover | <input type="checkbox"/> Model #103 E-Z
One P-trap cover, two angle valves and supply covers, one 5" offset tailpiece wheelchair strainer cover | <input type="checkbox"/> Accessory #107 E-Z
Two basket strainer covers and center or end outlet waste cover (adjustable) |
| <input type="checkbox"/> Model #101 E-Z
One P-trap cover, one angle valve cover | <input type="checkbox"/> Accessory #105 E-Z
One 5" offset tailpiece wheelchair strainer assembly | <input type="checkbox"/> Accessory #Ex99 E-Z
One 16" extension for water supply |
| <input type="checkbox"/> Model #401W*
One P-trap cover, one angle valve cover | <input type="checkbox"/> Accessory #Ex100 E-Z
One 16" extension for drain waste arm or tailpiece | |

*All #400W series items are the "original" LAV GUARD² design and construction. Specifications may change without notice.



Job/Location _____
Designer _____

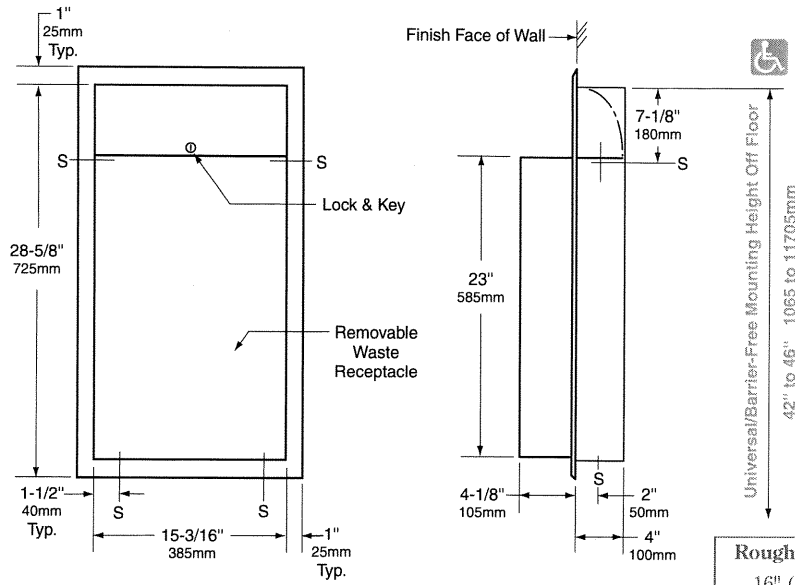
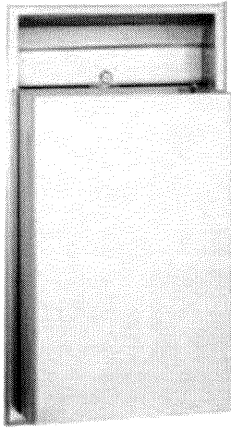
TRUEBRO reserves the right to make product and material changes at any time without notice. 2/07



Technical Data

RECESSED WASTE RECEPTACLE FOR 4" (102mm) WALLS

B-3644



MATERIALS:

Cabinet — 18-8 S, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.

Flange — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.

Waste Receptacle — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Front and side edges of bottom and all top edges are hemmed for safe handling. Secured to cabinet with a tumbler lock keyed like other Bobrick washroom accessories. Equipped with interior hooks for optional vinyl liner. Capacity: 12-gal. (45.4-L).

OPERATION:

To empty waste receptacle, unlock with key provided. Liner cannot be removed unless waste receptacle is unlocked from cabinet. Reusable vinyl liners are available as an optional accessory: order Bobrick Part No. 3944-12.

After unit is in use, if greater capacity waste receptacle is needed, an 18-gal. (68.1-L) capacity waste container can be substituted; order Bobrick Part No. 368-60 Waste Receptacle and Part No. 368-16 Vinyl Liner.

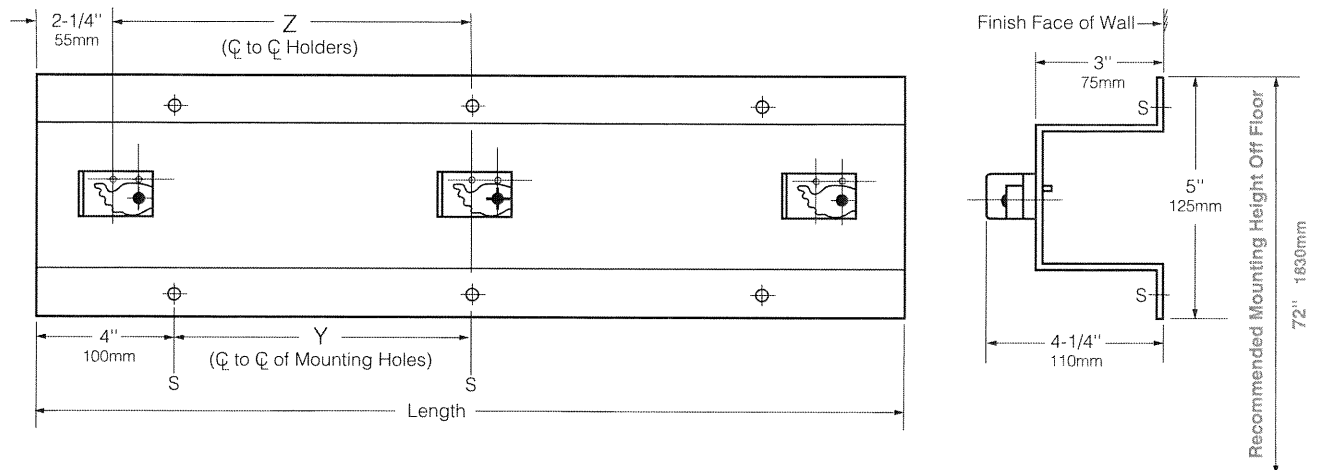
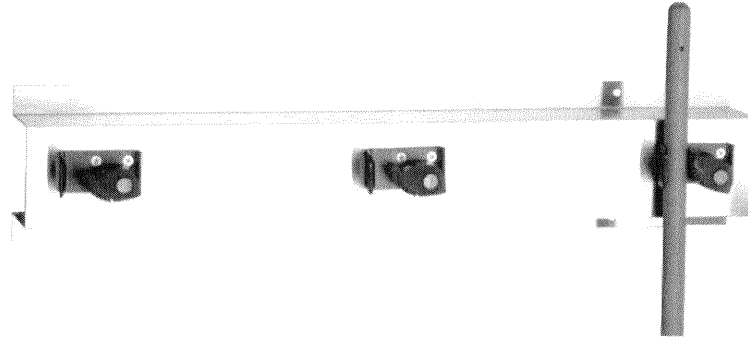
INSTALLATION:

Provide framed rough wall opening 16" wide x 29-1/4" high (405 x 745mm). Minimum recessed depth required to finish face of wall is 4" (102mm). Allow clearance for construction features that may protrude into rough wall opening from opposite wall. Coordinate with mechanical engineer to avoid pipes, vents, and conduits. If unit projects above top of wainscot, provide aluminum channel or other filler to eliminate gap between flange and finish face of wall. Mount unit in wall opening with shims between framing and cabinet at all points indicated by an S, then secure unit with sheet-metal screws (not furnished).

SPECIFICATION:

Recessed waste receptacle shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Flange shall be drawn and beveled, one-piece, seamless construction. Removable waste receptacle shall be secured to cabinet with a tumbler lock keyed like other Bobrick washroom accessories, have front and side edges of bottom and all top edges hemmed for safe handling, and shall have a minimum capacity of 12-gal. (45.4-L). Manufacturer's service and parts manual shall be provided to the building owner/manager upon request.

Recessed Waste Receptacle shall be Model B-3644 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

BOBRICK**Technical Data****STAINLESS STEEL
MOP AND BROOM
HOLDER****B-223****STANDARD STOCK SIZES**

Model No.	Length	No. of Holders	Dim. Y	No. of Mtg. Holes	Dim. Z
B-223 x 24	24" (610mm)	3	8" (205mm)	6	9-3/4" (250mm)
B-223 x 36	36" (915mm)	4	14" (355mm)	6	10-1/2" (265mm)

MATERIALS:

Mounting Base — 18-8 S, type-304, 22-gauge (0.8mm) stainless steel with satin finish.

Mop and Broom Holders — Spring-loaded rubber cam holders with anti-slip coating. Powder coated steel retainers.

OPERATION:

Surface-mounted holder is designed to keep mops and brooms away from wall. Spring-loaded rubber cam holders accommodate handles from 7/8" to 1-1/4" (20 to 30mm) diameter.

INSTALLATION:

Secure unit to wall with six sheet-metal screws, furnished by manufacturer, at points indicated by an S. For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with stainless steel mounting screws. For other wall surfaces, provide fiber plugs or expansion shields for use with stainless steel mounting screws, or provide 1/8" (3mm) toggle bolts or expansion bolts.

SPECIFICATION:

Mop and broom holder shall be type-304 stainless steel with satin finish. Unit shall be _____ (insert length) long with _____ (insert number) spring-loaded rubber cam holders.

Stainless Steel Mop and Broom Holder shall be Model _____ (insert model number) 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.

Appendix C

Fire Protection Cut Sheets

Table of Contents

FIRE PROTECTION		
		DESCRIPTION
A		Cover
B		Fire Flow Test
C		Hydraulic Calculations
D		Cut Sheets
	1	Potter OS&Y Supervisory Switch
	2	Potter Water Flow Switch
	3	Viking Alarm Check Valve
	4	Water Motor Alarm Gong
	5	Anvil Valve
	6	Kennedy OS&Y Gate Valve
	7	Kennedy ULFM Butterfly Valve
	9	Wheatland Schd 40 Pipe
	10	Viking Sprinkler Head VK300
	11	Viking Sprinkler Head VK462
	12	AGF Test & Drain Valve
E		Material Listings
	1	Potter Water Flow Switch
	2	Potter Supervisory Switch
	3	Victaulic Couplings
	4	Kennedy Valves

FIRE HYDRANT FLOW TEST

Glendale Fire Department Fire Flow Information

01/06/2012: Released to Andrew Hall / Osborn by e-mail
(AHALL@OSBORN320.COM) for 1844 Bel Aire (Balboa Elementary
School). JM

REF NO.
1959

Map Page#	2112	Hydrant #	11	Latest Release Date	01/05/2012
Location	1335	Elm		Cross Street	Bel Aire Dr.
Test Date	01/05/2012	Time	3:15 p.m.	Hydrant Type	2 1/2" X 4"

Requested by G.U.S.D. Phone #
Job Address 1844 Bel Aire Dr. Fax #

Static	120	psi	Residual	80	psi	Pitot	40	psi
Outlet Size	4		C-Factor	0.9				
Observed Flow	2717	gpm	Flow at 20 psi	4456	gpm		<input type="button" value="SELECT"/>	
By	JM & CM	Gage No.		Receipt #				

Comments

Red curb needed on each side of hydrant.

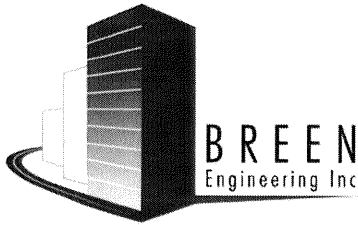
Flow Hydrant in front of 1335 Elm

Static / Residual taken at 1334 Elm

Reservoir:

- Brand Park 968'
- Level at time of test: 13.5'
- Pumps not running

HYDRAULIC CALCULATIONS



Client Osborn Architects

Project BALBOA ES

Job No. 273-11-002

Fire Sprinkler Calculations

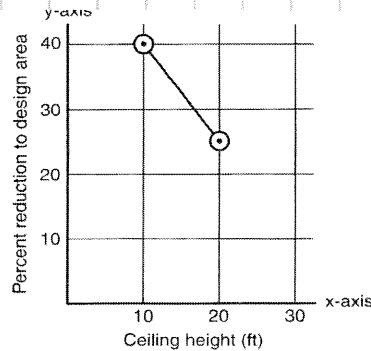
Date 10/9/2011

Engineer DG

Hazard Classification:	Light Hazard	Sprinkler:	Quick Response
Area of Operation:	1500 Sq.Ft.	Density:	0.1 gpm/Sq.Ft.
Area per Sprinkler	L = 14	Ceiling Height:	10 Ft
	S = 12	% Reduction	40 %
	L x S = 168 Sq.Ft.		
Area	= 900 Sq.Ft.		
Add 30% for Slope roof	NA		
Adjusted Area	= 900 Sq.Ft.		
No. of Sprinklers	= 5.357	use 6	Minimum
in remote area			
No. of Sprinklers	= 3	use 3	per branch
per Branch			

* Area reduction for Quick-response sprinklers per Section 11.2.3.2.3.1 NFPA 13

** Increase in Area for Slope Cielings per Section 11.2.3.2.4 NFPA 13



Note: $y = \frac{-3x}{2} + 55$

For ceiling height ≥ 10 ft and ≤ 20 ft, $y = \frac{-3x}{2} + 55$

For ceiling height < 10 ft, $y = 40$

For ceiling height > 20 , $y = 0$

For SI units, 1 ft = 0.31 m.

FIGURE 11.2.3.2.3.1 Design Area Reduction for Quick Response Sprinklers.

Reference: NFPA 13

BALBOA ES Fire Sprinkler Reports

for

**OSBORN
320 EAST HARVARD STREET
GLENDALE, CA 91205**

Prepared By:

JT
BREEN ENGINEERING
1983 W 190TH ST SUITE 200
TORRANCE CA 90504
310-464-8404
3/06/2015



General Project Data Report

General Data

Project Title:	BALBOA ES	Project File Name:	REMOTE AREA 1..fiw
Designed By:	JT	Date:	3/06/2015
Code Reference:	NFPA 2010	Approving Agency:	DSA
Client Name:	OSBORN	Phone:	818-246-3112
Address:	320 EAST HARVARD STREET	City, State Zip Code:	GLENDALE, CA 91205
Company Name:	BREEN ENGINEERING	Representative:	DG
Company Address:	1983 W 190TH ST SUITE 200	City And State:	TORRANCE CA 90504
Phone:	310-464-8404		
Building Name:	NEW CLASSROOM BLDG	Building Owner:	GLENDALE UNIFIED SCHOOL DISTRICT
Contact at Building:		Phone at Building:	
Address Of Building:	1844 BEL AIRE DRIVE	City, State Zip Code:	GLENDALE CA 91201

Project Data

Description Of Hazard:	Light Hazard	Sprinkler System Type:	Wet
Design Area Of Water Application:	1020 ft ²	Maximum Area Per Sprinkler:	168 ft ²
Ult Sprinkler K-Factor:	5.60 K	Default Pipe Material:	SCHEG 40 STEEL BLK
Hose Stream Allowance:	0.00 gpm	Outside Hose Stream Allowance:	100.00 gpm
In Rack Sprinkler Allowance:	0.00 gpm		

Sprinkler Specifications

Make:	VIKING	Model:	VK
Size:	1/2	Temperature Rating:	155 F

Water Supply Test Data

Source Of Information:	GLENDALE FIRE DEPT	Date Of Test:	01/05/2012
Test Hydrant ID:	2112-11		
Hydrant Elevation:	0 ft	Static Pressure:	120.00 psi
Test Flow Rate:	2717.00 gpm	Test Residual Pressure:	80.00 psi
Calculated System Flow Rate:	268.78 gpm	Calculated Inflow Residual Pressure:	67.74 psi
Available Residual Pressure At System Flow:	119.45 psi		

Calculation Project Data

Calculation Mode:	Demand		
HMD Minimum Residual Pressure:	7.00 psi	Minimum Desired Flow Density:	0.10 gpm/ft ²
Number Of Active Nodes:	25		
Number Of Active Pipes:	24	Number Of Inactive Pipes:	0
Number Of Active Sprinklers:	9	Number Of Inactive Sprinklers:	0



Fire Sprinkler Input Data

Node Input Data

Node No.	Node Description Branch Description	Area Group Branch Dia. (in)	Sprinkler KFactor (K) Branch Len. (ft)	Pressure Estimate (psi) Branch Std Fittings	Node Elev (ft) Branch Non- Std Fittings (ft)	Non-Sprinkler Flow (gpm) Branch Sprk KFactor (K)
10	Sprinkler ----	---- 0.000	5.60 0.0	9.00 ----	11.50 0.0	0.00 0.00
20	Sprinkler ----	---- 0.000	5.60 0.0	10.40 ----	11.50 0.0	0.00 0.00
30	Sprinkler ----	---- 0.000	5.60 0.0	11.91 ----	11.50 0.0	0.00 0.00
40	Sprinkler ----	---- 0.000	5.60 0.0	9.36 ----	11.50 0.0	0.00 0.00
50	Sprinkler ----	---- 0.000	5.60 0.0	10.81 ----	11.50 0.0	0.00 0.00
60	Sprinkler ----	---- 0.000	5.60 0.0	12.38 ----	11.50 0.0	0.00 0.00
70	Sprinkler ----	---- 0.000	5.60 0.0	10.60 ----	11.50 0.0	0.00 0.00
80	Sprinkler ----	---- 0.000	5.60 0.0	12.61 ----	11.50 0.0	0.00 0.00
90	Sprinkler ----	---- 0.000	5.60 0.0	14.38 ----	11.50 0.0	0.00 0.00
100	No Discharge ----	---- 0.000	N/A 0.0	13.78 ----	11.50 0.0	0.00 0.00
120	No Discharge ----	---- 0.000	N/A 0.0	14.90 ----	11.50 0.0	0.00 0.00
130	No Discharge ----	---- 0.000	N/A 0.0	14.32 ----	11.50 0.0	0.00 0.00
140	No Discharge ----	---- 0.000	N/A 0.0	15.48 ----	11.50 0.0	0.00 0.00
150	No Discharge ----	---- 0.000	N/A 0.0	16.60 ----	11.50 0.0	0.00 0.00
160	No Discharge ----	---- 0.000	N/A 0.0	17.94 ----	11.50 0.0	0.00 0.00
170	No Discharge ----	---- 0.000	N/A 0.0	47.06 ----	11.50 0.0	0.00 0.00
180	No Discharge ----	---- 0.000	N/A 0.0	51.38 ----	11.50 0.0	0.00 0.00



Fire Sprinkler Input Data

Node Input Data (cont'd)

Node No.	Node Description Branch Description	Area Group Branch Dia. (in)	Sprinkler KFactor (K) Branch Len. (ft)	Pressure Estimate (psi) Branch Std Fittings	Node Elev (ft) Branch Non- Std Fittings (ft)	Non-Sprinkler Flow (gpm) Branch Sprk KFactor (K)
190	Non-Sprinkler ----	---- 0.000	N/A 0.0	59.47 ----	-3.00 0.0	100.00 0.00
200	No Discharge ----	---- 0.000	N/A 0.0	59.81 ----	-3.00 0.0	0.00 0.00
210	No Discharge ----	---- 0.000	N/A 0.0	62.31 ----	-3.00 0.0	0.00 0.00
220	No Discharge ----	---- 0.000	N/A 0.0	62.76 ----	-3.00 0.0	0.00 0.00
230	No Discharge ----	---- 0.000	N/A 0.0	63.24 ----	-3.00 0.0	0.00 0.00
240	No Discharge ----	---- 0.000	N/A 0.0	66.25 ----	-3.00 0.0	0.00 0.00
250	No Discharge ----	---- 0.000	N/A 0.0	66.74 ----	-3.00 0.0	0.00 0.00
260	No Discharge ----	---- 0.000	N/A 0.0	67.74 ----	-3.00 0.0	0.00 0.00



Fire Sprinkler Input Data

Pipe Input Data

Beg. Node	End. Node	Pipe Description	Nominal Diameter (inch)	Type Group	Fitting Data	Nominal Length (feet)	Fitting Length (feet)	Total Length (feet)	C Factor (gpm/inch-psi)
10	20	SCHED 40 STEEL BLK	1.000	0	2E	12.00	2.80	14.80	120
20	100	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
30	100	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
40	50	SCHED 40 STEEL BLK	1.000	0	2E	12.00	2.80	14.80	120
50	130	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
60	130	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
70	80	SCHED 40 STEEL BLK	1.000	0	2ET	12.00	6.30	18.30	120
80	150	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
90	150	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
100	120	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
120	140	SCHED 40 STEEL BLK	2.000	0	T	12.00	7.10	19.10	120
130	140	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
140	160	SCHED 40 STEEL BLK	2.000	0	T	15.00	7.10	22.10	120
150	160	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
160	170	SCHED 40 STEEL BLK	2.000	0	T	110.50	7.10	117.60	120
170	180	SCHED 40 STEEL BLK	2.500	0	T	33.00	8.50	41.50	120
180	190	SCHED 40 STEEL BLK	3.000	0	2EGC	28.00	21.90	49.90	120
190	200	PVC, CLASS 200	4.000	0	E	9.00	15.10	24.10	150
200	210	PVC, CLASS 200	4.000	0	E	160.20	15.10	175.30	150
210	220	PVC, CLASS 200	4.000	0	E	16.30	15.10	31.40	150
220	230	PVC, CLASS 200	4.000	0	2E	3.40	30.20	33.60	150
230	240	Backflo Prev	3.000	Loss					
240	250	PVC, CLASS 200	4.000	0	2E	4.00	30.20	34.20	150
250	260	PVC, CLASS 200	4.000	0	ET	25.10	45.30	70.40	150



Fire Sprinkler Output Data

Overall Pipe Output Data

Beg. End. Node	Nodal KFactor (K)	Elevation (feet)	Spk/Hose Discharge (gpm)	Residual Pressure (psi)	Nom. Dia. Inside Dia. C-Value	q (gpm) Q (gpm) Velocity (fps)	F. L./ft (psi/ft) Fittings Type-Grp	Pipe-Len. Fit-Len. Tot-Len. (ft)	PF-(psi) PE-(psi) PT-(psi)
10	5.60	11.50	16.80	9.00	1.00	16.80	0.09429	12.00	1.396
20	5.60	11.50	18.06	10.40	1.049	16.80	2E	2.80	0.000
	SCHED 40 STEEL BLK				120	6.24	0	14.80	1.396
40	5.60	11.50	17.13	9.36	1.00	17.13	0.09778	12.00	1.447
50	5.60	11.50	18.41	10.81	1.049	17.13	2E	2.80	0.000
	SCHED 40 STEEL BLK				120	6.36	0	14.80	1.447
70	5.60	11.50	18.24	10.60	1.00	18.24	0.10973	12.00	2.008
80	5.60	11.50	19.89	12.61	1.049	18.24	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	6.77	0	18.30	2.008
20	5.60	11.50	18.06	10.40	1.00	18.06	0.36383	3.00	3.384
100	0.00	11.50	0.00	13.78	1.049	34.86	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	12.94	0	9.30	3.384
30	5.60	11.50	19.33	11.91	1.00	19.33	0.12218	9.00	1.869
70	0.00	11.50	0.00	13.78	1.049	19.33	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.17	0	15.30	1.869
100	0.00	11.50	0.00	13.78	1.25	0.00	0.21642	1.00	1.125
120	0.00	11.50	0.00	14.90	1.380	54.18	T	4.20	0.000
	SCHED 40 STEEL BLK				120	11.62	0	5.20	1.125
50	5.60	11.50	18.41	10.81	1.00	18.41	0.37722	3.00	3.508
130	0.00	11.50	0.00	14.32	1.049	35.54	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	13.19	0	9.30	3.508
60	5.60	11.50	19.70	12.38	1.00	19.70	0.12662	9.00	1.937
130	0.00	11.50	0.00	14.32	1.049	19.70	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.31	0	15.30	1.937
120	0.00	11.50	0.00	14.90	2.00	0.00	0.03026	12.00	0.578
140	0.00	11.50	0.00	15.48	2.067	54.18	T	7.10	0.000
	SCHED 40 STEEL BLK				120	5.18	0	19.10	0.578
130	0.00	11.50	0.00	14.32	1.25	0.00	0.22435	1.00	1.167
140	0.00	11.50	0.00	15.48	1.380	55.25	T	4.20	0.000
	SCHED 40 STEEL BLK				120	11.85	0	5.20	1.167
80	5.60	11.50	19.89	12.61	1.00	19.89	0.42941	3.00	3.993
150	0.00	11.50	0.00	16.60	1.049	38.12	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	14.15	0	9.30	3.993
90	5.60	11.50	21.24	14.38	1.00	21.24	0.14545	9.00	2.225
100	0.00	11.50	0.00	16.60	1.049	21.24	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.88	0	15.30	2.225



Fire Sprinkler Output Data

Overall Pipe Output Data (cont'd)

Beg. End. Node	Nodal KFactor (K)	Elevation (feet)	Spk/Hose Discharge (gpm)	Residual Pressure (psi)	Nom. Dia. Inside Dia. C-Value	q (gpm) Q (gpm) Velocity (fps)	F. L./ft (psi/ft) Fittings Type-Grp	Pipe-Len. Fit-Len. Tot-Len. (ft)	PF-(psi) PE-(psi) PT-(psi)
140	0.00	11.50	0.00	15.48	2.00	0.00	0.11107	15.00	2.455
160	0.00	11.50	0.00	17.94	2.067	109.43	T	7.10	0.000
	SCHED 40 STEEL BLK				120	10.46	0	22.10	2.455
150	0.00	11.50	0.00	16.60	1.25	0.00	0.25622	1.00	1.332
160	0.00	11.50	0.00	17.94	1.380	59.36	T	4.20	0.000
	SCHED 40 STEEL BLK				120	12.73	0	5.20	1.332
160	0.00	11.50	0.00	17.94	2.00	0.00	0.24764	110.50	29.122
170	0.00	11.50	0.00	47.06	2.067	168.78	T	7.10	0.000
	SCHED 40 STEEL BLK				120	16.14	0	117.60	29.122
170	0.00	11.50	0.00	47.06	2.50	0.00	0.10422	33.00	4.325
180	0.00	11.50	0.00	51.38	2.469	168.78	T	8.50	0.000
	SCHED 40 STEEL BLK				120	11.31	0	41.50	4.325
180	0.00	11.50	0.00	51.38	3.00	0.00	0.03619	28.00	1.806
190	0.00	-3.00	100.00	59.47	3.068	168.78	2EGC	21.90	6.279
	SCHED 40 STEEL BLK				120	7.33	0	49.90	8.084
190	0.00	-3.00	100.00	59.47	4.00	100.00	0.01427	9.00	0.344
200	0.00	-3.00	0.00	59.81	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	24.10	0.344
200	0.00	-3.00	0.00	59.81	4.00	0.00	0.01427	160.20	2.501
210	0.00	-3.00	0.00	62.31	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	175.30	2.501
210	0.00	-3.00	0.00	62.31	4.00	0.00	0.01427	16.30	0.448
220	0.00	-3.00	0.00	62.76	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	31.40	0.448
220	0.00	-3.00	0.00	62.76	4.00	0.00	0.01427	3.40	0.479
230	0.00	-3.00	0.00	63.24	4.072	268.78	2E	30.20	0.000
	PVC, CLASS 200				150	6.62	0	33.60	0.479
230	Backflo Prev	-3.00		63.24		268.79			
240	3.00 psi	-3.00		66.25					
240	0.00	-3.00	0.00	66.25	4.00	0.00	0.01427	4.00	0.488
250	0.00	-3.00	0.00	66.74	4.072	268.78	2E	30.20	0.000
	PVC, CLASS 200				150	6.62	0	34.20	0.488
250	0.00	-3.00	0.00	66.74	4.00	0.00	0.01427	25.10	1.004
260	0.00	-3.00	0.00	67.74	4.072	268.78	ET	45.30	0.000
	PVC, CLASS 200				150	6.62	0	70.40	1.004



Fire Sprinkler Output Data

Overall Sprinkler Output Data

Flowing Sprinkler Node No.	Area Group Code	Sprinkler KFactor (K)	Sprinkler Elevation (feet)	Residual Pressure (psi)	Flowing Area (ft ²)	Flowing Density (gpm/ft ²)	Sprinkler Discharge (gpm)
10		5.60	11.50	9.00	168.00	0.100	16.80
Sub Totals For Non-Group					168.00	0.100	16.80
20		5.60	11.50	10.40	168.00	0.107	18.06
Sub Totals For Non-Group					168.00	0.107	18.06
30		5.60	11.50	11.91	168.00	0.115	19.33
Sub Totals For Non-Group					168.00	0.115	19.33
40		5.60	11.50	9.36	168.00	0.102	17.13
Sub Totals For Non-Group					168.00	0.102	17.13
50		5.60	11.50	10.81	168.00	0.110	18.41
Sub Totals For Non-Group					168.00	0.110	18.41
60		5.60	11.50	12.38	168.00	0.117	19.70
Sub Totals For Non-Group					168.00	0.117	19.70
70		5.60	11.50	10.60	168.00	0.109	18.24
Totals For Non-Group					168.00	0.109	18.24
80		5.60	11.50	12.61	168.00	0.118	19.89
Sub Totals For Non-Group					168.00	0.118	19.89
90		5.60	11.50	14.38	168.00	0.126	21.24
Sub Totals For Non-Group					168.00	0.126	21.24
Totals For All Groups					1512.00	0.112	168.78



Fire Sprinkler Output Summary

Hydraulically Most Demanding Sprinkler Node

HMD Sprinkler Node Number:	10
HMD Actual Residual Pressure:	9.00 psi
HMD Actual GPM:	16.80 gpm

Sprinkler Summary

Sprinkler System Type:	Wet
Specified Area Of Application:	1020.00 ft ²
Minimum Desired Density:	0.100 gpm/ft ²
Application Average Density:	0.165 gpm/ft ²
Application Average Area Per Sprinkler:	113.33 ft ²
Sprinkler Flow:	168.78 gpm
Average Sprinkler Flow:	18.75 gpm

Flow Velocity And Imbalance Summary

Maximum Flow Velocity (In Pipe 160 - 170)	16.14 ft/sec
Maximum Velocity Pressure (In Pipe 160 - 170)	1.75 psi
Allowable Maximum Nodal Pressure Imbalance:	0.0001 psi
Actual Maximum Nodal Pressure Imbalance:	0.0001 psi
Actual Average Nodal Pressure Imbalance:	0.0000 psi
Actual Maximum Nodal Flow Imbalance:	0.0031 gpm
Actual Average Nodal Flow Imbalance:	0.0002 gpm

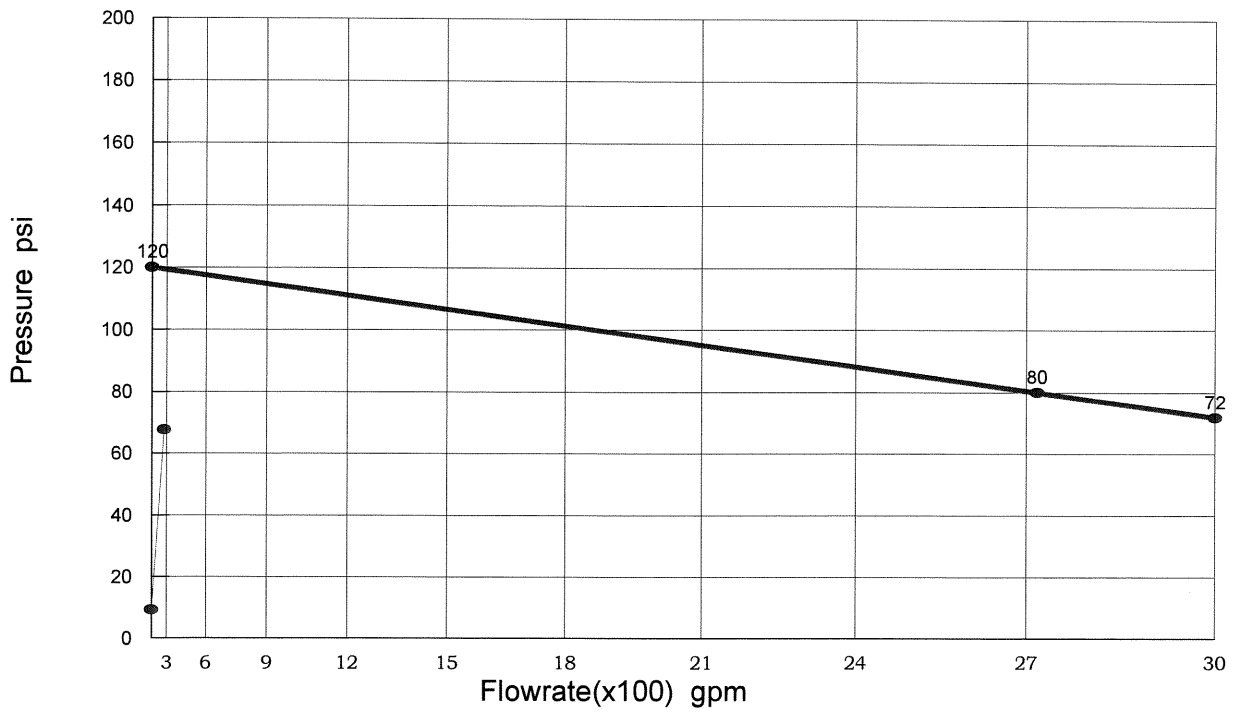
Overall Network Summary

Number Of Unique Pipe Sections:	24
Number Of Flowing Sprinklers:	9
Pipe System Water Volume:	193.87 gal
Sprinkler Flow:	168.78 gpm
Non-Sprinkler Flow:	100.00 gpm
Minimum Required Residual Pressure At System Inflow Node:	67.74 psi
Demand Flow At System Inflow Node:	268.78 gpm



Fire Sprinkler Output Data

Hydraulic Supply/Demand Graph



Supply Curve Data

Static Pressure: 120 psi
Test Residual Pressure: 80 psi
Test Flow Rate: 2717 gpm

Demand Curve Data

Calculated Residual Pressure: 67.74 psi
Calculated Flow Rate: 268.78 gpm
Excess Available Residual Pressure At Calculated Flow: 51.7 psi
Pressure Required For First Sprinkler Downstream From Inflow Node To Flow: 9.28 psi

BALBOA ES Fire Sprinkler Reports

for

**OSBORN
320 EAST HARVARD STREET
GLENDALE, CA 91205**

Prepared By:

**JT
BREEN ENGINEERING
1983 W 190TH ST SUITE 200
TORRANCE CA 90504
310-464-8404
3/06/2015**



General Project Data Report

General Data

Project Title:	BALBOA ES	Project File Name:	REMOTE AREA 2..fiw
Designed By:	JT	Date:	3/06/2015
Code Reference:	NFPA 2010	Approving Agency:	DSA
Client Name:	OSBORN	Phone:	818-246-3112
Address:	320 EAST HARVARD STREET	City, State Zip Code:	GLENDALE, CA 91205
Company Name:	BREEN ENGINEERING	Representative:	DG
Company Address:	1983 W 190TH ST SUITE 200	City And State:	TORRANCE CA 90504
Phone:	310-464-8404		
Building Name:	NEW CLASSROOM BLDG	Building Owner:	GLENDALE UNIFIED SCHOOL DISTRICT
Contact at Building:		Phone at Building:	
Address Of Building:	1844 BEL AIRE DRIVE	City, State Zip Code:	GLENDALE CA 91201

Project Data

Description Of Hazard:	Light Hazard	Sprinkler System Type:	Wet
Design Area Of Water Application:	1020 ft ²	Maximum Area Per Sprinkler:	168 ft ²
Ult Sprinkler K-Factor:	5.60 K	Default Pipe Material:	SCHED 40 STEEL BLK
Hose Stream Allowance:	0.00 gpm	Outside Hose Stream Allowance:	100.00 gpm
In Rack Sprinkler Allowance:	0.00 gpm		

Sprinkler Specifications

Make:	VIKING	Model:	VK
Size:	1/2	Temperature Rating:	155 F

Water Supply Test Data

Source Of Information:	GLENDALE FIRE DEPT	Date Of Test:	01/05/2012
Test Hydrant ID:	2112-11		
Hydrant Elevation:	0 ft	Static Pressure:	120.00 psi
Test Flow Rate:	2717.00 gpm	Test Residual Pressure:	80.00 psi
Calculated System Flow Rate:	268.78 gpm	Calculated Inflow Residual Pressure:	73.80 psi
Available Residual Pressure At System Flow:	119.45 psi		

Calculation Project Data

Calculation Mode:	Demand		
HMD Minimum Residual Pressure:	7.00 psi	Minimum Desired Flow Density:	0.10 gpm/ft ²
Number Of Active Nodes:	25		
Number Of Active Pipes:	24	Number Of Inactive Pipes:	0
Number Of Active Sprinklers:	9	Number Of Inactive Sprinklers:	0



Fire Sprinkler Input Data

Node Input Data

Node No.	Node Description Branch Description	Area Group Branch Dia. (in)	Sprinkler KFactor (K) Branch Len. (ft)	Pressure Estimate (psi) Branch Stnd Fittings	Node Elev (ft) Branch Non- Stnd Fittings (ft)	Non-Sprinkler Flow (gpm) Branch Sprk KFactor (K)
10	Sprinkler ----	---- 0.000	5.60 0.0	9.00 ----	25.50 0.0	0.00 0.00
20	Sprinkler ----	---- 0.000	5.60 0.0	10.40 ----	25.50 0.0	0.00 0.00
30	Sprinkler ----	---- 0.000	5.60 0.0	11.91 ----	25.50 0.0	0.00 0.00
40	Sprinkler ----	---- 0.000	5.60 0.0	9.36 ----	25.50 0.0	0.00 0.00
50	Sprinkler ----	---- 0.000	5.60 0.0	10.81 ----	25.50 0.0	0.00 0.00
60	Sprinkler ----	---- 0.000	5.60 0.0	12.38 ----	25.50 0.0	0.00 0.00
70	Sprinkler ----	---- 0.000	5.60 0.0	10.60 ----	25.50 0.0	0.00 0.00
80	Sprinkler ----	---- 0.000	5.60 0.0	12.61 ----	25.50 0.0	0.00 0.00
90	Sprinkler ----	---- 0.000	5.60 0.0	14.38 ----	25.50 0.0	0.00 0.00
100	No Discharge ----	---- 0.000	N/A 0.0	13.78 ----	25.50 0.0	0.00 0.00
120	No Discharge ----	---- 0.000	N/A 0.0	14.90 ----	25.50 0.0	0.00 0.00
130	No Discharge ----	---- 0.000	N/A 0.0	14.32 ----	25.50 0.0	0.00 0.00
140	No Discharge ----	---- 0.000	N/A 0.0	15.48 ----	25.50 0.0	0.00 0.00
150	No Discharge ----	---- 0.000	N/A 0.0	16.60 ----	25.50 0.0	0.00 0.00
160	No Discharge ----	---- 0.000	N/A 0.0	17.94 ----	25.50 0.0	0.00 0.00
170	No Discharge ----	---- 0.000	N/A 0.0	47.06 ----	25.50 0.0	0.00 0.00
180	No Discharge ----	---- 0.000	N/A 0.0	51.38 ----	25.50 0.0	0.00 0.00



Fire Sprinkler Input Data

Node Input Data (cont'd)

Node No.	Node Description Branch Description	Area Group Branch Dia. (in)	Sprinkler KFactor (K) Branch Len. (ft)	Pressure Estimate (psi) Branch Stnd Fittings	Node Elev (ft) Branch Non- Stnd Fittings (ft)	Non-Sprinkler Flow (gpm) Branch Sprk KFactor (K)
190	Non-Sprinkler ----	---- 0.000	N/A 0.0	65.53 ----	-3.00 0.0	100.00 0.00
200	No Discharge ----	---- 0.000	N/A 0.0	65.87 ----	-3.00 0.0	0.00 0.00
210	No Discharge ----	---- 0.000	N/A 0.0	68.38 ----	-3.00 0.0	0.00 0.00
220	No Discharge ----	---- 0.000	N/A 0.0	68.82 ----	-3.00 0.0	0.00 0.00
230	No Discharge ----	---- 0.000	N/A 0.0	69.30 ----	-3.00 0.0	0.00 0.00
240	No Discharge ----	---- 0.000	N/A 0.0	72.31 ----	-3.00 0.0	0.00 0.00
250	No Discharge ----	---- 0.000	N/A 0.0	72.80 ----	-3.00 0.0	0.00 0.00
260	No Discharge ----	---- 0.000	N/A 0.0	73.80 ----	-3.00 0.0	0.00 0.00



Fire Sprinkler Input Data

Pipe Input Data

Beg. Node	End. Node	Pipe Description	Nominal Diameter (inch)	Type Group	Fitting Data	Nominal Length (feet)	Fitting Length (feet)	Total Length (feet)	C Factor (gpm/inch-psi)
10	20	SCHED 40 STEEL BLK	1.000	0	2E	12.00	2.80	14.80	120
20	100	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
30	100	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
40	50	SCHED 40 STEEL BLK	1.000	0	2E	12.00	2.80	14.80	120
50	130	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
60	130	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
70	80	SCHED 40 STEEL BLK	1.000	0	2ET	12.00	6.30	18.30	120
80	150	SCHED 40 STEEL BLK	1.000	0	2ET	3.00	6.30	9.30	120
90	150	SCHED 40 STEEL BLK	1.000	0	2ET	9.00	6.30	15.30	120
100	120	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
120	140	SCHED 40 STEEL BLK	2.000	0	T	12.00	7.10	19.10	120
130	140	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
140	160	SCHED 40 STEEL BLK	2.000	0	T	15.00	7.10	22.10	120
150	160	SCHED 40 STEEL BLK	1.250	0	T	1.00	4.20	5.20	120
160	170	SCHED 40 STEEL BLK	2.000	0	T	110.50	7.10	117.60	120
170	180	SCHED 40 STEEL BLK	2.500	0	T	33.00	8.50	41.50	120
180	190	SCHED 40 STEEL BLK	3.000	0	2EGC	28.00	21.90	49.90	120
190	200	PVC, CLASS 200	4.000	0	E	9.00	15.10	24.10	150
200	210	PVC, CLASS 200	4.000	0	E	160.20	15.10	175.30	150
210	220	PVC, CLASS 200	4.000	0	E	16.30	15.10	31.40	150
220	230	PVC, CLASS 200	4.000	0	2E	3.40	30.20	33.60	150
230	240	Backflo Prev	3.000	Loss					
240	250	PVC, CLASS 200	4.000	0	2E	4.00	30.20	34.20	150
250	260	PVC, CLASS 200	4.000	0	ET	25.10	45.30	70.40	150



Fire Sprinkler Output Data

Overall Pipe Output Data

Beg. End. Node	Nodal KFactor (K)	Elevation (feet)	Spk/Hose Discharge (gpm)	Residual Pressure (psi)	Nom. Dia. Inside Dia. C-Value	q (gpm) Q (gpm) Velocity (fps)	F. L./ft (psi/ft) Fittings Type-Grp	Pipe-Len. Fit-Len. Tot-Len. (ft)	PF-(psi) PE-(psi) PT-(psi)
10	5.60	25.50	16.80	9.00	1.00	16.80	0.09429	12.00	1.396
20	5.60	25.50	18.06	10.40	1.049	16.80	2E	2.80	0.000
	SCHED 40 STEEL BLK				120	6.24	0	14.80	1.396
40	5.60	25.50	17.13	9.36	1.00	17.13	0.09778	12.00	1.447
50	5.60	25.50	18.41	10.81	1.049	17.13	2E	2.80	0.000
	SCHED 40 STEEL BLK				120	6.36	0	14.80	1.447
70	5.60	25.50	18.24	10.60	1.00	18.24	0.10973	12.00	2.008
80	5.60	25.50	19.89	12.61	1.049	18.24	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	6.77	0	18.30	2.008
20	5.60	25.50	18.06	10.40	1.00	18.06	0.36383	3.00	3.384
100	0.00	25.50	0.00	13.78	1.049	34.86	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	12.94	0	9.30	3.384
30	5.60	25.50	19.33	11.91	1.00	19.33	0.12218	9.00	1.869
90	0.00	25.50	0.00	13.78	1.049	19.33	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.17	0	15.30	1.869
100	0.00	25.50	0.00	13.78	1.25	0.00	0.21642	1.00	1.125
120	0.00	25.50	0.00	14.90	1.380	54.18	T	4.20	0.000
	SCHED 40 STEEL BLK				120	11.62	0	5.20	1.125
50	5.60	25.50	18.41	10.81	1.00	18.41	0.37722	3.00	3.508
130	0.00	25.50	0.00	14.32	1.049	35.54	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	13.19	0	9.30	3.508
60	5.60	25.50	19.70	12.38	1.00	19.70	0.12662	9.00	1.937
130	0.00	25.50	0.00	14.32	1.049	19.70	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.31	0	15.30	1.937
120	0.00	25.50	0.00	14.90	2.00	0.00	0.03026	12.00	0.578
140	0.00	25.50	0.00	15.48	2.067	54.18	T	7.10	0.000
	SCHED 40 STEEL BLK				120	5.18	0	19.10	0.578
130	0.00	25.50	0.00	14.32	1.25	0.00	0.22435	1.00	1.167
140	0.00	25.50	0.00	15.48	1.380	55.25	T	4.20	0.000
	SCHED 40 STEEL BLK				120	11.85	0	5.20	1.167
80	5.60	25.50	19.89	12.61	1.00	19.89	0.42941	3.00	3.993
150	0.00	25.50	0.00	16.60	1.049	38.12	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	14.15	0	9.30	3.993
90	5.60	25.50	21.24	14.38	1.00	21.24	0.14545	9.00	2.225
100	0.00	25.50	0.00	16.60	1.049	21.24	2ET	6.30	0.000
	SCHED 40 STEEL BLK				120	7.88	0	15.30	2.225



Fire Sprinkler Output Data

Overall Pipe Output Data (cont'd)

Beg. End. Node	Nodal KFactor (K)	Elevation (feet)	Spk/Hose Discharge (gpm)	Residual Pressure (psi)	Nom. Dia. Inside Dia. C-Value	q (gpm) Q (gpm) Velocity (fps)	F. L./ft (psi/ft) Fittings Type-Grp	Pipe-Len. Fit-Len. Tot-Len. (ft)	PF-(psi) PE-(psi) PT-(psi)
140	0.00	25.50	0.00	15.48	2.00	0.00	0.11107	15.00	2.455
160	0.00	25.50	0.00	17.94	2.067	109.43	T	7.10	0.000
	SCHED 40 STEEL BLK				120	10.46	0	22.10	2.455
150	0.00	25.50	0.00	16.60	1.25	0.00	0.25622	1.00	1.332
160	0.00	25.50	0.00	17.94	1.380	59.36	T	4.20	0.000
	SCHED 40 STEEL BLK				120	12.73	0	5.20	1.332
160	0.00	25.50	0.00	17.94	2.00	0.00	0.24764	110.50	29.122
170	0.00	25.50	0.00	47.06	2.067	168.78	T	7.10	0.000
	SCHED 40 STEEL BLK				120	16.14	0	117.60	29.122
170	0.00	25.50	0.00	47.06	2.50	0.00	0.10422	33.00	4.325
180	0.00	25.50	0.00	51.38	2.469	168.78	T	8.50	0.000
	SCHED 40 STEEL BLK				120	11.31	0	41.50	4.325
180	0.00	25.50	0.00	51.38	3.00	0.00	0.03619	28.00	1.806
190	0.00	-3.00	100.00	65.53	3.068	168.78	2EGC	21.90	12.341
	SCHED 40 STEEL BLK				120	7.33	0	49.90	14.146
190	0.00	-3.00	100.00	65.53	4.00	100.00	0.01427	9.00	0.344
200	0.00	-3.00	0.00	65.87	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	24.10	0.344
200	0.00	-3.00	0.00	65.87	4.00	0.00	0.01427	160.20	2.501
210	0.00	-3.00	0.00	68.38	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	175.30	2.501
210	0.00	-3.00	0.00	68.38	4.00	0.00	0.01427	16.30	0.448
220	0.00	-3.00	0.00	68.82	4.072	268.78	E	15.10	0.000
	PVC, CLASS 200				150	6.62	0	31.40	0.448
220	0.00	-3.00	0.00	68.82	4.00	0.00	0.01427	3.40	0.479
230	0.00	-3.00	0.00	69.30	4.072	268.78	2E	30.20	0.000
	PVC, CLASS 200				150	6.62	0	33.60	0.479
230	Backflo Prev	-3.00		69.30		268.79			
240	3.00 psi	-3.00		72.31					
240	0.00	-3.00	0.00	72.31	4.00	0.00	0.01427	4.00	0.488
250	0.00	-3.00	0.00	72.80	4.072	268.78	2E	30.20	0.000
	PVC, CLASS 200				150	6.62	0	34.20	0.488
250	0.00	-3.00	0.00	72.80	4.00	0.00	0.01427	25.10	1.004
260	0.00	-3.00	0.00	73.80	4.072	268.78	ET	45.30	0.000
	PVC, CLASS 200				150	6.62	0	70.40	1.004



Fire Sprinkler Output Data

Overall Sprinkler Output Data

Flowing Sprinkler Node No.	Area Group Code	Sprinkler KFactor (K)	Sprinkler Elevation (feet)	Residual Pressure (psi)	Flowing Area (ft ²)	Flowing Density (gpm/ft ²)	Sprinkler Discharge (gpm)
10		5.60	25.50	9.00	168.00	0.100	16.80
Sub Totals For Non-Group					168.00	0.100	16.80
20		5.60	25.50	10.40	168.00	0.107	18.06
Sub Totals For Non-Group					168.00	0.107	18.06
30		5.60	25.50	11.91	168.00	0.115	19.33
Sub Totals For Non-Group					168.00	0.115	19.33
40		5.60	25.50	9.36	168.00	0.102	17.13
Sub Totals For Non-Group					168.00	0.102	17.13
50		5.60	25.50	10.81	168.00	0.110	18.41
Sub Totals For Non-Group					168.00	0.110	18.41
60		5.60	25.50	12.38	168.00	0.117	19.70
Sub Totals For Non-Group					168.00	0.117	19.70
70		5.60	25.50	10.60	168.00	0.109	18.24
Totals For Non-Group					168.00	0.109	18.24
80		5.60	25.50	12.61	168.00	0.118	19.89
Sub Totals For Non-Group					168.00	0.118	19.89
90		5.60	25.50	14.38	168.00	0.126	21.24
Sub Totals For Non-Group					168.00	0.126	21.24
Totals For All Groups					1512.00	0.112	168.78



Fire Sprinkler Output Summary

Hydraulically Most Demanding Sprinkler Node

HMD Sprinkler Node Number:	10
HMD Actual Residual Pressure:	9.00 psi
HMD Actual GPM:	16.80 gpm

Sprinkler Summary

Sprinkler System Type:	Wet
Specified Area Of Application:	1020.00 ft ²
Minimum Desired Density:	0.100 gpm/ft ²
Application Average Density:	0.165 gpm/ft ²
Application Average Area Per Sprinkler:	113.33 ft ²
Sprinkler Flow:	168.78 gpm
Average Sprinkler Flow:	18.75 gpm

Flow Velocity And Imbalance Summary

Maximum Flow Velocity (In Pipe 160 - 170)	16.14 ft/sec
Maximum Velocity Pressure (In Pipe 160 - 170)	1.75 psi
Allowable Maximum Nodal Pressure Imbalance:	0.0001 psi
Actual Maximum Nodal Pressure Imbalance:	0.0001 psi
Actual Average Nodal Pressure Imbalance:	0.0000 psi
Actual Maximum Nodal Flow Imbalance:	0.0031 gpm
Actual Average Nodal Flow Imbalance:	0.0002 gpm

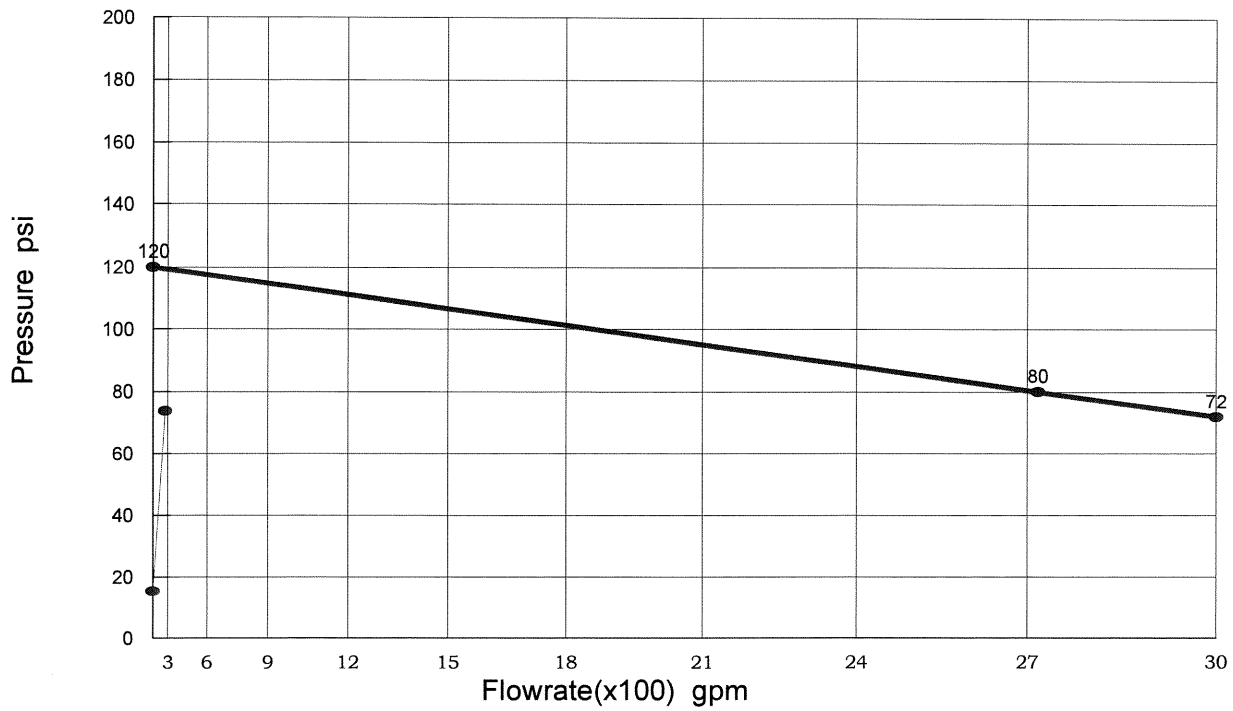
Overall Network Summary

Number Of Unique Pipe Sections:	24
Number Of Flowing Sprinklers:	9
Pipe System Water Volume:	193.87 gal
Sprinkler Flow:	168.78 gpm
Non-Sprinkler Flow:	100.00 gpm
Minimum Required Residual Pressure At System Inflow Node:	73.80 psi
Demand Flow At System Inflow Node:	268.78 gpm



Fire Sprinkler Output Data

Hydraulic Supply/Demand Graph



Supply Curve Data

Static Pressure: 120 psi
Test Residual Pressure: 80 psi
Test Flow Rate: 2717 gpm

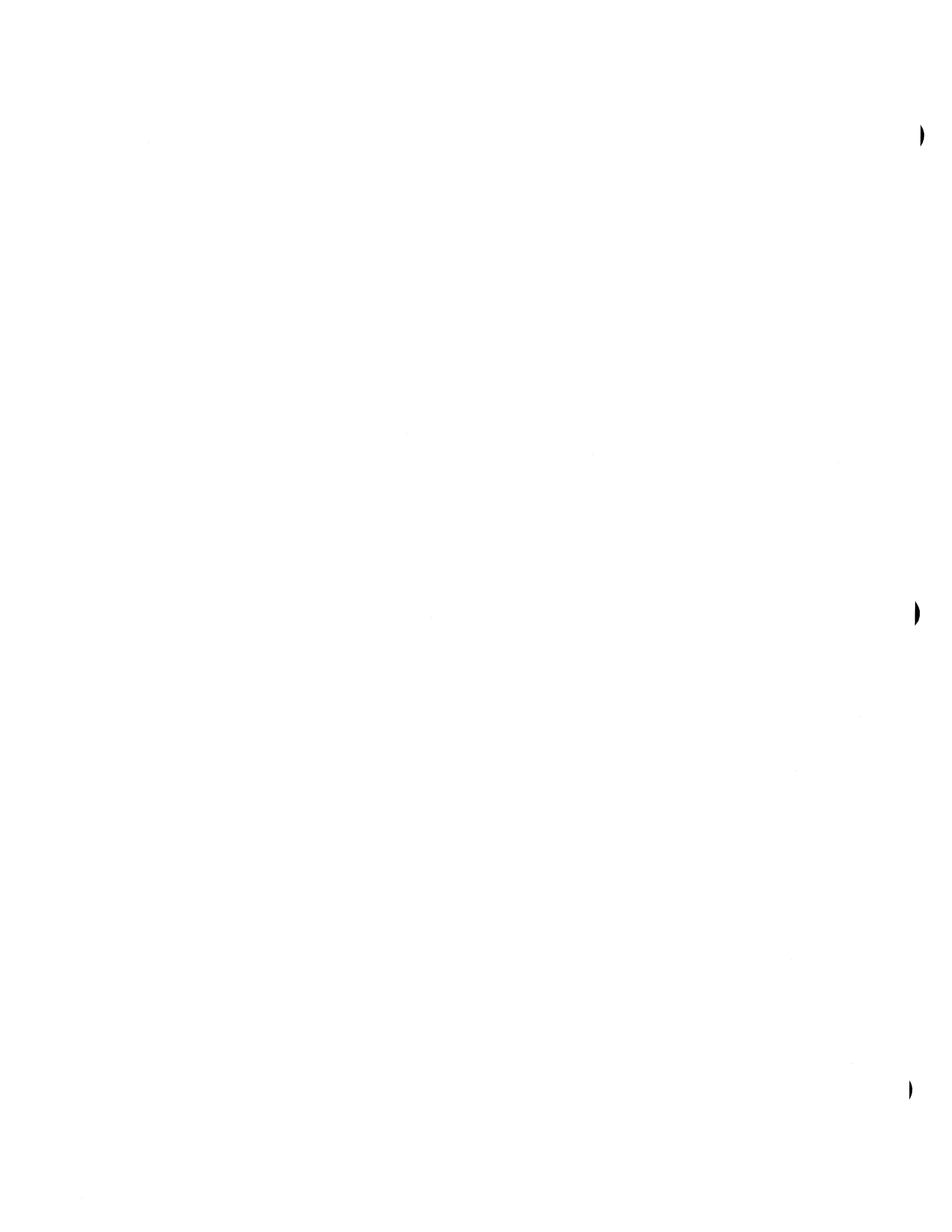
Demand Curve Data

Calculated Residual Pressure: 73.80 psi
Calculated Flow Rate: 268.78 gpm
Excess Available Residual Pressure At Calculated Flow: 45.64 psi
Pressure Required For First Sprinkler Downstream From Inflow Node To Flow: 15.34 psi

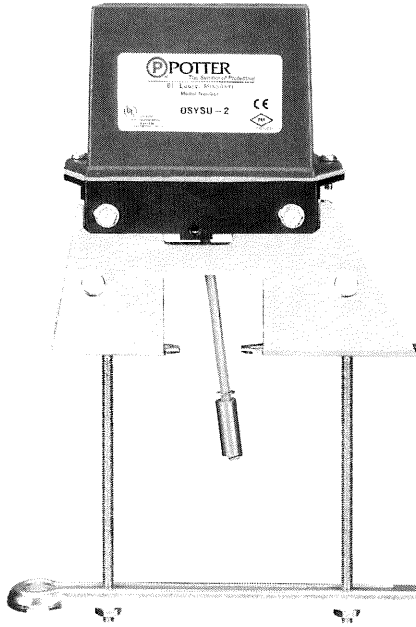
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MATERIAL CUT SHEETS



OSYSU-1, -2
OUTSIDE SCREW AND YOKE VALVE
SUPERVISORY SWITCH



UL, ULC, and CSFM Listed, FM Approved, NYMEA Accepted, CE Marked

Dimensions: 6.19"L X 2.25"W X 5.88"H
15,7cm L X 5,7cm W X 14,6cm H

Weight: 2 lbs. (0,9 kg.)

Enclosure: Cover - Die-Cast
Finish - Red Spatter Enamel
Base - Die Cast Zinc

All parts have corrosion resistant finishes.

Cover Tamper: Tamper resistant screws,
Optional cover tamper kit available.

Contact Ratings:
OSYSU-1: One set of SPDT (Form C)
OSYSU-2: Two sets of SPDT (Form C)
15.00 Amps at 125/250VAC
2.50 Amps at 30VDC resistive

- Environmental Limitations:**
- **NEMA 4 and NEMA 6P Enclosure (IP67) when used with appropriate watertight conduit fittings.**
 - Indoor or Outdoor use (Not for use in hazardous locations. See bulletin no. 5400705 OSYS-U-EX for hazardous locations.)
 - Temperature Range: -40°F to 140°F (-40°C to 60°C)

Conduit Entrances:
2 knockouts for 1/2" conduit provided

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

General Information

The OSYSU is used to monitor the open position of an OS&Y (outside screw and yoke) type gate valve. This device is available in two models; the OSYSU-1, containing one set of SPDT (Form C) contacts and the OSYSU-2, containing two sets of SPDT (Form C) contacts. These switches mount conveniently to most OS&Y valves ranging in size from 2" to 12" (50mm to 300mm). They will mount on some valves as small as 1/2" (12,5mm).

The cover is held in place by two tamper resistant screws that require a special tool to remove. The tool is furnished with each device and should be left with the building owner or responsible party. Replacement or additional cover screws and hex keys are available. See Ordering Information.

Optional Cover Tamper Switch

A field installable cover tamper switch is available as an option which may be used to indicate removal of the cover. See Ordering Information.

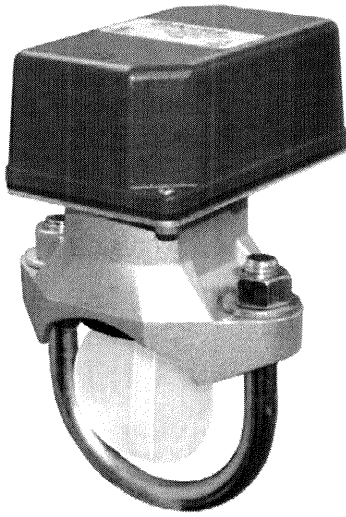
Testing

The OSYSU and its associated protective monitoring system should be inspected and tested in accordance with applicable NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

Ordering Information

Model	Description	Stock No.
OSYSU-1	Outside Screw & Yoke-Supervisory Switch (Single switch)	1010106
OSYSU-2	Outside Screw & Yoke-Supervisory Switch (Double switch)	1010206
--	Cover Screw	5490424
--	Hex Key for Cover Screws and Installation Adjustments	5250062
--	Optional Cover Tamper Switch Kit	0090131

For pressure reducer type valve installation kits (if required) contact valve manufacturer.



Specifications subject to change without notice.

Ordering Information			
Nominal Pipe Size		Model	Part Number
2"	DN50	VSR-2	1144402
2 1/2"	DN65	VSR-2 1/2	1144425
3"	DN80	VSR-3	1144403
3 1/2"	-	VSR-3 1/2	1144435
4"	DN100	VSR-4	1144404
5"	-	VSR-5	1144405
6"	DN150	VSR-6	1144406
8"	DN200	VSR-8	1144408

Optional: Cover Tamper Switch Kit, stock no. 0090148

Replaceable Components: Retard/Switch Assembly, stock no. 1029030

UL, CUL and CSFM Listed, FM Approved, LPCB Approved, For CE Marked (EN12259-5)/VdS Approved model use VSR-EU

Service Pressure: 450 PSI (31 BAR) - UL

Flow Sensitivity Range for Signal:

4-10 GPM (15-38 LPM) - UL

Maximum Surge: 18 FPS (5.5 m/s)

Contact Ratings: Two sets of SPDT (Form C)

10.0 Amps at 125/250VAC

2.0 Amps at 30VDC Resistive

10 mAmps min. at 24VDC

Conduit Entrances: Two knockouts provided for 1/2" conduit.

Individual switch compartments suitable for dissimilar voltages.

Environmental Specifications:

- NEMA 4/IP54 Rated Enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting.
- Temperature Range: 40°F - 120°F, (4.5°C - 49°C) - UL
- Non-corrosive sleeve factory installed in saddle.

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

WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

CAUTION

Waterflow switches that are monitoring wet pipe sprinkler systems shall not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems. Waterflow switches used for this application may result in unintended discharges caused by surges, trapped air, or short retard times.

General Information

The Model VSR 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" (50 mm thru 200 mm). LPC approved sizes are 2" thru 8" (50 mm thru 200 mm). See Ordering Information chart.

The VSR may also be used as a sectional waterflow detector on large systems. The VSR 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 GPM (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 VSR switches and retard device are 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 number 5401103 for installation instructions of this switch.



TECHNICAL DATA

ALARM CHECK VALVE MODEL J-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

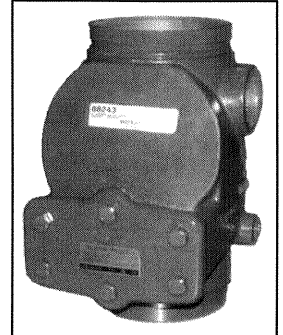
1. DESCRIPTION

The Viking Model J-1 Alarm Check Valve serves as a check valve by trapping pressurized water above the clapper and preventing reverse flow from sprinkler piping.

The valve is designed to initiate an alarm during a sustained flow of water (such as the flow required by an open sprinkler) by operating an optional water motor alarm and/or alarm pressure switch. The valve is made suitable for use on variable pressure water supplies by adding the optional retard chamber to the standard trim.

Features

- Ductile iron body for less weight and extra strength.
- Rubber-faced clapper hinged to access cover for quick removal and easy servicing.
- All moving parts can be serviced without removing the valve from the installed position.
- With the cover/clapper assembly removed, clapper rubber replacement requires removal of only one screw.
- External by-pass trim to minimize clapper movement and false alarm.
- Trim allows installation of optional non-interruptible pressure switch to activate an electric alarm panel and/or remote alarm.
- Can be installed on constant or variable pressure water supplies.
- Can be installed vertically or horizontally, with access cover facing up.
- Valve housing tapped for inlet and outlet pressure gauges, alarm devices, and system main drain.
- Trim includes alarm test valve for testing alarms without reducing system pressure.



2. LISTINGS AND APPROVALS



UL Listed - Guide VPLX
cUL Listed



FM Approved - Waterflow Alarm Valves

NYC Department of Buildings - MEA 89-92-E Vol. XI



LPCB



VdS - DN80 - G 4960086, DN100 - G 4960087, DN150 - G 4960088, DN200 - G 4960089



CE Certified: Standard EN-12259-2, EC-certificate of conformity 0832-CPD-2010

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.

3. TECHNICAL DATA

Specifications

Friction Loss - Refer to Table 1

Pressure Rating - 250 psi (17.2 bar) water working pressure.

Factory tested hydrostatically to 500 psi (34.5 bar).

The valve may be hydrostatically tested at 300 psi (20.7 bar) and/or 50 psi (3.4 bar) above the normal water working pressure, for limited periods of time (two hours), for the purpose of acceptance by the AHJ. If air testing is required, do not exceed 40 psi (2.8 bar) air pressure.

Material Standards

Refer to Table 1

Ordering Information

The valve is listed and/or approved with specific trim for use up to 250 psi (17.2 bar). No substitutions or omissions, in part or in full, are allowed. Additional accessories to the standard trim packages are required for a complete system meeting the requirements of the applicable rules and codes. See appropriate technical data for additional information.

Part Numbers - Refer to Table 1

Accessories -

- Retard Chamber: Required when the J-1 Alarm Check Valve is installed on systems with a variable pressure water supply to minimize unwanted (false) alarms.
- Water Motor Alarm: The J-1 Alarm Check Valve is designed to operate a mechanical alarm during a sustained flow of water (such as the flow required by an open sprinkler). Refer to the water motor alarm technical data.



TECHNICAL DATA

ALARM CHECK VALVE MODEL J-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Table 1 - Specifications

	Nominal Size	Part Number	Friction Loss*	Shipping Weight
Flange/Flange				
Flange Drilling	Model J-1			
ANSI	3"	08235	10 ft. (3,1 m)	35 lbs. (16 kg)
ANSI	4"	08238	13 ft. (4,0 m)	47 lbs. (21 kg)
ANSI	6"	08241	20 ft. (6,0 m)	75 lbs. (34 kg)
ANSI	8"	08244	23 ft. (7,0 m)	135 lbs. (61 kg)
PN10/16	DN80	09108	10 ft. (3,1 m)	35 lbs. (16 kg)
PN10/16	DN100	09109	13 ft. (4,0 m)	47 lbs. (21 kg)
PN10/16	DN150	09110	20 ft. (6,0 m)	75 lbs. (34 kg)
PN10	DN200	09111	23 ft. (7,0 m)	135 lbs. (61 kg)
PN16	DN200	12388	23 ft. (7,0 m)	135 lbs. (61 kg)
Table E	DN80	09116	10 ft. (3,1 m)	35 lbs. (16 kg)
Table E	DN100	09117	13 ft. (4,0 m)	47 lbs. (21 kg)
Table E	DN150	09118	20 ft. (6,0 m)	75 lbs. (34 kg)
Table E	DN200	09119	23 ft. (7,0 m)	135 lbs. (61 kg)

* Expressed in equivalent length of Schedule 40 pipe based on Hazen & Williams formula: C=120

	Nominal Size	Part Number	Friction Loss*	Shipping Weight
Flange/Groove				
Flange Drilling / Pipe O.D.	Model J-1			
ANSI / 89mm	3"	08236	10 ft. (3,1 m)	27 lbs. (12 kg)
ANSI / 114mm	4"	08239	13 ft. (4,0 m)	37 lbs. (17 kg)
ANSI / 168mm	6"	08242	20 ft. (6,0 m)	64 lbs. (29 kg)
ANSI / 219mm	8"	08245	23 ft. (7,0 m)	119 lbs. (54 kg)
PN10/16 / 89mm	DN80	09535	10 ft. (3,1 m)	27 lbs. (12 kg)
PN10/16 / 114mm	DN100	09536	13 ft. (4,0 m)	37 lbs. (17 kg)
PN10/16 / 168mm	DN150	09874	20 ft. (6,0 m)	64 lbs. (29 kg)
PN10 / 219mm	DN200	09877	23 ft. (7,0 m)	119 lbs. (54 kg)
PN16 / 219mm	DN200	12389	23 ft. (7,0 m)	119 lbs. (54 kg)
Groove/Groove				
Pipe O.D.	Model J-1			
89mm	3" / DN80	08237	10 ft. (3,1 m)	20 lbs. (9 kg)
114mm	4" / DN100	08240	13 ft. (4,0 m)	27 lbs. (12 kg)
165mm	DN150	09405	20 ft. (6,0 m)	51 lbs. (23 kg)
168mm	6" / DN150	08243	20 ft. (6,0 m)	51 lbs. (23 kg)
219mm	8" / DN200	08246	23 ft. (7,0 m)	106 lbs. (48 kg)

Systems with water working pressures above 175 psi (12.1 bar) may require extra-heavy pattern fittings. Model J-1 Alarm Valve flanges are Ductile Iron ANSI B16.42 Class 150 with a maximum water working pressure of 250 psi. ANSI B16.42 Class 150 flanges are NOT compatible with ANSI Class 250 or Class 300 flanges. To mate the Model J-1 Alarm Check Valve with ANSI Class 250 or Class 300 flanges, use the grooved-inlet/ grooved-outlet style installed with listed grooved/flanged adapters of the appropriate pressure rating. For piping with grooved connections, the grooved-inlet and/or grooved-outlet Model J-1 Alarm Check Valve may be installed with listed grooved couplings of the appropriate pressure rating.

c. Alarm Pressure Switch: The J-1 Alarm Check Valve trim allows installation of pressure switches to operate local electric alarms and/ or remote electric alarms during a sustained flow of water (such as the flow required by an open sprinkler). Additional accessories are available and may be required for operation or supervision. Refer to the system description for complete operating trim requirements.

Trim Packages - Viking 250 psi (17.2 bar) trim is required to maintain listings and approvals. Trim packages include all necessary nipples, fittings, standard trim accessories and necessary gauges.

a. 250 psi (17.2 bar) vertical trim* for use when the J-1 Alarm Check Valve is installed vertically.

b. 250 psi (17.2 bar) horizontal trim* for use when the J-1 Alarm Check Valve is installed horizontally.

*For optional pre-trimmed Model J-1 Alarm check Valves, refer to the current Viking Price List or contact the manufacturer.

4. INSTALLATION

The Model J-1 Alarm Check Valve must be installed in an area not subject to freezing temperatures or physical damage. When corrosive atmospheres and/or contaminated water supplies are present, it is the owner's responsibility to verify compatibility with the Model J-1 Alarm Check Valve, trim, and associated equipment.

Prior to installing the valve, thoroughly flush the water supply piping to verify that no foreign matter is present.

The Model J-1 Alarm Check Valve may be installed in the vertical position with direction of flow up, or in the horizontal position with the access cover up.

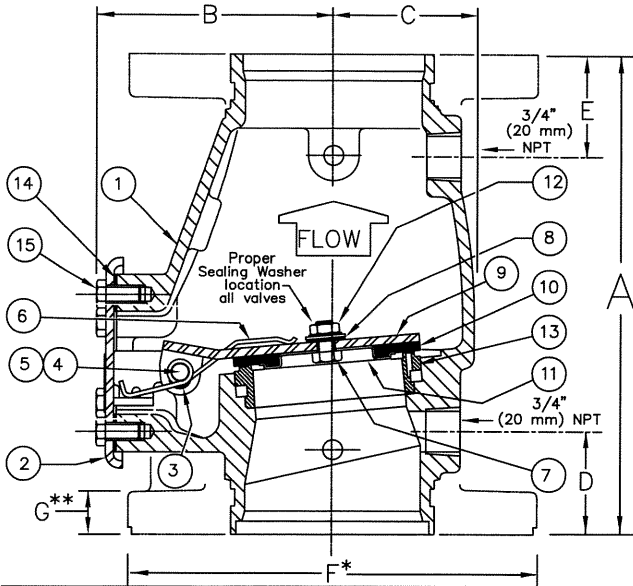


TECHNICAL DATA

ALARM CHECK VALVE MODEL J-1

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com



SIZE	A	B	C	D	E	F*	G**
3" (DN80)	10-3/16" (259)	4-3/4" (120,7)	2-3/4" (69,9)	1-13/16" (46)	2-1/8" (54)	7-7/8" (200)	3/4" (19,05)
4" (DN100)	10-5/8" (269,9)	5-3/16" (131,8)	3-1/8" (79,4)	1-7/8" (47,6)	2-1/4" (57,2)	9" (228,6)	15/16" (23,81)
6" (DN150)	13-3/8" (340)	6-3/4" (171,5)	4-1/8" (104,8)	2-1/4" (57,2)	2-1/4" (57,2)	11" (279,4)	1" (25,4)
8" (DN200)	17" (431,8)	8-7/8" (225,4)	5" (127)	2-1/4" (57,2)	2-7/8" (73,0)	13-1/2" (342,9)	1-1/8" (28,58)

Dimensions shown in parentheses are millimeters.

* Flanges are optional.
Valve is available Fig X Flg, Fig X Grv, or Grv X Grv.

** 4", 6", and 8" valves are manufactured with sculptured flanges.
Dimension indicates thickness of flange at bolt holes.

Figure 2 - Replacement Parts

ITEM NO.	PART NUMBERS				DESCRIPTION	MATERIAL	NO. REQ'D				
	3" (DN80)	4" (DN100)	6" (DN150)	8" (DN200)			3"	4"	6"	8"	
1	--	--	--	--	Body	Ductile Iron, ASTM A536 (65-45-12)	1	1	1	1	
2	--	--	--	--	Cover Assembly	E-Coated HSLA Steel, A715 and Stainless Steel, UNS-S30400	1	1	1	1	
3	07576	07576	07576		Bushing	Lubricomp 189 Ryton	2	2	2		
4	05355A	04900A	04991A	05334A	Clapper Hinge Pin	Stainless Steel, UNS-S30400	1	1	1	1	
5	05445A	05445A	05445A	05369A	Hinge Pin Retaining Ring	Stainless Steel, UNS-S15700	2	2	2	2	
6	06021B	05939B	05940B	05952B	Spring	Stainless Steel, UNS-S30200	1	1	1	1	
7	08159	08159			Clapper Hex Nut 3/8"-16 UNC	Stainless Steel, UNS-S30400	1	1			
				08144	08144	Clapper Hex Nut 1/2"-13 UNC	Stainless Steel, UNS-S30400			1	1
8	08158	08158			Sealing Washer 3/8" x 1" O.D.	EPDM and Stainless Steel	1	1			
				08143	08143	Sealing Washer 1/2" x 1-1/8" O.D.	EPDM and Stainless Steel			1	1
9	*	*	*	*	Clapper	Teflon® Coated HR Steel UNS-G10180	1	1	1	1	
10	*	*	*	*	Clapper Rubber	EPDM	1	1	1	1	
11	*	*	*	*	Clapper Rubber Retainer	Stainless Steel, UNS-S30400	1	1	1	1	
12	10194	10194			Screw, Button Head, Socket 3/8"-24 x 1/2" (12,7 mm) lg.	Stainless Steel, UNS-S30400	1	1			
				10308		Screw, Button Head, Socket 1/4"-20 x 3/4" (19,0 mm) lg.	Stainless Steel, UNS-S30400			1	
					10686	Screw, Button Head, Socket 1/4"-20 x 7/8" (22,2 mm) lg.	Stainless Steel, UNS-S30400				1
13	--	--	--	--	Seat	Brass, UNS-C84400	1	1	1	1	
14	05354B	04649B	04992B	05339C	Cover Gasket	SBR Rubber	1	1	1	1	
15	01517A	01517A			H.H.C. Screw 3/8"-16 x 3/4" (19,0 mm) lg.	Steel, Zinc Plated	4	6			
				04993A		H.H.C. Screw 1/2"-13 x 7/8" (22,2 mm) lg.	Steel, Zinc Plated			6	
					01922A	H.H.C. Screw 5/8"-11 x 1-1/4" (31,8 mm) lg.	Steel, Zinc Plated				6

-- Indicates replacement part not available

* Indicates replacement part only available in a Sub-Assembly listed below.

SUB-ASSEMBLIES

3, 7-12	08518	08519	08520	08521	Clapper Assembly
7, 8, 10-12, 14	08522	08523	08524	08525	Replacement Rubber Kit



TECHNICAL DATA

WATER MOTOR ALARMS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

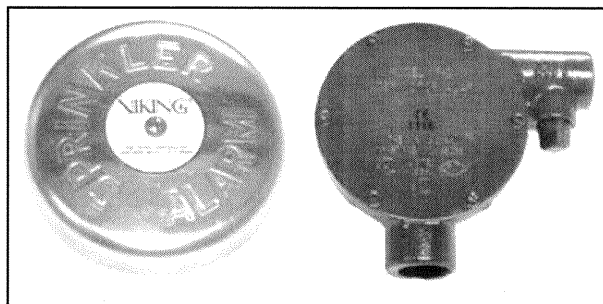
The Viking water motor alarms are mechanical devices actuated by a flow of water. They are designed to sound a continuous alarm while a sprinkler system operates. An alarm is a required component of every sprinkler system having more than 20 sprinklers.

A. Features

1. The water motor alarms are tapped 3/4" NPT on the inlet and 1" NPT on the drain outlet.
2. The water motor alarm package includes a drive shaft 16-3/4" (425 mm) long for walls 14" (356 mm) thick or less. A special extension shaft is available for walls up to 30-1/4" (768 mm) thick.
3. The package also includes the required 3/4" (20 mm) NPT strainer for installation on the alarm line.
4. Rated water working pressure of Model F-2 is 250 PSI (17.2 bar).

B. Accessories: (order separately)

1. Extension Mounting Cup: Viking Part Number 05957B, Material: 14-Gauge Cold Rolled Steel, UNS-G10080, coated with black E-coat. The extension mounting cup is required when the wall thickness is less than 3" (76.2 mm). Refer to "INSTALLATION" instructions. See Figure 2.
2. Closure Plate: For use with Model F-2 only, Viking Part Number 05820B, Material: 16-Gauge Galvanized Steel, UNS-G10080. The closure plate is required when the Model F-2 Water Motor Alarm gong is mounted on an irregularly surfaced wall. It serves to prevent birds from entering the inside of the gong. The closure plate also serves as a mounting plate for sheet metal walls. Refer to "INSTALLATION" instructions. See Figure 2.
3. Special Extension Shaft: Viking Part Number 03312B, Material: Stainless Steel, UNS- S30400. The extension shaft is required when the F-2 or G-2 Water Motor Alarm is installed on walls from 14" (356 mm) to 30-1/4" (768 mm) thick.



2. LISTINGS AND APPROVALS

Model F-2:

UL Listed - VPLX
 C-UL Listed
 FM Approved - Water Motor Gongs
 L.P.C. Approved
 CE - Certificate 1116
 New York City Board of Standards and Appeals - Calendar No. 219-76-SA

Model G-2:

VdS
 CE Approval - Certificate 1116

Viking Technical Data may be found on
 The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
 The Web site may include a more recent
 edition of this Technical Data Page.

3. TECHNICAL DATA

Specifications

Available since 1991
 Shipping Weight: Model F-2: 11 lbs. (5.0 kg); Model G-2: 13 lbs. (5.9 kg)
 Water working pressure: Rated to 175 PSI (12 bar)

Material Standards (See Figure 3)

Viking E-coat Spec: SPF02 W01

Ordering Information

Model F-2, Viking Part No. 07862
 Model G-2, Viking Part No. 07868

4. INSTALLATION

Locate the water motor on an exterior wall as close as practical to the valve being monitored for water flow. A 3/4" (20 mm) strainer (included) is required on the alarm line as close as possible to the alarm outlet of the valve being monitored for water flow (or outlet of the retard chamber, if used). The location must be easily accessible for cleaning.

- A. Cut a 1-7/16" (36.5 mm) minimum to 1-5/8" (41.3 mm) maximum diameter hole in the building wall to accommodate the 3/4" (20 mm) galvanized spacer pipe. (Note: Spacer pipe is NOT included in Water Motor Alarm Package). The hole through the wall must be level or pitched slightly downward toward the water motor.
- B. Measure the wall thickness.



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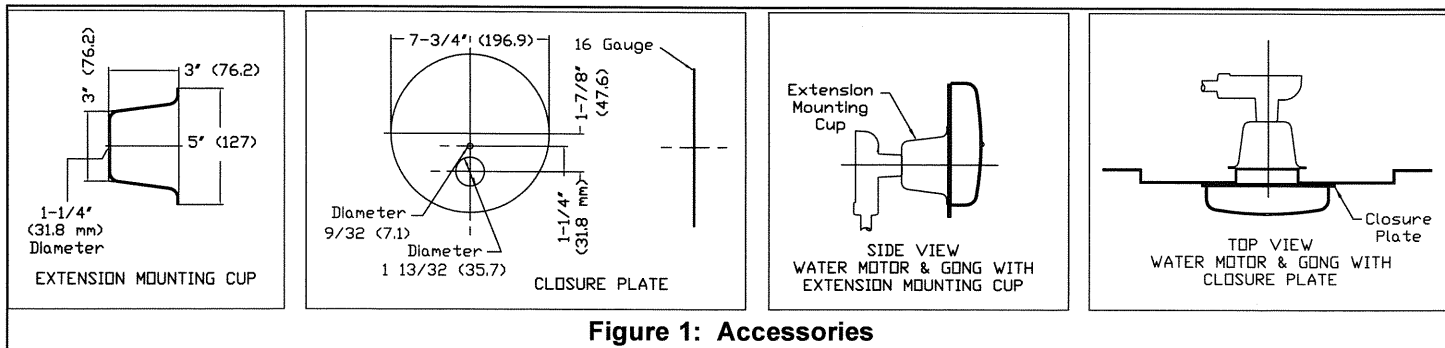


Figure 1: Accessories

- C. Cut and thread the spacer pipe to a length equal to: The wall thickness minus 1" (25.4 mm). If the extension mounting cup is used, add an additional 3" (76 mm) to the spacer pipe.
- D. Cut the drive shaft (10) to a length equal to: The total wall thickness plus 2-3/4" (70 mm). If extension mounting cup is used, add an additional 3" (76 mm).
- E. File the drive shaft to provide a 3/32" (2.4 mm) x 45° chamfer on both corners of both ends. File off all burrs and insert the drive shaft into the hole of the striker arm shaft.
- F. Slide the spacer pipe over the shaft and thread the end of the spacer pipe into the gong support assembly coupling (12).
- G. Slide the closure plate (if used) over the free end of the spacer pipe, up to the back of the gong. If desired, the closure plate may be fastened to the gong support by using the 9/32" (7.14 mm) diameter hole in the gong support. Use only a flat or round headed fastener that will not interfere with striker arm movement.
- H. Position the support assembly on the exterior wall surface by sliding the free threaded end of the spacer pipe into the hole from outside the building.
- I. On the inside surface of the wall: Slide the wall plate provided (9), over the free threaded end of the spacer pipe. (If an extension mounting cup is used, place it over the end of the spacer pipe with the flared end toward the wall before sliding the wall plate into position).
- J. Remove the plastic thread protectors from the threaded openings in the body of the water motor.
- K. Attach the water motor assembly by threading the body (3) onto the free threaded end of the spacer pipe. The chamfered ends of the drive shaft allow it to slide into position as the water motor body is threaded onto the spacer pipe. When the assembly is properly tightened, the water motor should be positioned with the 1" (25 mm) NPT drain outlet facing downward and the 3/4" (20

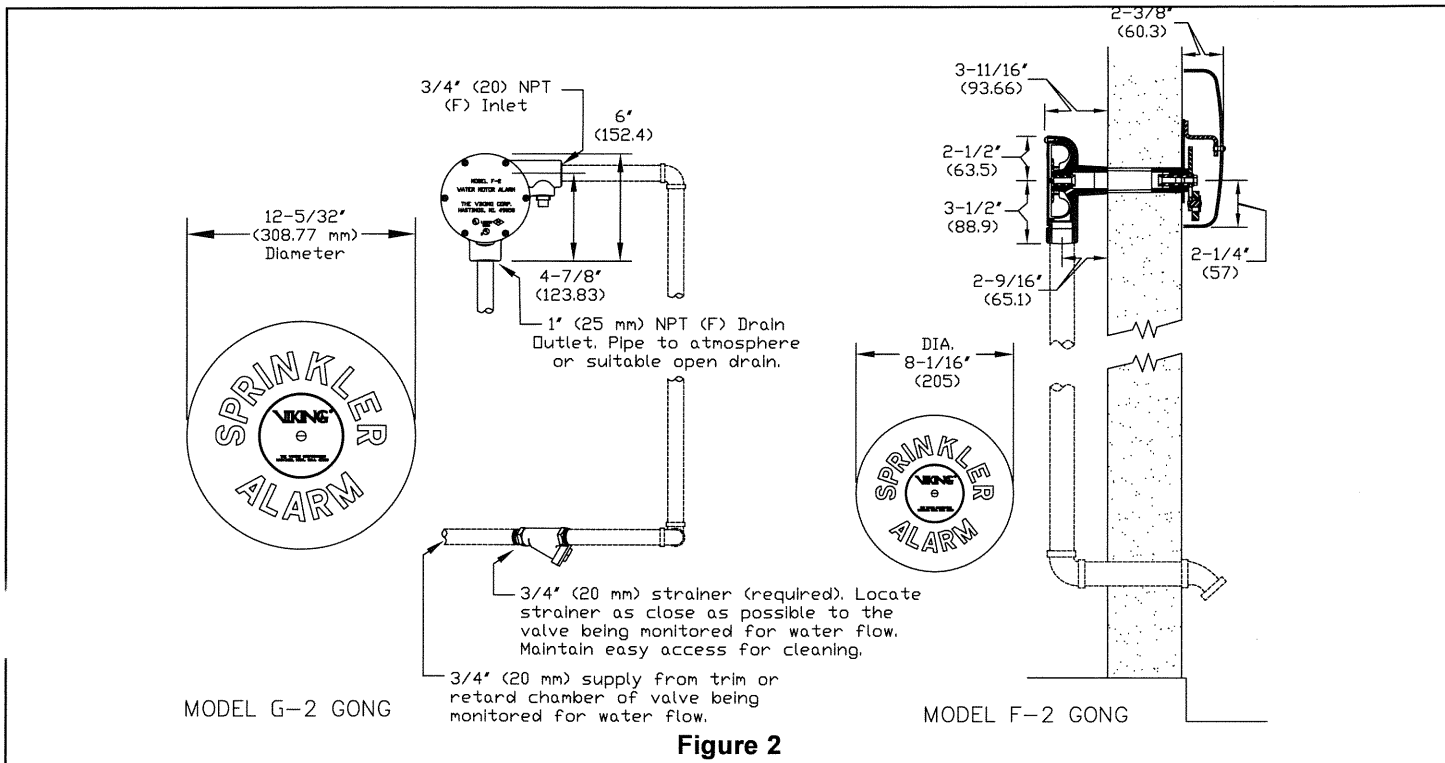


Figure 2



TECHNICAL DATA

WATER MOTOR ALARMS

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mm) NPT alarm line inlet horizontal. See Figures 1 and 3.

- L. Attach the gong, the flat washer, and the gong label (16, 17, and 18) to the gong support installed on the exterior surface of the wall, with the 5/16-18 x 12" (13 mm) screw (19). Note: The flat washer must be installed between the gong and the gong support (17).
- M. With galvanized, brass, or other approved corrosion-resistant piping, not less than 3/4" (20 mm) diameter, connect the water motor inlet to the alarm outlet of the waterflow detecting device. A 3/4" (20 mm) strainer (included) is required on the alarm line as close as possible to the alarm outlet of the waterflow detecting device (or outlet of the retard chamber if used). The location must be easily accessible for cleaning.
- N. The drain outlet of the impeller housing must discharge to an open drain. Care shall be taken to keep the drain line clean at all times.
- O. Note: A water motor drain line that:
 - 1. Has too many fittings, and/or
 - 2. Has a very short length of pipe between the 1" (25 mm) outlet and the first elbow in the water motor drain pipe, and/or
 - 3. Is very long may result in slow drainage and reduced water motor speed. This condition can be remedied by increasing the drain pipe diameter, increasing the length of pipe to the first elbow, and/or pitching the pipe toward the discharge location.

5. OPERATION (See Figure 3)

When a sprinkler system is activated, water flows from the alarm outlet of the valve, through the 3/4" (20 mm) strainer and alarm line piping, into the inlet of the water motor. From the 1/8" inlet orifice, the water flows through a nozzle (4), which restricts the flow into a pressurized stream directed onto the impeller (7). Force from the water stream turns the impeller and drive shaft (10), causing the striker arm (20) to rotate. The striker (25) impacts against the gong (16), producing a continuous alarm. A minimum of 5 PSI (.34 bar) is required at the nozzle to cause a continuous alarm. When properly installed, the Model F-2 Water Motor Alarm produces the required 90 decibel output and the Model G-2 produces 100 decibels. After passing through the water motor, the water is discharged through a 1" (25 mm) drain outlet in the bottom of the impeller housing. The discharged water must be piped through the wall to atmosphere or to a suitable open drain.

6. INSPECTIONS, TESTS AND MAINTENANCE

Weather-resistant materials are used in the construction of the water motor alarm. At regular intervals, examine and test the water motor to ensure that the nozzle and drain line are clean and free of obstruction, and that the alarm functions properly. Also, at regular intervals and before disassembly of the water motor, clean and inspect the alarm line strainer located at the alarm outlet of the waterflow detecting device, or the outlet of the retard chamber, if used. (Note: Some retard chambers may be equipped with a strainer built in). For minimum maintenance and inspection requirements, refer to NFPA 25. In addition, the Authority Having Jurisdiction may have additional maintenance, testing, and inspection requirements that must be followed. Before proceeding with disassembly of the water motor alarm, notify the Authority Having Jurisdiction and occupants of the area covered by the system affected. Take all appropriate precautions. The water motor alarm will be disabled during disassembly.

A. Water Motor Disassembly (See Figure 3)

1. Isolate the water motor alarm by closing the alarm line valve in the trim of the waterflow detecting device. (Refer to appropriate technical data for the system used.)
2. Remove pipe plug (5).
3. Remove all round head machine screws (1) from the water motor cover.
4. Separate the cover (2) and the gasket (6) from the housing (3).
5. Remove the impeller (7).
6. Inspect and, if necessary, carefully clean the nozzle (4) with a wire or pipe cleaner brush.
7. Flush the nozzle way and drain line with water or compressed air.

B. Water Motor Re-Assembly

1. Re-install the pipe plug (5).
2. Re-install the impeller (7).
3. Replace cover gasket (6) and attach cover (2) by using round head machine screws (1).
4. Open the alarm line valve.
5. Test the water motor alarm.
6. When test is complete and water motor alarm operation is satisfactory, place the alarm line valve in the proper "alarm" position. Reset and return the affected systems to service.

7. AVAILABILITY

Viking Water Motor Alarms are available through a network of domestic and international distributors. See the Viking Corp. Web site for closest distributor or contact The Viking Corporation.

8. GUARANTEES

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.



TECHNICAL DATA

WATER MOTOR ALARMS

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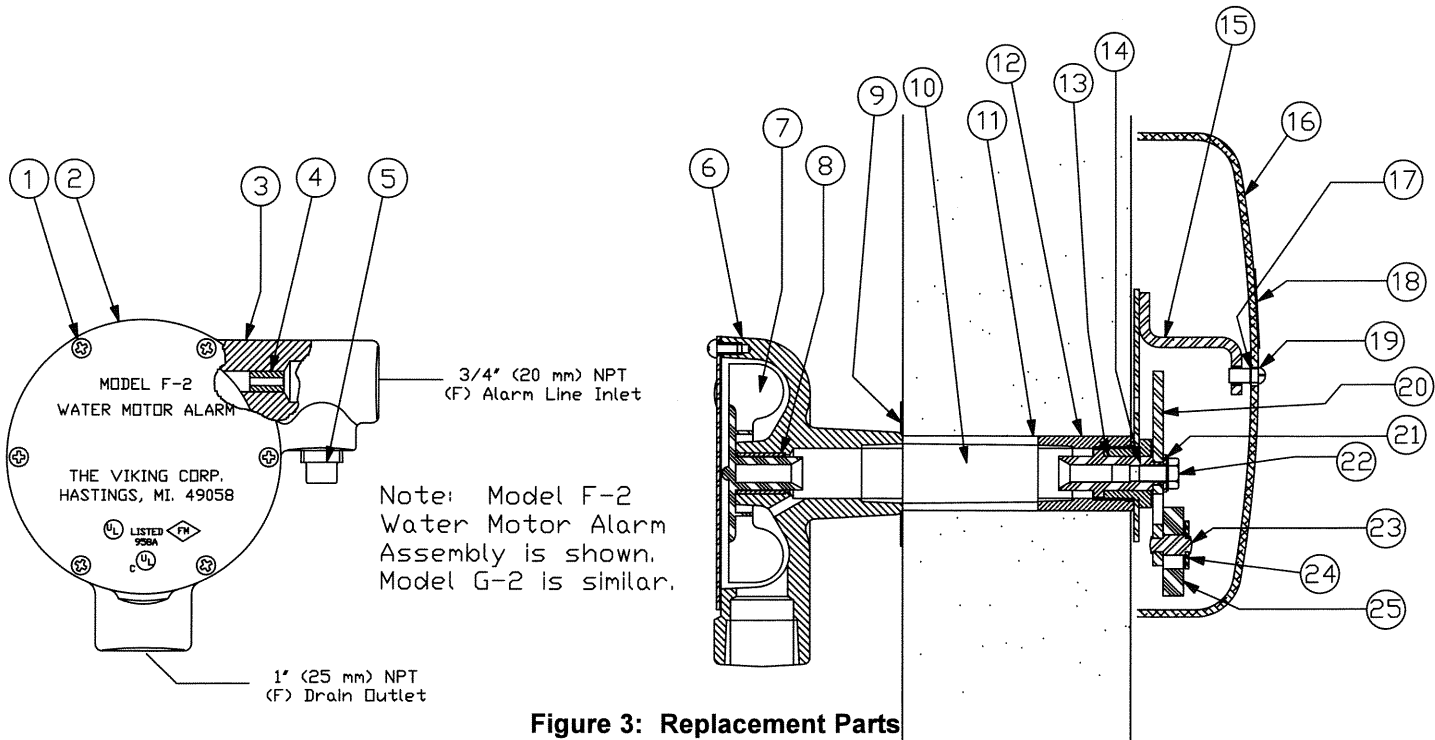
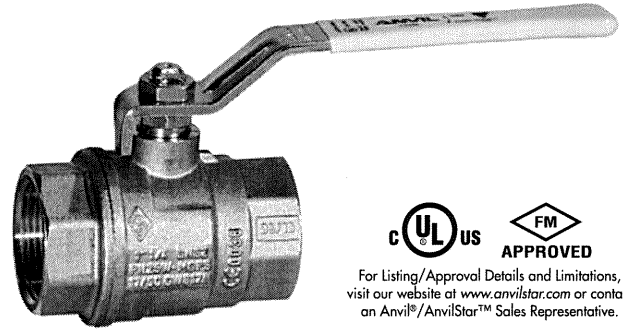


Figure 3: Replacement Parts

ITEM NO.	PART NUMBER		DESCRIPTION	MATERIAL	NO. REQ'D
	F-2	G-2			
1	*	*	Screw, R. H. Self-tap #10-24 x 3/8" lg.	Zinc Plated Steel	6
2	07867	07870	Cover	Galvanized Steel	1
3	*	*	Housing	Cast Iron	1
4	*	*	Nozzle	Brass	1
5	01925S	01925S	1/2" Pipe Plug	Cast Iron	1
6	02550B	02550B	Cover Gasket	Cellulose/Nitrile/Glass Blend	1
7	02547C	02547C	Impeller	Delrin	1
8	*	*	Bearing	Brass: Sintered Bronze	1
9	05603A	05603A	Wall Plate	Galvanized Steel	1
10	05604B	05604B	Drive Shaft	Stainless Steel	1
11	--	--	3/4" Pipe (C.O.J.) not furnished	Galvanized Steel	1
12	*	*	Coupling	Brass	1
13	02556B	02556B	Striker Arm Shaft	Celcon Glass Filled	1
14	*	*	Bearing	Brass	1
15	*	*	Gong Support	Stainless Steel	1
16	05821C	06508C	Gong	Aluminum	1
17	02766A	02766A	Flat Washer, 11/32" ID x 11/16" ID x 1/16"	Stainless Steel	1
18	05768A	06505C	Gong Label	Aluminum (F-2), Vinyl (G-2)	1
19	--	--	Screw, B.H. Slotted, 5/16-18 x 1/2" lg.	Stainless Steel	1
20	*	*	Striker Arm	Stainless Steel	1
21	--	--	Flat Washer, 11/32" ID x 11/16" OD x 1/16"	Stainless Steel	1
22	--	--	Screw, H.H. Self-tap 5/16-18 x 1/2" lg.	Zinc Plated Steel	1
23	*	*	Striker Pin	Stainless Steel	1
24	*	*	Striker Arm Washer	Stainless Steel	1
25	*	*	Striker	Canvas Phenolic	1
--Indicates replacement part not available					
*Indicates replacement part only available in a Sub-Assembly listed below					
SUB-ASSEMBLIES					
1-8	07863	07869	Motor Assembly		
20, 23-25	02558B	02558B	Striker Arm Assembly		

The 171N Threaded Ball Valves are UL listed and FM Approved for use in fire protection systems. Valves have a rugged, dependable design, meeting rigid specification for residential, commercial and industrial applications. The two piece 171N full port design is available in sizes 1/4" through 4". All valves conform to MSS-SP-11 0, MSS-SP-25 and Federal Specification WW-V-35B Type II, Class A Style 3. The valves are available in triple stem seal, hard chrome plated ball, blow-out proof stem, adjustable packing gland, a bubble tight shut off and a floating ball for an economical solution.



For Listing/Approval Details and Limitations, visit our website at www.anvilstar.com or contact an Anvil®/AnvilStar™ Sales Representative.

MATERIAL SPECIFICATIONS

- BODY:** Brass, ASTM B124, Alloy C37700
- RETAINER:** Brass, ASTM B124, Alloy C37700
- BALL:** Brass, ASTM B124, Alloy C37700 Chrome Plated
- STEM:** Brass, ASTM B124, Alloy C37700 Nickel Plated
- SEAT RING:** PTFE
- PACKING:** PTFE
- PACKING NUT:** Steel, Zinc
- PACKING GLAND:** Brass, ASTM B124, Alloy C37700 Nickel Plated

- FRICITION WASHER:** PTFE
- STEM O-RING:** NBR 75 Shore A
- HANDLE:** Steel, Zinc Plated to 2", Aluminum to 4"
- HANDLE COVER:** Yellow PVC Coated to 2", Yellow Enamel to 4"
- HANDLE NUT:** Steel, Zinc Plated
- AVAILABLE OPTIONS ***
- LEVER HANDLE:** 1/4" - 4"

PROJECT INFORMATION		APPROVAL STAMP	
Project:		<input type="checkbox"/> Approved	
Address:		<input type="checkbox"/> Approved as noted	
Contractor:		<input type="checkbox"/> Not approved	
Engineer:		Remarks:	
Submittal Date:			
Notes 1:			
Notes 2:			

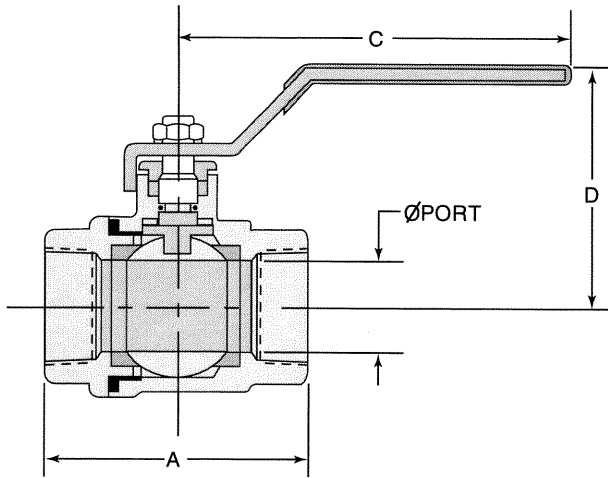
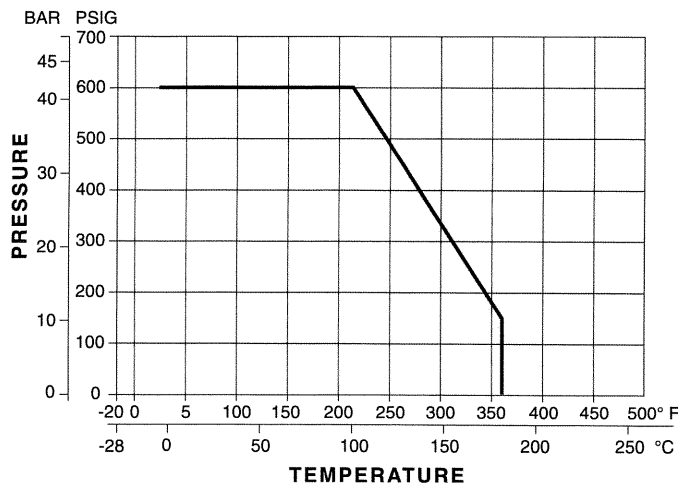


FIGURE 171N FULL PORT

Nominal Size	Port Dia.	A	C	D	Cv	Approx. Wt. Ea.
In./mm	In./mm	In./mm	In./mm	In./mm		Lbs./Kg
1/4	3/8	2	3 3/8	1 3/4	6	0.3
8	10	51	98	45		0.1
3/8	3/8	2	3 3/8	1 3/4	7	0.3
10	10	51	98	45		0.1
1/2	3/4	2 1/4	3 3/8	1 7/8	19	0.4
15	14	62	98	48		0.2
3/4	3/4	2 1/4	4 13/16	2 1/4	35	.7
20	19	68	122	57		0.3
1	1 1/8	3 1/4	4 13/16	2 1/4	50	1.0
25	24	78	122	62		0.5
1 1/4	1 1/4	3 3/4	6	3 1/4	104	2.0
32	32	87	152	78		0.9
1 1/2	1 1/8	3 7/8	6	3 5/8	268	3.1
40	40	98	152	84		1.4
2	1 5/8	4 1/4	6 3/8	3 13/16	309	4.2
50	49	110	162	97		1.9
2 1/2	2 1/8	5 1/4	8 1/8	5	629	8.0
65	65	141	205	127		3.7
3	3 1/8	6 1/4	8 3/8	5 1/4	1018	12.0
80	79	164	205	138		5.9
4	3 5/8	7 3/8	10 1/4	6 5/8	1622	22.0
100	100	194	260	160		10.0

PRESSURE VS. TEMPERATURE



Notes:

- Dimensions of solder joint ends conform to ANSI B16.22. Solder end valves are designed to be used with solders not exceeding a melting point of 470°F/250°C. Higher temperatures may damage the seal material.
- For solder joint valves, the pressure/temperature rating is dependent on the solder material used. Please refer to the limitations listed in ANSI B16.18.

3. Rate of Flow Calculations for liquids: To determine the flow rate of a liquid passing through a valve, use the following formula:

$$Q_L = C_v \left(\sqrt{\frac{\Delta P}{S_L}} \right)$$

Where: Q_L = flow of liquid in gallons per minute (GPM)

C_v = flow coefficient
 ΔP = pressure drop (PSI)
 S_L = specific gravity of liquid



**KENNEDY VALVE KS-RW
RESILIENT
WEDGE VALVES**

KENNEDY VALVE

**KENNEDY VALVE AWWA C515 Resilient Wedge Gate Valves
Meet or Exceed the Requirements of
AWWA Standard C515
UL-262/FM-1120/1130
ULC-Underwriters' of Canada**

Size Range	Water Working Pressure psi	Seat Test psi	Hydrostatic Shell Test psi
AWWA 2"-12"	250 Water Works	250 & 400	500
ULFM 4"-12"	200 Fire Protection	250 & 400	500

Available in either non-rising stem or outside screw & yoke.

Available End Connections & Size Range	Figure No.	Figure No. with (STD)	Post Plate
Flg. End (NRS)	2" - 12"	7561SS	7701SS (3" - 12")
M.J.	2" - 12" (except 2 1/2")	7571SS	7071SS (3" - 12")
Flg. & M.J.	3" - 12"	7572SS	7072SS (3" - 12")
Push-on for PVC (SDR)	2" - 8"	7597SS	7597PSS (3" - 8")
Flg. End (OS & Y)	2 1/2" - 12"	7068A	N/A
M.J. for Tapping	4" - 12"	7950SS	7950PSS
Push-on for D.I. & C900 PVC	4" - 12"	7901SS	7901PSS
M.J. Cutting-in	4" - 12"	7576SS	(Consult K.V.)
Push-on D.I. X Flg.	4" - 12"	7902SS	7902PSS
Threaded	2" - 3"	7057SS	7057PSS (3" only)
FLG & GRV OS&Y	2 1/2" - 8"	7092ABF	—
GRV & GRV OS&Y	2 1/2" - 8"	7093A	—
FLG & GRV NRS	2 1/2" - 8"	7592ABF	7592PABF
GRV & GRV NRS	2 1/2" - 8"	7593A	7593PA

Accessories

Indicator Posts	Handwheels
"T" Handles	Extension Stems
Stem Guides	Floor Boxes
2" Sq. Operating Nuts	Chain Wheels
Floorstands (non-rising stem)	

2" size not UL Listed

NOTE: All RSGV's 18" and larger will be furnished with either spur gearing (vertical) or bevel gearing (horizontal)

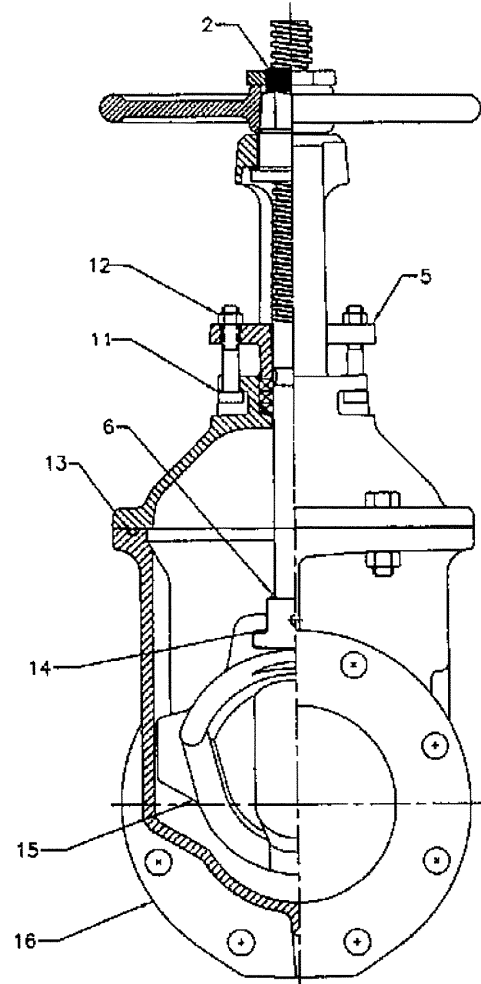
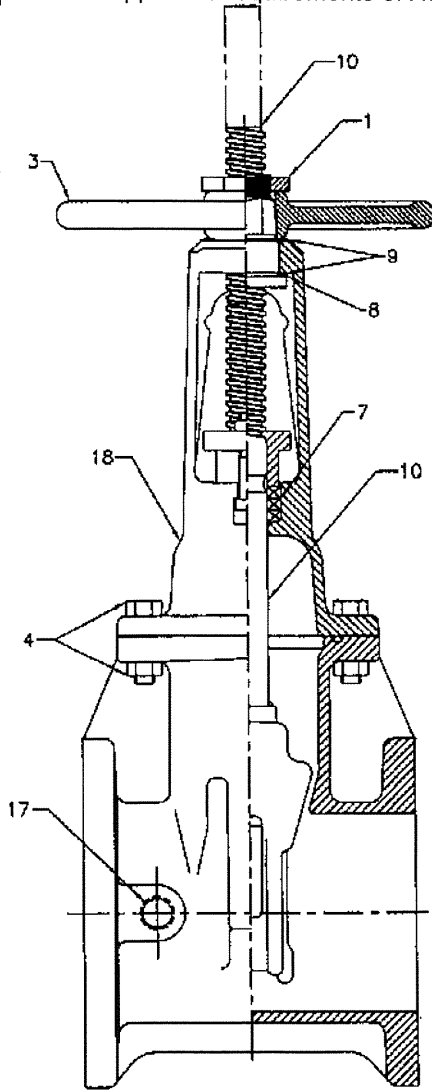
NOTE: 2" to 3" sizes full wall ductile iron



2" - 12" R/S VALVE OS&Y MATERIAL LIST

KENNEDY VALVE MODEL KS-RW

Complies with applicable requirements of AWWA C515



PIPE PLUG STANDARD ON FLANGE & GROOVE VALVES @ POSITION "A"

ITEM	DESCRIPTION	MATERIAL	ASTM SPEC.
1	Handwheel Hold Down Nut	Bronze	ASTM B62
2	Top Stem Nut	Bronze	ASTM B584 C86700
3	Handwheel	Gray Iron	ASTM 126 CI B
4	Hex Head Bolts & Nuts	Zinc Plated Steel	ASTM A307 Gr B
5	Packing Gland	Gray Iron	ASTM A126 CI B
6	Stem O-Ring	Buna N	-----
7	Packing	Lubricated Fiber	
8	Thrust Washer Bearing	Delrin	-----
9	Thrust Washer (1 only on 2"-4")	Bronze	ASTM B36 C260
10	Stem	Bronze	ASTM B584 C86700
11	Packing Bolts	Zinc Plated Steel	ASTM A307 Gr B
12	Packing Bolt Nuts	Brass	Commercial
13	Cover O-Ring	Buna N	-----
14	Stem Nut	Bronze	ASTM B584 C83600
15	Wedge	Gray Iron & Rubber	ASTM A126 CI B
16	Body - all types	Ductile Iron	ASTM A536 65-45-12
17	Pipe Plug 1/2"; 2 1/2"-4" --3/4"; 6-12"	Galvanized Steel	-----
18	Cover	Ductile Iron	ASTM A536 65-45-12

KENNEDY VALVE

Division of McWane, Inc.

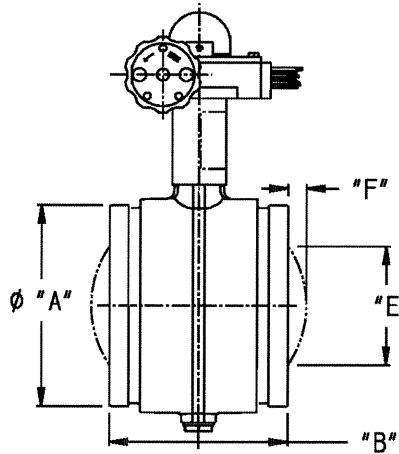
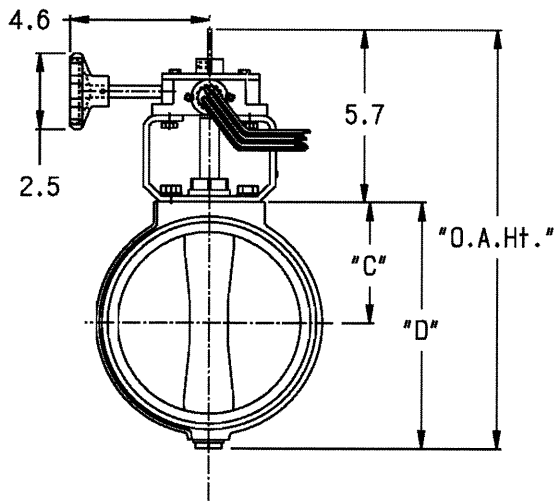


1021 East Water St., Elmira, NY 14901 (607) 734-2211

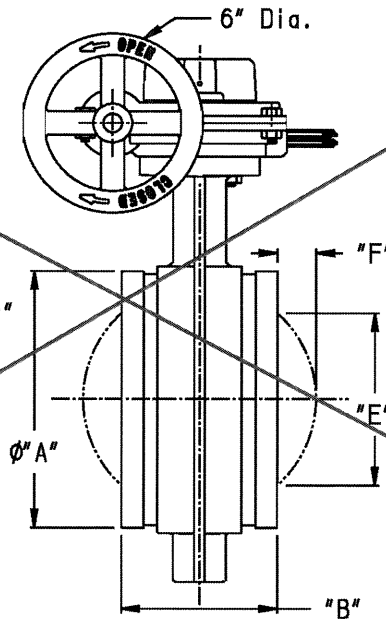
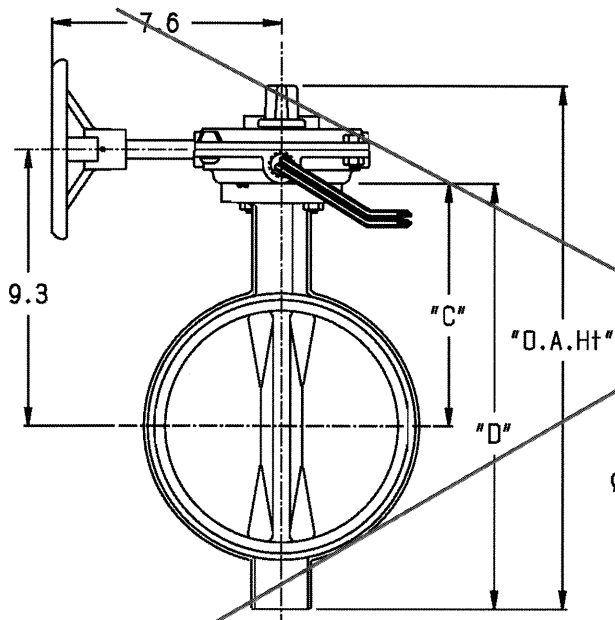


Grooved End Butterfly Valves 2-1/2" to 8" Figure G300 & 01G 300 psi with Supervisory Tamper Switch

Wetted Components NSF Approved 4"-8"



2-1/2" to 6"
G300
Outdoor Rated UL/FM



8" Only
01G
Outdoor Rated UL

1. UPPER AND LOWER SHAFTS: 416 SS
2. BODY COATING: EPOXY
3. DISC ENCAPSULATION MTL: SBR

SIZE	G300				01G
	2-1/2"	3"	4"	6"	8"
A	2.85	3.47	4.47	6.61	8.6
B	3.8	3.8	4.5	5.8	5.2
C	2.2	2.4	2.9	4.0	8.2
D	4.3	4.8	5.9	8.1	14.3
E	-	-	-	1.7	5.9
F	-	-	-	.1	1.3
O.A.Ht.	10.0	10.4	11.6	13.8	17.6
Wt.#	8.8	10.1	13.5	24.6	44

Note: "E" will be MINIMUM allowed pipe I.D.
Exercise care handling and during installation.



KENNEDY VALVE



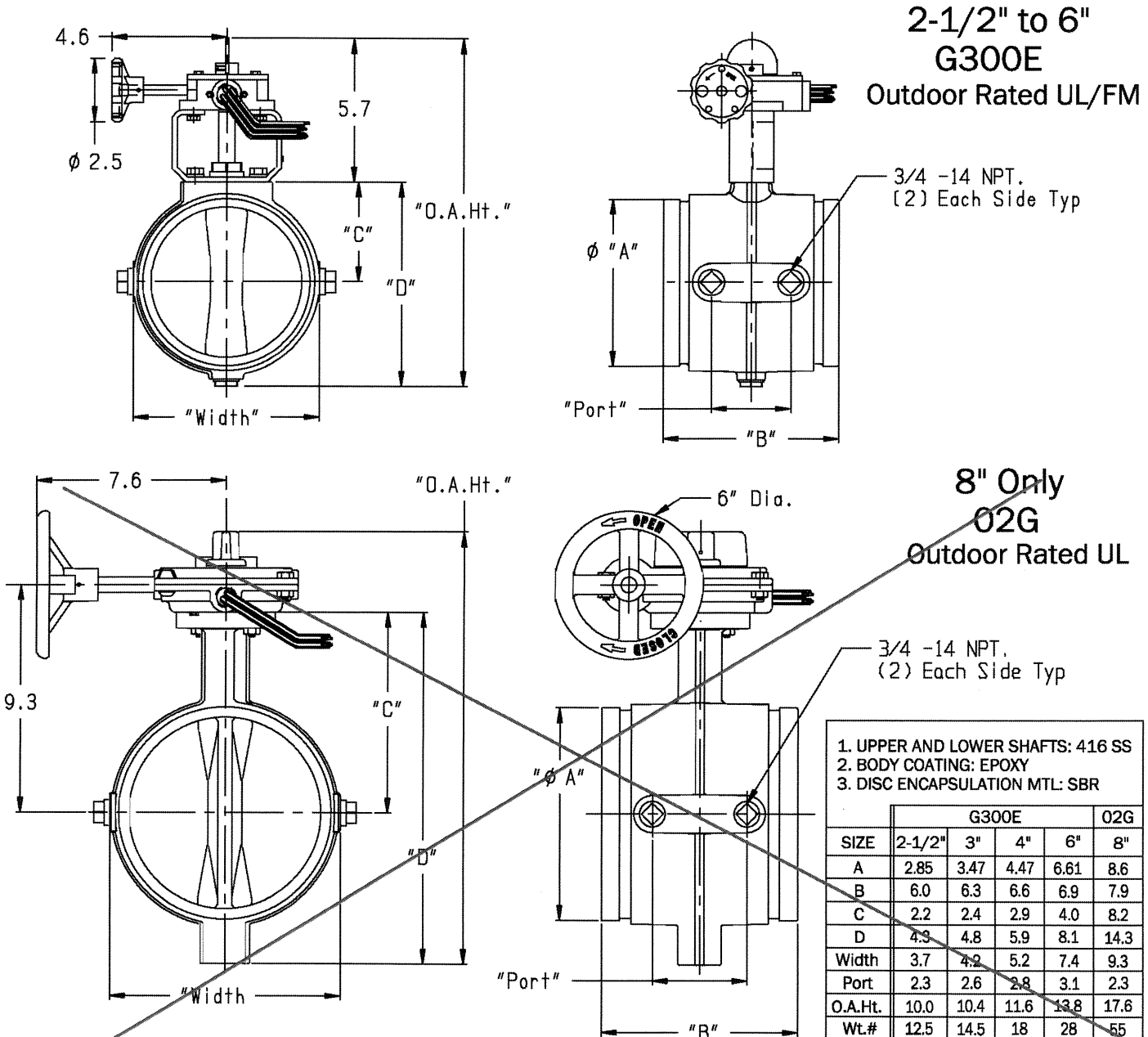
Division of McWane, Inc.
 1021 East Water St., Elmira, NY 14901 (607) 734-2211



Grooved End Butterfly Valves 2-1/2" to 8"

Figure G300E & 02G 300 psi with Supervisory Tamper Switch

Extended Length
 Equipped with Four 3/4"NPT Ports
 Wetted Components NSF Approved 4"-8"
 USC Approved 4" to 8"



Note: Disc does not protrude past the "B" dimension of the body on any size in the open position. Exercise care handling and during installation.





Wheatland ASTM A 53 Schedule 40 and Schedule 80 Pipe

www.wheatland.com

Wheatland Steel Pipe is made by specialists who understand that it's the small details that make the difference between average products and superior products. At the Wheatland Plant, most department heads and foremen have been employed in some phase of pipe manufacturing for 25 or more years.

This kind of specialization, experience and knowledge pays off...in workable, threadable, uniform pipe. Delivered clean. Delivered promptly.

Wheatland specializes in manufacturing welded steel pipe in 1/2 through 4 nominal sizes. Available inventory in 1/8 to 12 pipe sizes produced to various ASTM standards is maintained to meet your pipe requirements.

Care, pride and personal concern are bonus features that go into every inch of Wheatland Pipe. Don't settle for less.

Make sure it's quality. Make sure it's Wheatland.

Standard Pipe Schedule 40 ASTM A 53 Grades A and B

NPS Designator	DN Designator	Outside Diameter		Inside Diameter		Wall Thickness		Nominal Weight (Mass) per unit Length			
		(Inches)	(mm)	(Inches)	(mm)	(Inches)	(mm)	Plain End (lb/ft)	Plain End (kg/m)	Threads & Coupling (lb/ft)	Threads & Coupling (kg/m)
1/8	6	0.405	10.3	0.269	6.8	0.068	1.73	0.24	0.37	0.25	0.37
1/4	8	0.540	13.7	0.364	9.2	0.088	2.24	0.43	0.63	0.43	0.63
3/8	10	0.675	17.1	0.493	12.5	0.091	2.31	0.57	0.84	0.57	0.84
1/2	15	0.840	21.3	0.622	15.8	0.109	2.77	0.85	1.27	0.86	1.27
3/4	20	1.050	26.7	0.824	20.9	0.113	2.87	1.13	1.69	1.14	1.69
1	25	1.315	33.4	1.049	26.6	0.133	3.38	1.68	2.50	1.69	2.50
1-1/4	32	1.660	42.2	1.380	35.1	0.140	3.56	2.27	3.39	2.28	3.40
1-1/2	40	1.900	48.3	1.610	40.9	0.145	3.68	2.72	4.05	2.74	4.04
2	50	2.375	60.3	2.067	52.5	0.154	3.91	3.66	5.44	3.68	5.46
2-1/2	65	2.875	73.0	2.469	62.7	0.203	5.16	5.80	8.63	5.85	8.67
3	80	3.500	88.9	3.068	77.9	0.216	5.49	7.58	11.29	7.68	11.35
3-1/2	90	4.000	101.6	3.548	90.1	0.226	5.74	9.12	13.57	9.27	13.71
4	100	4.500	114.3	4.026	102.3	0.237	6.02	10.80	16.07	10.92	16.23
5	125	5.563	141.3	5.047	158.2	0.258	6.55	14.63	21.77	14.90	22.07
6	150	6.625	168.3	6.065	154.1	0.280	7.11	18.99	28.26	19.34	28.58
8	200	8.625	219.1	7.981	202.7	0.322	8.18	28.58	42.55	29.35	43.73
10	250	10.750	273.0	10.020	254.5	0.365	9.27	40.52	60.29	41.49	63.36
Standard Pipe											
12 ¹	300	12.750	323.8	12.000	304.8	0.375	9.52	9.61	3.78	51.28	76.21
Note ¹ NPS 12 dimensions are for standard wall pipe, not schedule 40.											

Product Type and Specification:

Standard welded pipe is produced in 1/2 to 6 trade sizes. Wheatland pipe is produced to ASTM A 53 Grades A and B, A 501, and A 589 Type II, API 5L and Federal Specification WW-P404. All pipe threads conform to ANSI B1.20.1. Merchant couplings comply with ASTM A 865.

Specifications and descriptions are accurate as known at time of publication and subject to change without notice.

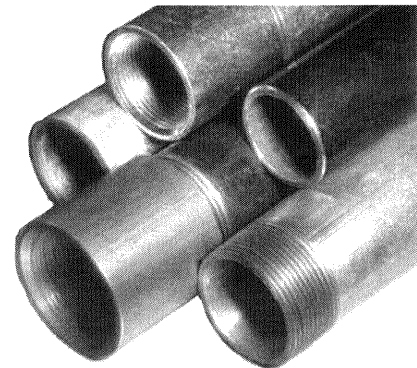
Wheatland ASTM A 53 Grades A & B Schedule 40 Pipe



Extra Heavy Pipe Schedule 80 ASTM A 53 Grade A

NPS Designator	DN Designator	Outside Diameter		Inside Diameter		Wall Thickness		Nominal Weight (Mass) per unit Length			
		(Inches)	(mm)	(Inches)	(mm)	(Inches)	(mm)	Plain End (lb/ft)	Plain End (kg/m)	Threads & Coupling (lb/ft)	Threads & Coupling (kg/m)
1/8	6	0.405	10.3	0.215	5.5	0.095	2.41	0.31	0.47	0.32	0.46
1/4	8	0.540	13.7	0.302	7.7	0.119	3.02	0.54	0.80	0.54	0.80
3/8	10	0.675	17.1	0.423	10.7	0.126	3.20	0.74	1.10	0.74	1.10
1/2	15	0.840	21.3	0.549	13.9	0.147	3.73	1.09	1.62	1.09	1.62
3/4	20	1.050	26.7	0.742	18.8	0.154	3.91	1.48	2.20	1.48	2.21
1	25	1.315	33.4	0.957	24.3	0.179	4.55	2.17	3.24	2.19	3.25
1-1/4	32	1.660	42.2	1.278	32.5	0.191	4.85	3.00	4.47	3.03	4.49
1-1/2	40	1.900	48.3	1.500	38.1	0.200	5.08	3.63	5.41	3.65	5.39
2	50	2.375	60.3	1.939	49.3	0.218	5.54	5.03	7.48	5.08	7.55
2-1/2	65	2.875	73.0	2.323	59.0	0.276	7.01	7.67	11.41	7.75	11.52
3	80	3.500	88.9	2.900	73.7	0.300	7.62	10.26	15.27	10.35	15.39
3-1/2	90	4.000	101.6	3.364	85.4	0.318	8.08	12.52	18.63	12.67	18.82
4	100	4.500	114.3	3.826	97.2	0.337	8.56	15.00	22.32	15.20	22.60
5	125	5.563	141.3	4.813	122.3	0.375	9.52	20.80	30.94	21.04	31.42
6	150	6.625	168.3	5.761	146.3	0.432	10.97	28.60	42.56	28.88	43.05
8	200	8.625	219.1	7.625	193.7	0.500	12.70	43.43	64.64	44.00	65.41

Wheatland ASTM A 53 Grade A Schedule 80 Pipe



Permissible Variations for ASTM A 53 Grades A and B Pipe			
	O.D.	Over	Under
Outside Diameter	NPS 1/8 to 1-1/2 DN 6 to 40	1/64" (0.4mm)	1/64" (0.4mm)
	NPS 2 and up DN 50 and up	1%	1%
Wall Thickness at Any Point		-----	12.5%

ASTM A 53 Grades A and B: Black and Galvanized Pipe is manufactured for ordinary use in steam, water, gas, and air lines. UL Listed and FM Approved, sizes 1" through 6" nominal, for use in Fire Sprinkler Pipe Applications.

Mechanical Properties

Grade A: Yield 30,000 [205 Mpa] psi minimum Tensile: 48,000 psi [330 Mpa] minimum

Grade B: Yield 35,000 [240 Mpa] psi minimum Tensile: 60,000 psi [415 Mpa] minimum

For additional information or to order, contact our pipe department at 800.257.8182,
Fax: 724.346.7260, e-mail info@wheatland.com



TECHNICAL DATA

MICROFAST® AND MicrofastHP® QUICK RESPONSE UPRIGHT AND CONVENTIONAL SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

Viking Microfast® and MicrofastHP® Quick Response Upright and Conventional (Old Style) Sprinklers are small, thermosensitive, glass-bulb spray sprinklers available in several different finishes, temperature ratings, and K-Factors to meet design requirements. The special Polyester and Teflon® coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are cULus listed as corrosion resistant as indicated in the Approval Chart. (Note: FM Global has no approval classification for Teflon® and Polyester coatings as corrosion resistant.)



2. LISTINGS AND APPROVALS

cULus Listed: Category VNIV

FM Approved: Class 2020

NYC Approved: Calendar Number 219-76-SA and MEA 89-92-E, Volume 16

ABS Certified: Certificate 04-HS407984B-PDA

VdS Approved: Certificate G4060054, G4060056, G4880046, G4930039, and G4980020

LPC Approved: Ref. No. 096e/03, TE30401, and TE30872

CE Certified: Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2001, 0832-CPD-2003, 0786-CPD-40131, and 0786-CPD-40171

MED Certified: Standard EN 12259-1, EC-certificate of conformity 0832-MED-1003 and 0832-MED-1008

NOTE: Other International approval certificates are available upon request.

Refer to the Approval Chart on page 51d and Design Criteria on page 51e for cULus and FM approval requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Available since 1987.

Minimum Operating Pressure: 7 psi (0.5 bar)

Maximum Working Pressure: Sprinklers VK315 and VK340 are rated for use with water working pressures ranging from the minimum 7 psi (0.5 bar) up to 250 psi (17 bar) for high-pressure systems. High-pressure (HP) sprinklers can be identified by locating "250" stamped on the deflector. All other Part Nos. not mentioned above are rated to a maximum 175 psi (12 bar) wwp.

Factory tested hydrostatically to 500 psi (34.5 bar)

Testing: U.S.A. Patent No. 4,831,870

Thread size: Refer to the Approval Chart

Nominal K-Factor: Refer to the Approval Chart

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

Overall Length: Refer to the Approval Chart

Material Standards:

Frame Casting: Brass UNS-C84400

Deflector: Brass UNS-C23000 or Copper UNS-C19500 for Sprinklers 06661B and 12281. Copper UNS-C19500 for Sprinklers 06665B, 06764B, and 07060. Brass UNS-C26000 for all other Sprinklers.

Bushing (for Sprinklers 06719B, 06717B, and 12286): Brass UNS-C36000

Bulb: Glass, nominal 3 mm diameter

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Teflon Tape

Screw: Brass UNS-C36000

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

For Teflon® Coated Sprinklers: Belleville Spring-Exposed, Screw-Nickel Plated, Pip Cap-Teflon® Coated

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-945-4495 Email: techsvcs@vikingcorp.com

For Polyester Coated Sprinklers: Belleville Spring-Exposed

Ordering Information: (Also refer to the current Viking price list.)

Order Microfast® and MicrofastHP® Quick Response Upright and Conventional Sprinklers by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome-Enloy® = F, White Polyester = M-W, Black Polyester = M-B, and Black Teflon® = N

Temperature Suffix (°F/°C): 135°/68° = A, 155°/68° = B, 175°/79° = D, 200°/93° = E, and 286°/141° = G

For example, sprinkler VK300 with a 1/2" thread, Brass finish and a 155 °F/68 °C temperature rating = Part No. 06661BAB

Available Finishes And Temperature Ratings:

Refer to Table 1

Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

Sprinkler Wrenches:

Standard Wrench: Part No. 10896W/B (available since 2000)

Sprinkler Cabinets:

A. Six-head capacity: Part No. 01724A (available since 1971)

B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

The Viking Microfast® and MicrofastHP® Quick Response Upright and Conventional Sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

	TECHNICAL DATA	MICROFAST® AND MicrofastHP® QUICK RESPONSE UPRIGHT AND CONVENTIONAL SPRINKLERS
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-945-4495 Email: techsvcs@vikingcorp.com

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

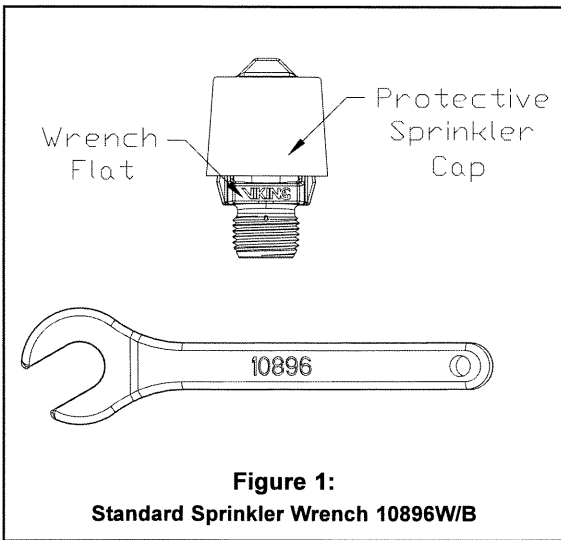
Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

Sprinkler Finishes: Brass, Chrome-Enloy®, White Polyester, Black Polyester, and Black Teflon®

Corrosion-Resistant Coatings⁴: White Polyester, Black Polyester, and Black Teflon®

Footnotes

- ¹ The sprinkler temperature rating is stamped on the deflector.
- ² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.
- ³ The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated on pages 51d. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester and Teflon® coatings.



	<h2 style="margin: 0;">TECHNICAL DATA</h2>	<h3 style="margin: 0;">MICROFAST® AND MicrofastHP® QUICK RESPONSE UPRIGHT AND CONVENTIONAL SPRINKLERS</h3>
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Approval Chart Microfast® and MicrofastHP® Quick Response Upright and Conventional Sprinklers Maximum 175 PSI (12 bar) WWP													
												KEY Temperature Finish A1X ← Escutcheon (if applicable)	

Base Part Number ¹	SIN	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³ (Refer also to Design Criteria on page 51e.)						
		NPT	BSP	U.S.	metric ²	Inches	mm	cULus ⁴	FM ⁷	NYC ⁸	VdS	LPCB	CE	⊗
Upright-Standard Orifice														
06661B	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A2	A3	A2	--	--	--	--
07060	VK345	--	15 mm	5.6	80.6	2-3/16	56	--	A3	--	A3	A3	B3 ¹²	B3 ¹⁴
Conventional-Standard Orifice														
06766B	VK310	1/2"	15 mm	5.6	80.6	2-3/16	56	A3	--	A3	--	A3	B3 ¹²	B3 ¹⁴
Upright-Large Orifice														
06665B	VK350	3/4"	--	8.0	115.2	2-5/16	59	A2	A3	A2	A3	A3	B3 ¹²	--
14817	VK350	--	20 mm	8.0	115.2	2-5/16	59	A2	A3	A2	A3	A3	B3 ¹²	--
06764B	VK350	1/2"	15 mm	8.0	115.2	2-5/16	59	A2	--	A2	A3	--	--	--
Conventional-Large Orifice														
06768B	VK354	3/4"	20 mm	8.0	115.2	2-5/16	59	A2	--	A3	--	A3	B3 ¹²	--
Upright-Small Orifice¹⁰														
06717B ¹¹	VK325	1/2"	15 mm	2.8	40.3	2-3/16	56	A2	A1	A2	--	--	--	--
06719B ¹¹	VK327	1/2"	15 mm	4.2	60.5	2-3/16	56	A2	--	A2	--	--	--	--
06931B ¹¹	VK327	--	10 mm	4.2	60.5	2-3/16	56	--	--	--	A3	--	E1 ¹³	--

Maximum 250 PSI (17 bar) WWP Upright-Standard Orifice													
---	--	--	--	--	--	--	--	--	--	--	--	--	--

Base Part Number ¹	SIN	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³ (Refer also to Design Criteria on page 51e.)						
		NPT	BSP	U.S.	metric ²	Inches	mm	cULus ⁴	FM	NYC ⁸	VdS	LPCB	CE	⊗
12281	VK315	1/2"	15 mm	5.6	80.6	2-3/16	56	A2	--	A2	--	--	--	--
Upright-Small Orifice¹⁰														
12286 ¹¹	VK340	1/2"	15 mm	2.8	40.3	2-3/16	56	A2	--	A2	--	--	--	--

Approved Temperature Ratings A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C) B - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C) C - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 286 °F (141°C) D - 135 °F (57 °C), 155 °F (68 °C), and 175 °F (79 °C) E - 155 °F (68 °C)	Approved Finishes 1 - Brass and Chrome-Enloy® 2 - Brass, Chrome-Enloy®, White Polyester ^{5,6} , Black Polyester ^{5,6} , and Black Teflon ^{6,5} 3 - Brass, Chrome-Enloy®, White Polyester ^{5,6} , and Black Polyester ^{5,6}
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Footnotes

¹ Base part number is shown. For complete part number, refer to Viking's current price schedule.

² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

³ This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.

⁴ Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada.

⁵ cULus Listed as corrosion resistant.

⁶ Other colors are available on request with the same Listings and Approvals as the standard colors.

⁷ For installation in accordance with the latest applicable FM Loss Prevention Data Sheets and Technical Advisory Bulletins.

⁸ Accepted for use, City of New York Board of Standards and Appeals, Calendar Number 219-76-SA.

⁹ Accepted for use, City of New York Department of Buildings, MEA 89-92-E, Vol. 16.

¹⁰ Listings and Approvals limited to Light Hazard Occupancies where allowed by the installation standards being applied, with hydraulically calculated wet systems only. **Exception:** 4.2K sprinklers may be installed on hydraulically calculated dry pipe systems where piping is corrosion resistant or internally galvanized.

¹¹ The sprinkler orifice is bushed.

CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2001 and 0832-CPD-2003.

CE Certified, Standard EN 12259-1, EC-certificate of conformity 0786-CPD-40131.

¹⁴ MED Certified, Standard EN 12259-1, EC-certificate of conformity 0832-MED-1003 and 0832-MED-1008.



TECHNICAL DATA

MICROFAST® AND MicrofastHP® QUICK RESPONSE UPRIGHT AND CONVENTIONAL SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-945-4495 Email: techsvcs@vikingcorp.com

DESIGN CRITERIA

(Also refer to the Approval Chart on page 51d)

cULus Listing Requirements:

Microfast® and MicrofastHP® Quick Response Upright and Conventional Sprinklers are cULus Listed as indicated in the Approval Chart for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers, or old style (conventional) sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies (*exception: small orifice sprinklers are limited to Light Hazard where allowed by the installation standards being applied, with hydraulically calculated wet systems only*).
- The sprinkler installation rules contained in NFPA 13 for standard spray upright sprinklers must be followed. For conventional sprinklers, refer to the installation guidelines for old style (conventional) sprinklers.

FM Approval Requirements:

For installation in accordance with the latest applicable FM Loss Prevention Data Sheets (including 2-8N) and Technical Advisory Bulletins. FM Global Loss Prevention Data Sheets and Technical Advisory Bulletins contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

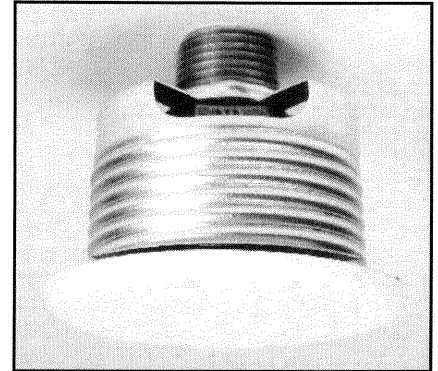
NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

VIKING**TECHNICAL DATA****MIRAGE® STANDARD AND
QR CONCEALED PENDENT
SPRINKLER VK462 AND HP
SPRINKLER VK463 (K5.6)****The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058****Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com****1. DESCRIPTION**

Viking Mirage® Standard and Quick Response Concealed Pendent Sprinkler VK462 and HP Sprinkler VK463 are thermosensitive glass-bulb spray sprinklers designed for installation on concealed pipe systems where the appearance of a smooth ceiling is desired.

The sprinkler is pre-assembled with a threaded adapter for installation with a low-profile cover assembly that provides up to 1/2" (12.7 mm) of vertical adjustment. The two-piece design allows installation and testing of the sprinkler prior to installation of the cover plate. The "push-on", "thread-off" design of the concealed cover plate assembly allows easy installation of the cover plate after the system has been tested and the ceiling finish has been applied. The cover assembly can be removed and reinstalled, allowing temporary removal of ceiling panels without taking the sprinkler system out of service or removing the sprinkler.

**2. LISTINGS AND APPROVALS**

cULus Listed: Category VNIV

FM Approval: Class 2015

NYC Approved: MEA 89-92-E, Volume 32

VdS Approved: Certificate G4080021

LPC Approved: Ref. No. 096e/12

CE Certified: Standard EN 12259-1, EC-certificates of conformity 0832-CPD-2032 and 0786-CPD-40249

Refer to the Approval Chart on page 54c and Design Criteria on page 54d for cULus Listing requirements that must be followed.

3. TECHNICAL DATA**Specifications:**

Available since 2006.

Minimum Operating Pressure: 7 psi (0.5 bar)*

Maximum Working Pressure: Sprinkler VK463 is rated for use with water working pressures ranging from the minimum 7 psi (0.5 bar) up to 250 psi (17.2 bar) for high-pressure systems. High-pressure (HP) sprinklers can be identified by locating "250" stamped on the deflector. Sprinkler VK462 is rated to a maximum 175 psi (12 bar) wwp.

Factory tested hydrostatically to 500 psi (34.5 bar)

Testing: U.S.A. Patent No. 4,831,870

Thread size: 1/2" (15 mm) NPT

Nominal K-Factor: 5.6 U.S. (80.6 metric†)

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

Patents Pending

*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

†Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Material Standards:

Sprinkler Body: Brass UNS-C84400

Deflector: Copper UNS-C19500 for Sprinkler VK462

Phosphor Bronze UNS-C51000 for Sprinkler VK463

Deflector Pins: Stainless Steel Alloy

Bulb: Glass, nominal 3 mm diameter

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

Button: Brass UNS-C36000

Screws: 18-8 Stainless Steel

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Teflon Tape

Yoke: Phosphor Bronze UNS-C51000

Cover Adapter: Cold Rolled Steel UNS-G10080, Finish: Clear Chromate over Zinc Plating

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Cover Assembly Materials:

Cover: Copper UNS-C11000

Base: Brass UNS-C26000 or UNS-C26800

Springs: Nickel Alloy

Solder: Eutectic

Ordering Information: (Also refer to the current Viking price list.)

Viking Mirage® Standard and Quick Response Concealed Pendent Sprinklers and Cover Plate Assemblies must be ordered separately:

Sprinkler: Base Part No. 13503A, 14697A, or HP Base Part No. 13667A

Specify sprinkler temperature rating by adding the appropriate suffix for the temperature rating to the base part number:

Temperature Suffix (°F/°C): 155°/68° = B, 175°/79° = D, 200°/93° = E

For example, sprinkler VK463 with a 155 °F/68 °C temperature rating = 13667AB.

Cover Plate Assembly: Base Part No. 13504 (2-3/4" diameter), Base Part No. 13642 (3-5/16" diameter), or Base Part No. 15394 (square cover plate, 3-5/16" diameter)

Specify finish and temperature rating of the cover plate assembly by first adding the appropriate suffix for the finish and then the appropriate suffix for the cover temperature rating to the base part number:

Finish Suffix: Polished Chrome = F, Painted White = M-/SW1004, Painted Ivory = M-/SW1634, Painted Black = M-/SW1007

Temperature Suffix (°F/°C): 135°/57° UL (139°/59° FM) = A, 165°/74° = C

For example, cover 13504 with a Polished Chrome finish and a 165 °F/74 °C temperature rating = 13504FC.

Note: Square cover plate 15394 cULus Listing is for the 135 °F (57 °C) temperature rated cover plate only. Refer to the Approval Chart.

Available Finishes And Temperature Ratings:

Refer to Table 1

Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

Sprinkler Wrenches:**

A. Heavy Duty Wrench Part No. 14047W/B (available since 2006), or

B. Head Cabinet Wrench Part No. 14031*** (available since 2006)

C. Optional Concealed Cover Plate Installer Tool Part No. 14412 for cover 13504, or Part No. 14867 for the large diameter cover (available since 2007)

Requires a 1/2" ratchet (not available from Viking). *Optional for removal of the protective cap. Ideal for sprinkler cabinets.

Sprinkler Cabinet: Part No. 01731A, Capacity: five (5) sprinklers (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, when the temperature around the sprinkler approaches its operating temperature, the cover plate detaches. Continued heating of the exposed sprinkler causes the heat-sensitive liquid in the glass bulb to expand and the bulb to shatter, releasing the yoke, pip-cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

Viking Sprinklers VK462 and VK463 are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

	<h2 style="margin:0;">TECHNICAL DATA</h2>	<h3 style="margin:0;">MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)</h3>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Approval Chart											
Mirage® Concealed Pendent Sprinklers VK462 and VK463											

Sprinkler Base Part No. ¹	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure	Overall Length (Sprinkler Body)		Listings and Approvals ⁴ (Refer also to Design Criteria on page 54d.)					
		Inch	mm	U.S.	metric ²		Inches	mm	cULus ⁵	FM	NYC ⁶	VdS	LPCB	CE
Standard Response Applications														
13503A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	2-3/16"	56	--	AU1, BX1	--	AY1, CZ1	--	--
14697A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	2-3/16"	56	--	--	--	--	AV2, BW2	AV2, BW2 ⁷
Quick Response Applications														
13503A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	2-3/16"	56	AV1, BX1	--	AV1, BW1	--	--	AY2, CZ2 ⁸
14697A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	2-3/16"	56	AV1, BX1	--	AV1, BW1	--	--	--
13667A	VK463	1/2"	15	5.6	80.6	250 psi (17.2 bar) ³	2-3/16"	56	AV1, BX1	--	AV1, BW1	--	--	--

Sprinkler Temperature Ratings A - 155 °F (68 °C) B - 175 °F (79°C) and 200 °F (93 °C) J - 200 °F (93 °C)	Cover Plate Assembly Temperature Ratings⁹ U - 135 °F (57 °C) cULus Listed cover 13504 ¹ , 13642 ¹ (large diameter), or 15394 ¹ (square cover plate) <i>FM Approved as 139 °F (59 °C)</i> V - 135 °F (57 °C) cULus Listed cover 13504 ¹ or 13642 ¹ (large diameter) W - 165 °F (74 °C) cover 13504 ¹ or 13642 ¹ (large diameter) X - 165 °F (74 °C) cover 13504 ¹ , 13642 ¹ (large diameter), or 15394 ¹ (square cover plate) Y - 135 °F (57 °C) cover 13504 ¹ Z - 165 °F (74 °C) cover 13504 ¹	Finishes of the Cover Plate Assembly¹⁰ 1 - Polished Chrome, Painted White, Painted Ivory, or Painted Black 2 - Polished Chrome, Painted White
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Footnotes

¹ Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.
² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
³ The Water Working Pressure rating is stamped on the deflector.
⁴ This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals.
⁵ Listed by Underwriter's Laboratories for use in the U.S. and Canada.
⁶ Accepted for use, City of New York Department of Buildings, MEA Number 89-92-E, Vol. 32.
⁷ CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2032.
⁸ CE Certified, Standard EN 12259-1, EC-certificate of conformity 0786-CPD-40249.
⁹ The 135/139 °F cover has an orange label. The 165 °F cover has a white label.
¹⁰ Painted finish consists of Polyester Baked Enamel. Other paint colors are available on request with the same listings as the standard paint colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information.
 NOTE: Custom colors are indicated on a label inside the cover assembly. Refer to Figure 1.

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Temperature Rating of Cover Assembly (Required)	Bulb Color
→ Ordinary	155 °F (68 °C)	100 °F (38 °C)	135 °F (57 °C) cULus 139 °F (59 °C) FM	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	165 °F (74 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	165 °F (74 °C)	Green

ver Plate Finishes: Polished Chrome, Painted White, Painted Ivory, or Painted Black

Footnotes

¹ The sprinkler temperature rating is stamped on the sprinkler deflector.
² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.



TECHNICAL DATA

MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

DESIGN CRITERIA

(Also refer to the Approval Chart on page 54c.)

cULus Listing Requirements:

Mirage® Standard and Quick Response Concealed Pendent Sprinklers VK462 and VK463 are cULus Listed for installation in accordance with the latest edition of NFPA 13 for standard coverage pendent spray sprinklers as indicated below.

- For hazard occupancies up to and including Ordinary Hazard, Group II.
- Protection areas and maximum spacing shall be in accordance with the tables provided in NFPA 13. Maximum spacing allowed is 15 ft. (4.6 m).
- Minimum spacing allowed is 6 ft. (1.8 m) unless baffles are installed in accordance with NFPA 13.
- Minimum distance from walls is 4 in. (102 mm).
- Maximum distance from walls shall be no more than one-half of the allowable distance between sprinklers. The distance shall be measured perpendicular to the wall.
- The sprinkler obstruction rules contained in NFPA 13 for standard coverage pendent spray sprinklers must be followed.

NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.

FM Approval Requirements: Mirage® Concealed Pendent Sprinkler VK462 is FM Approved as a standard response standard spray sprinkler as indicated in the Approval Chart for hazard occupancies up to and including Ordinary Hazard, Group II. For installation in accordance with the latest applicable FM Loss Prevention Data Sheets (including 2-8N) and Technical Advisory Bulletins. FM Global Loss Prevention Data Sheets and Technical Advisory Bulletins contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page SR1-3 or QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.



Identification of Custom Paint Color:
All custom color painted cover plates will have an identifying label affixed to the inside of the cover that indicates custom color and will have a representative sample (a paint dot) of the paint on the label.

Figure 1: Identification of Custom Paint Color for Concealed Covers



Figure 2: Square Cover Assembly 15394

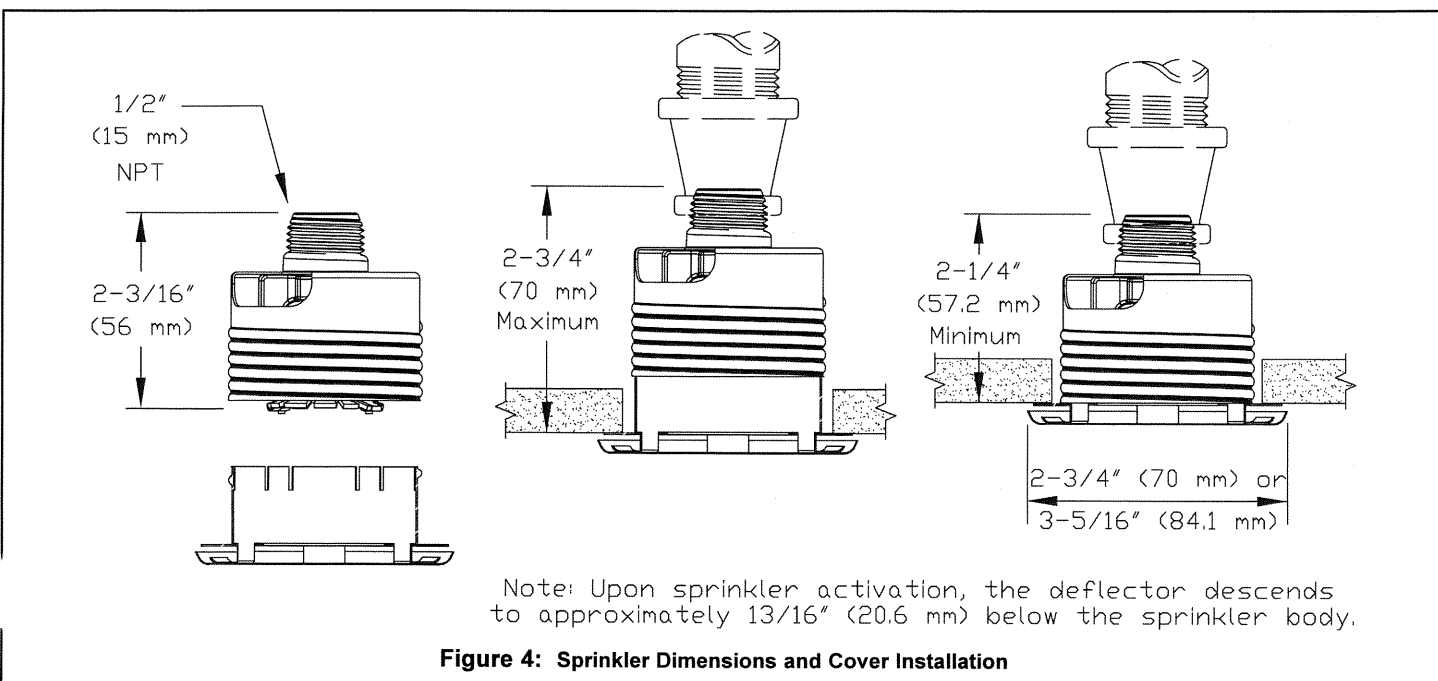
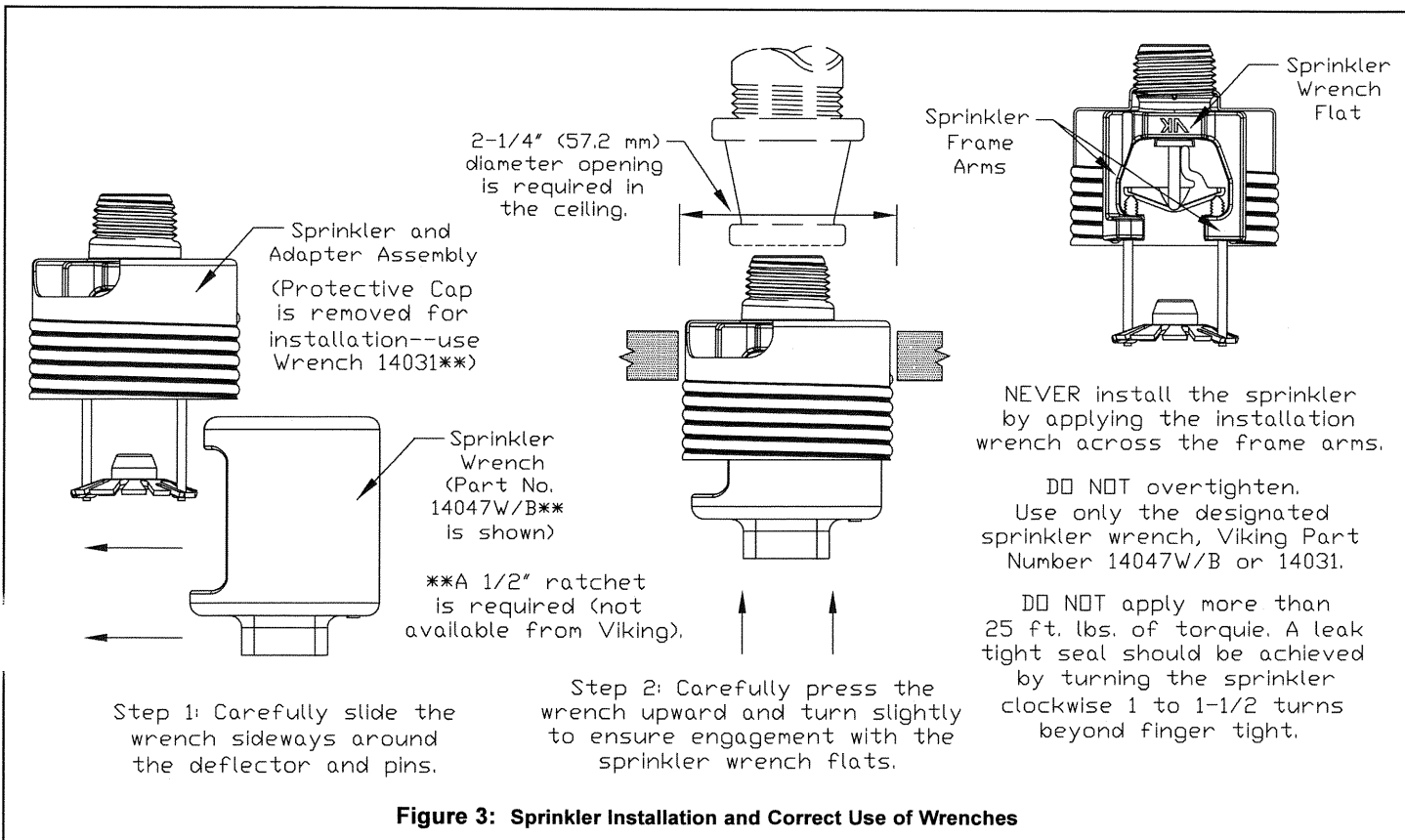


TECHNICAL DATA

MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com





TECHNICAL DATA

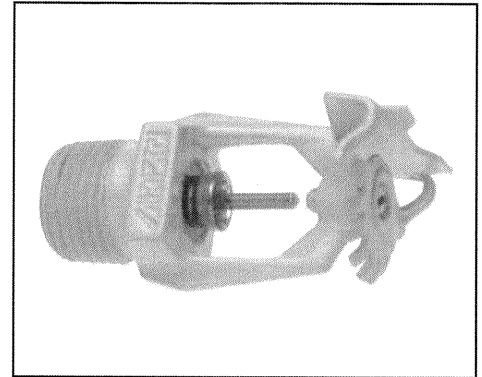
MICROFAST® AND MICROFASTHP® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLERS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

Viking Microfast® and MicrofastHP® Quick Response Horizontal Sidewall Sprinklers are small thermosensitive glass bulb spray sprinklers available with various finishes and temperature ratings to meet design requirements. The special Polyester and Teflon® coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are cULus listed as corrosion resistant as indicated in the Approval Chart. (Note: FM Global has no approval classification for Teflon® and Polyester coatings as corrosion resistant.)



2. LISTINGS AND APPROVALS

cULus Listed: Category VNIV

FM Approved: Class 2020

Refer to the Approval Chart 1 and Design Criteria on pages 52d-e for cULus Listing requirements, and refer to Approval Chart 2 and Design Criteria on page 52f for FM Approval requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Available since 1987.

Minimum Operating Pressure: 7 psi (0.5 bar)

Maximum Working Pressure: Sprinkler VK344 is rated for use with water working pressures ranging from the minimum 7 psi (0.5 bar) up to 250 psi (17 bar) for high-pressure systems. High-pressure (HP) sprinklers can be identified by locating "250" stamped on the deflector. Sprinklers VK304, VK333, and VK335 are rated to a maximum 175 psi (12 bar) wwp.

Factory tested hydrostatically to 500 psi (34.5 bar)

Testing: U.S.A. Patent No. 4,831,870

Nominal K-Factor: Refer to the Approval Charts

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

Overall Length: Refer to the Approval Charts

Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass for Sprinkler 06725B. Brass UNS-C84400 for all other sprinklers.

Deflector: Copper UNS-C19500

Bushing (for sprinklers VK333 and VK344): Brass UNS-C36000

Bulb: Glass, nominal 3 mm diameter

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Teflon Tape

Screw: Brass UNS-C36000

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

Pip Cap Attachment (for sprinklers VK333 and VK344): Brass UNS-C36000

For Teflon® Coated Sprinklers: Belleville Spring-Exposed, Screw-Nickel Plated, Pip Cap-Teflon® Coated

For Polyester Coated Sprinklers: Belleville Spring-Exposed

Ordering Information: (Also refer to the current Viking price list.)

Order Quick Response Horizontal Sidewall Sprinklers by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome-Enloy® = F, White Polyester = M-W, Black Polyester = M-B, and Black Teflon® = N

Temperature Suffix (°F/°C): 135°/68° = A, 155°/68° = B, 175°/79° = D, 200°/93° = E, and 286°/141° = G

For example, sprinkler VK304 with a Brass finish and a 155 °F/68 °C temperature rating = Part No. 06725BAB

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Available Finishes And Temperature Ratings:

Refer to Table 1

Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

Sprinkler Wrenches:

A. Standard Wrench: Part No. 10896WB (available since 2000).

B. Wrench for recessed sprinklers with protective shields: Part No. 13655WB** (available since 2003)

**A 1/2" ratchet is required (not available from Viking).

Sprinkler Cabinets:

A. Six-head capacity: Part No. 01724A (available since 1971)

B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

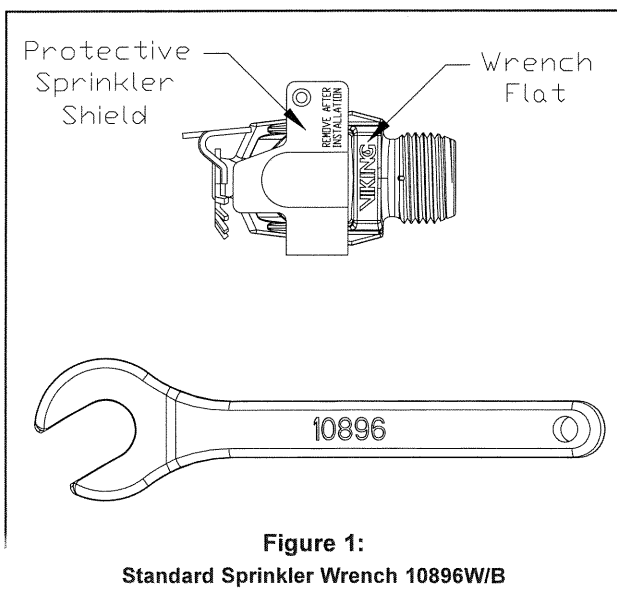
Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

Viking Quick Response Horizontal Sidewall Sprinklers are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.





TECHNICAL DATA

**MICROFAST® AND
MICROFASTHP® QUICK
RESPONSE HORIZONTAL
SIDEWALL SPRINKLERS**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
→ Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

Sprinkler Finishes: Brass, Chrome-Enloy®, White Polyester, Black Polyester, and Black Teflon®

Corrosion-Resistant Coatings³: White Polyester, Black Polyester, and Black Teflon®

Footnotes

¹ The sprinkler temperature rating is stamped on the deflector.

² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

³ The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Chart. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester and Teflon® coatings. For Teflon® coated open sprinklers only, the waterway is coated.

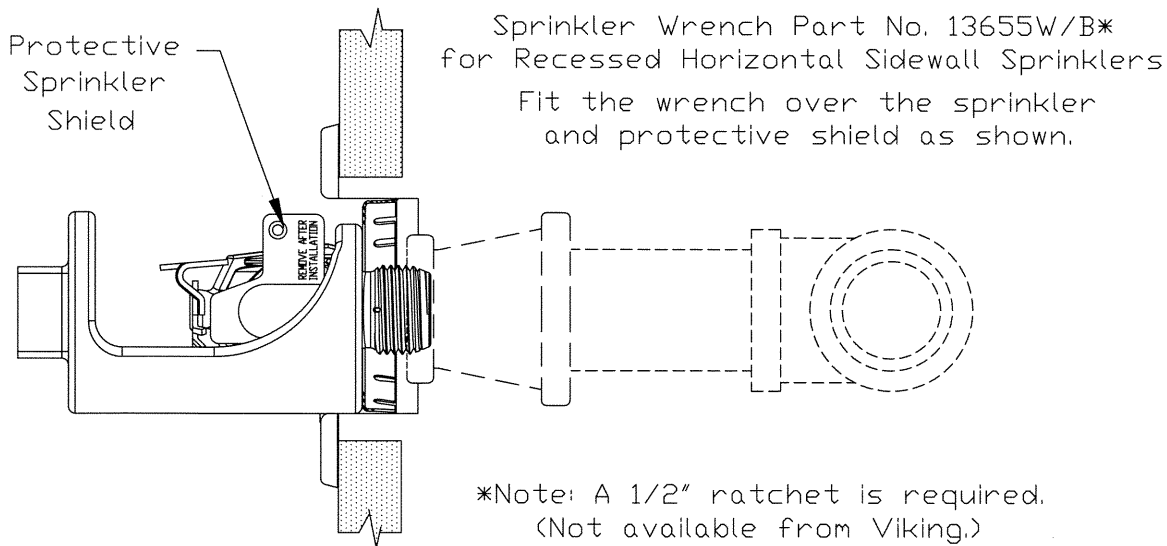


Figure 2: Wrench 13655W/B for Recessed Horizontal Sidewall Sprinklers



TECHNICAL DATA

**MICROFAST® AND
MICROFASTHP® QUICK
RESPONSE HORIZONTAL
SIDEWALL SPRINKLERS**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Approval Chart 1 (UL)

Microfast® and MicrofastHP® Quick Response Horizontal Sidewall Sprinklers
For Light Hazard Occupancies Only

Temperature	KEY
Finish	
A1X ←	Escutcheon (if applicable)

Maximum 175 PSI (12 Bar) WWP

Standard Orifice, Deflector must be located 4" to 6" (102 mm to 152 mm) below the ceiling.

Base Part Number ¹	SIN	Maximum Pressure	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³ (Refer also to Design Criteria on pg 52e.)				
			NPT	BSP	U.S.	metric ²	Inches	mm	cULus ⁴	NYC ⁵	LPCB	CE	⊕
06725B	VK304	175 psi	1/2"	15 mm	5.6	80.6	2-1/2	64	A1X, B1W	A1X, B1Y	--	--	--

Standard Orifice, Deflector must be located 6" to 12" (152 mm to 304 mm) below the ceiling.

06725B	VK304	175 psi	1/2"	15 mm	5.6	80.6	2-1/2	64	A1X	A1X	--	--	--
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Small Orifice⁷, Deflector must be located 4" to 6" (102 mm to 152 mm) below the ceiling.

Base Part Number ¹	SIN	Maximum Pressure	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³ (Refer also to Design Criteria on pg 52e.)				
			NPT	BSP	U.S.	metric ²	Inches	mm	cULus ⁴	NYC ⁵	LPCB	CE	⊕
10035 ⁸	VK333	175 psi	1/2"	15 mm	2.8	40.3	2-1/2	64	A1X, B1W	A1X	--	--	--
08983	VK335	175 psi	3/8"	10 mm	4.2	57	2-1/2	64	--	--	--	--	--

Maximum 250 PSI WWP

Small Orifice⁸, Deflector must be located 4" to 6" (102 mm to 152 mm) below the ceiling.

12287 ⁸	VK344	250 psi	1/2"	15 mm	2.8	40.3	2-1/2	64	A1X, B1W	A1X	--	--	--
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<p>Approved Temperature Ratings</p> <p>A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)</p> <p>B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)</p>	<p>Approved Finishes</p> <p>1 - Brass, Chrome-Enloy®, White Polyester⁹, Black Polyester⁹, and Black Teflon⁹</p> <p>2 - Brass and Chrome-Enloy®</p>	<p>Approved Escutcheons</p> <p>W - Installed with standard surface-mounted escutcheons or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1, E-2, or G-1 Recessed Escutcheon</p> <p>X - Installed with standard surface-mounted escutcheons or the Viking Microfast® Model F-1 Adjustable Escutcheon</p> <p>Y - Installed with standard surface-mounted escutcheons or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1 or E-2 Recessed Escutcheon</p>
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Footnotes

- ¹ Base part number shown. For complete part number, refer to Viking's current price schedule.
- ² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
- ³ This table shows the listings and approvals available at the time of printing. Other approvals may be in process.
- ⁴ Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada.
- ⁵ Accepted for use, City of New York Board of Standards and Appeals, Calendar Number 219-76-SA.
- ⁶ Accepted for use, City of New York Department of Buildings, MEA 89-92-E, Vol. 16.
- ⁷ Listings are limited to Light Hazard Occupancies, with hydraulically calculated wet systems. **Exception:** 4.2K sprinklers may be installed on hydraulically calculated dry pipe systems where piping is corrosion resistant or internally galvanized.
- ⁸ The sprinkler orifice is bushed.
- ⁹ cULus Listed as corrosion-resistant.



TECHNICAL DATA

**MICROFAST® AND
MICROFASTHP® QUICK
RESPONSE HORIZONTAL
SIDEWALL SPRINKLERS**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

DESIGN CRITERIA - UL

(Also refer to Approval Chart 1 on page 52d.)

cULus Listing Requirements:

Microfast® and MicrofastHP® Quick Response Horizontal Sidewall Sprinklers are cULus Listed as indicated in the Approval Chart for installation in accordance with the latest edition of NFPA 13 for sidewall standard spray sprinklers.

- Limited to Light Hazard occupancies only (*Small orifice sprinklers are limited to Light Hazard where allowed by the installation standards being applied, with hydraulically calculated wet systems only. Exception: 4.2K sprinklers may be installed on hydraulically calculated dry pipe systems where piping is corrosion resistant or internally galvanized.*)
- Protection areas and maximum spacing shall be in accordance with the tables provided in NFPA 13. Minimum spacing allowed is 6 ft. (1.8 m).
- Refer to the Approval Chart for allowable deflector distance below the ceiling. Align with the leading edge of the deflector parallel to the ceiling.
- Maximum distance from end walls shall be no more than one-half of the allowable distance between sprinklers. The distance shall be measured perpendicular to the wall. Minimum distance from end walls is 4 in. (102 mm).
- The sprinkler installation and obstruction rules contained in NFPA 13 for sidewall standard spray sprinklers must be followed.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

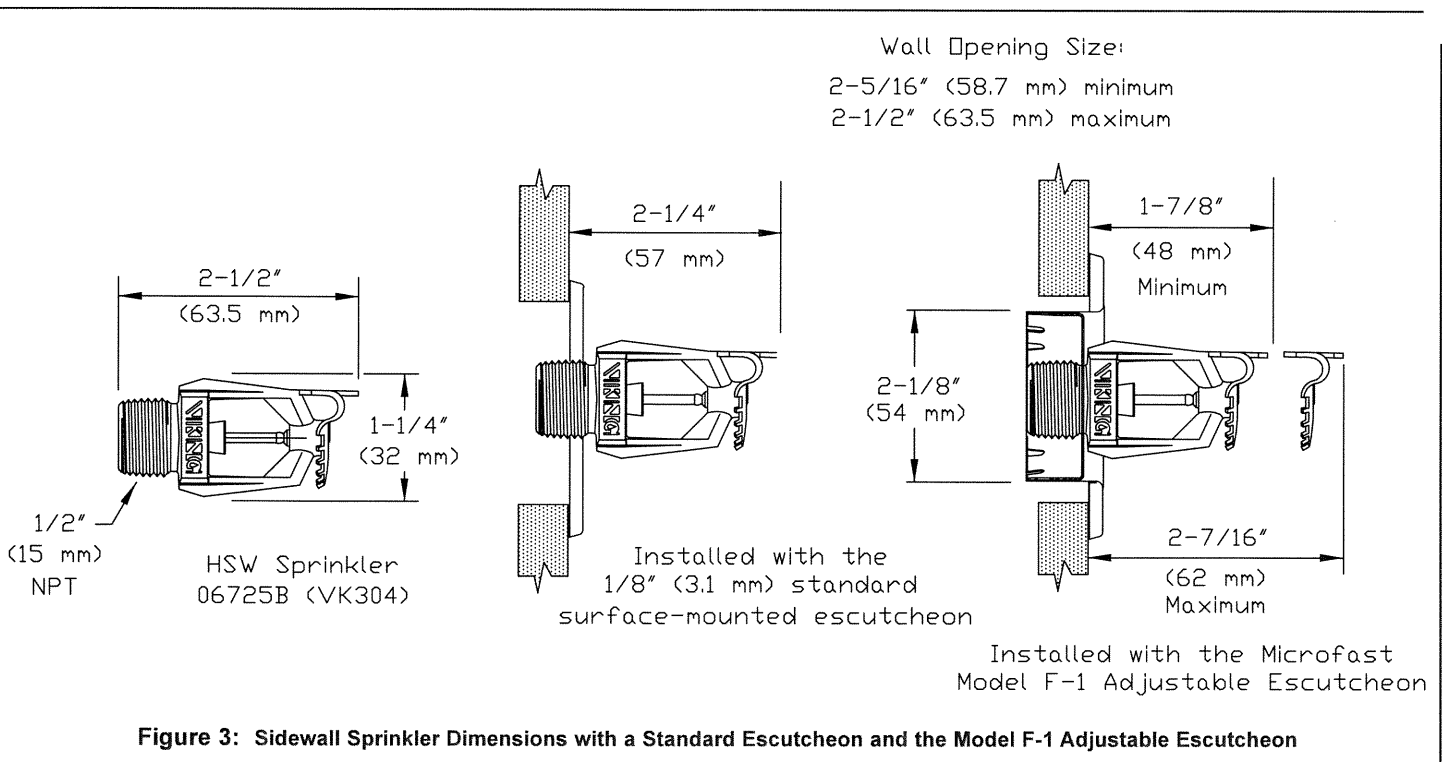
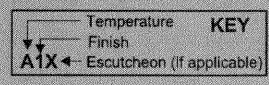


Figure 3: Sidewall Sprinkler Dimensions with a Standard Escutcheon and the Model F-1 Adjustable Escutcheon

	<h2 style="margin: 0;">TECHNICAL DATA</h2>	<h3 style="margin: 0;">MICROFAST® AND MICROFASTHP® QUICK RESPONSE HORIZONTAL SIDEWALL SPRINKLERS</h3>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Approval Chart 2 (FM) Microfast® Quick Response Horizontal Sidewall Sprinklers Maximum 175 PSI (12 Bar) WWP									
Base Part Number ¹	SIN	Maximum Pressure	Thread Size		Nominal K-Factor		Overall Length		FM Approvals ³ (Refer also to Design Criteria below.)
			NPT	BSP	U.S.	metric ²	Inches	mm	
06725B	VK304	175 psi	1/2"	15 mm	5.6	80.6	2-1/2	64	A1X, B1W
Approved Temperature Ratings A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C) B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)			Approved Finishes 1 - Brass and Chrome-Enloy®			Approved Escutcheons W - Installed with standard surface-mounted escutcheons or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1, E-2, or G-1 Recessed Escutcheon X - Installed with standard surface-mounted escutcheons or the Viking Microfast® Model F-1 Adjustable Escutcheon			
Footnotes ¹ Base part number shown. For complete part number, refer to Viking's current price schedule. ² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0. ³ This table shows the listings and approvals available at the time of printing. Other approvals may be in process.									



DESIGN CRITERIA - FM (Also refer to Approval Chart 2 above.)
<p>FM Approval Requirements:</p> <p>Sprinkler VK304 is FM Approved as a quick response Non-Storage horizontal sidewall sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.</p> <p>NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.</p>
<p>IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.</p>

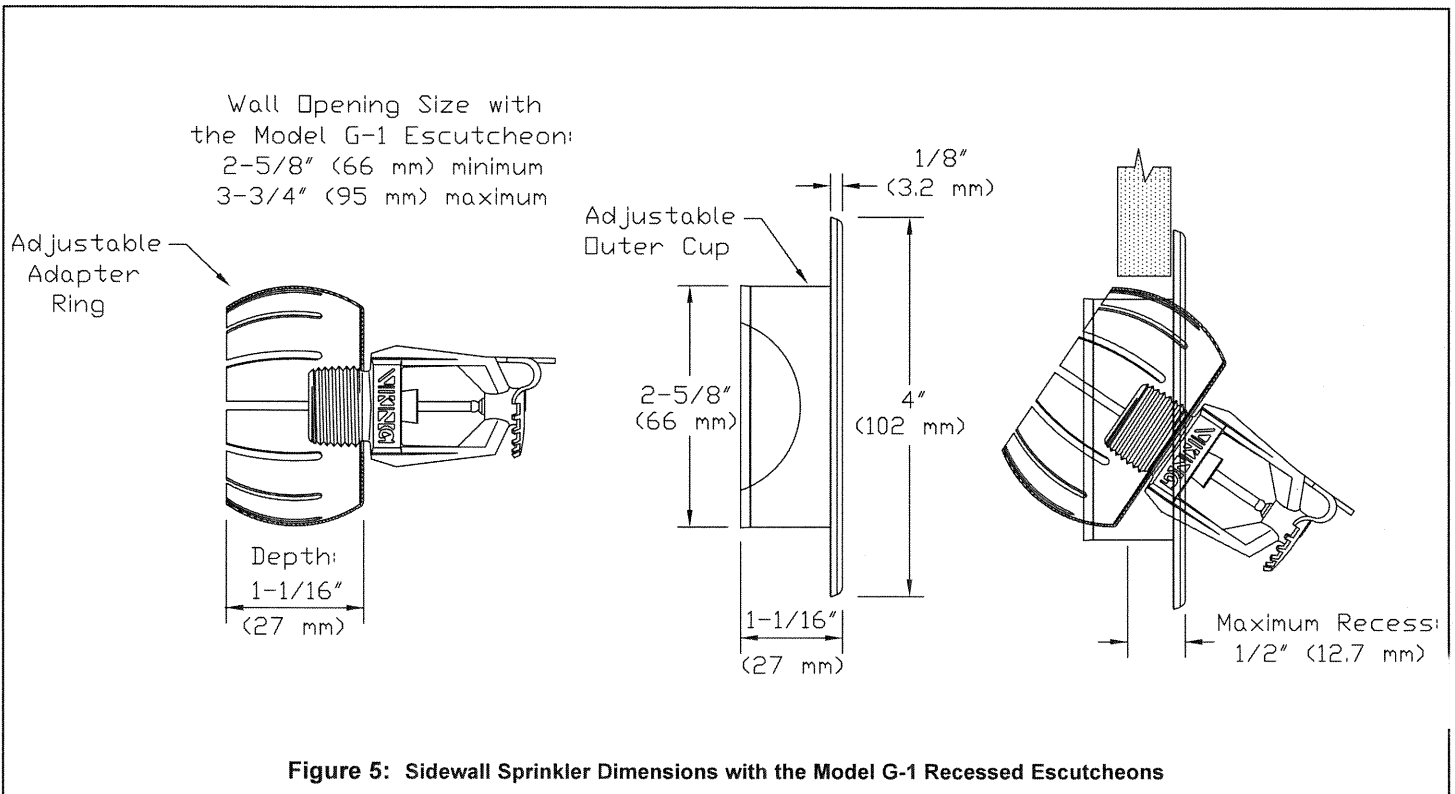
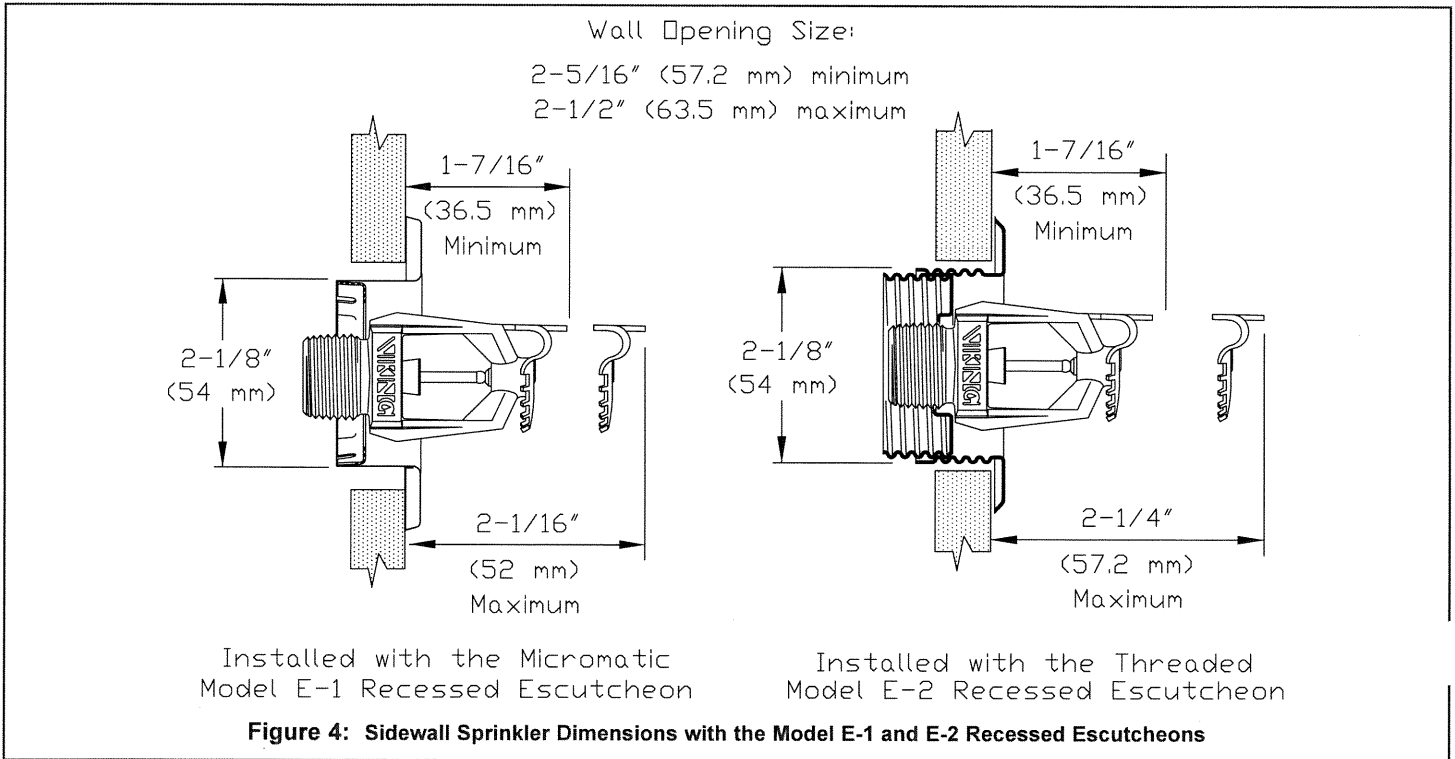


TECHNICAL DATA

**MICROFAST® AND
MICROFASTHP® QUICK
RESPONSE HORIZONTAL
SIDEWALL SPRINKLERS**

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Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com





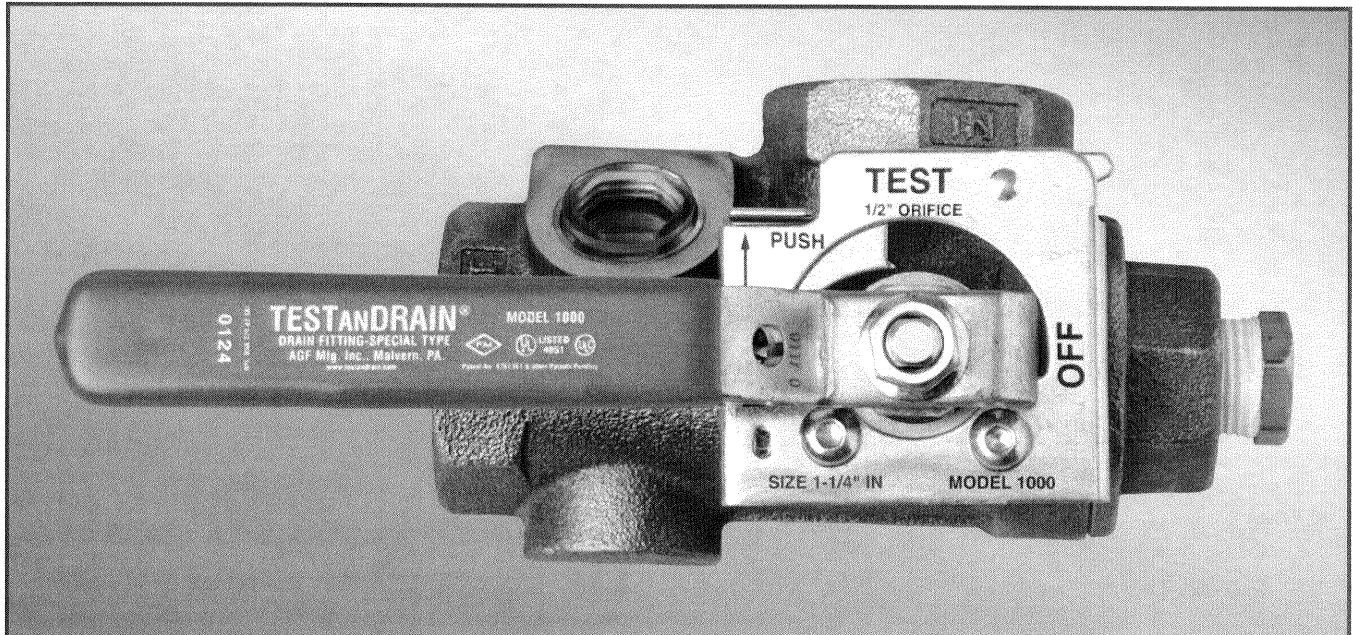
Model 1000

TEST AND DRAIN®

Sectional Floor Control Test and Drain Valve

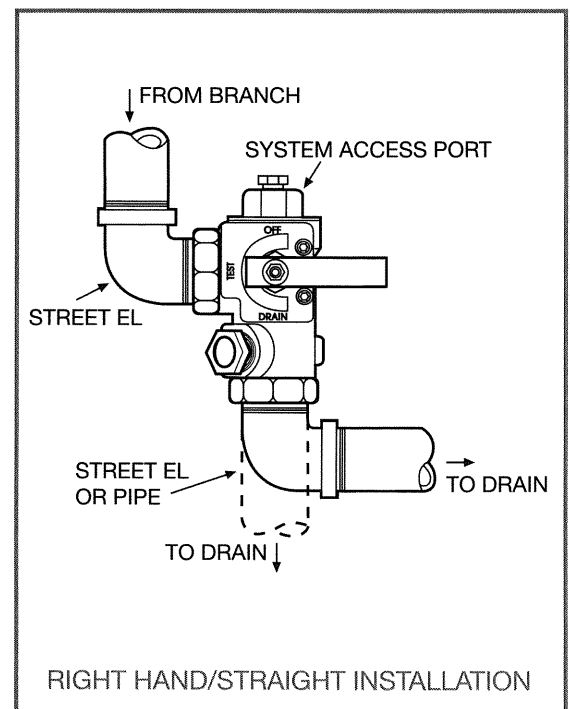


3/4" 1" 1 1/4" 1 1/2" 2"



- The AGF Manufacturing, Inc. **Model 1000 TEST AND DRAIN®** provides both the test function and the express drain function for a wet fire sprinkler system.
- The **Model 1000** complies with the requirements of NFPA-13, NFPA-13R, and NFPA-13D.
- The **Model 1000 TEST AND DRAIN®** 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 3/4" to 2" NPT and BSPT, with all specifiable orifice sizes 3/8" (2.8K), 7/16" (4.2K), 1/2" (5.6K), 17/32" (8.0K), 5/8" (11.2K, ELO), 3/4" (14.0K, ESFR), and K25 as required by NFPA 13, 2007 Edition (see reverse).
- The orifice size is noted on the indicator plate and the valve features a tapped and plugged port for system access.
- A locking kit is available and can be ordered with the valve to provide vandal resistance or prevent unintentional alarm activation.

MODEL 1000 - FRONT VIEW, VERTICAL INSTALLATION



Reliability, Versatility, Code Compatibility

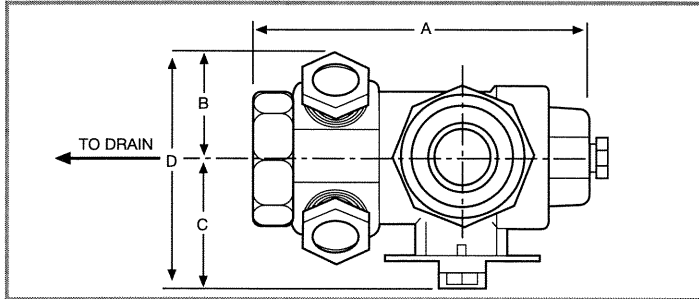


TEST AND DRAIN®

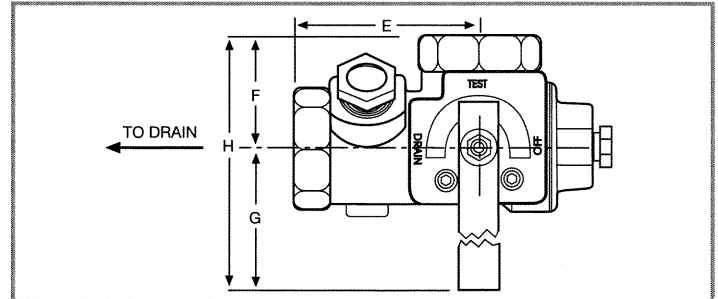
Model 1000

300 PSI Bronze Ball Valve

MODEL 1000 - PLAN VIEW



FRONT VIEW - HORIZONTAL INSTALL



DIMENSIONS

Orifice Size Available: 3/8", 7/16", 1/2", 17/32", ELO (5/8")*, ESFR (3/4")*, & K25**

SIZE	A	B	C	D	E	F	G	H
3/4"	5 1/16" (128 mm)	1 1/2" (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"	5 1/16" (128 mm)	1 1/2" (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 1/4"	5 7/16" (163 mm)	1 11/16" (43 mm)	2 9/16" (65 mm)	4 1/4" (108 mm)	3 5/16" (83 mm)	1 15/16" (51 mm)	5 9/16" (141 mm)	5 1/2" (192 mm)
1 1/2"	6 7/16" (163 mm)	1 13/16" (45 mm)	3 1/4" (81.5 mm)	5 1/16" (127 mm)	3 7/8" (99 mm)	2 5/8" (67 mm)	8 1/4" (207 mm)	10 7/8" (274 mm)
2"	6 7/16" (163 mm)	1 13/16" (45 mm)	3 1/4" (81.5 mm)	5 1/16" (127 mm)	3 7/8" (99 mm)	2 5/8" (67 mm)	8 1/4" (207 mm)	10 7/8" (274 mm)

* Available on 1 1/4" to 2" size units only

** Available on 1 1/2" and 2" size units only

THE MODEL 1000 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 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.
- & 8.16.2.4.3
- 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.

MATERIALS

- Handle: Steel
- Stem: Rod Brass
- Ball: C.P. Brass
- Body: Bronze
- Valve Seat: Impregnated Teflon®
- Indicator Plate: Steel
- Handle Stop: Steel

APPROVALS

- UL and ULC Listed (EX4019)
- FM Approved
- NYC-BSA No. 720-87-SM



USA Patent # 4741361 and Other Patents Pending



AGF Manufacturing Inc.
 100 Quaker Lane, Malvern, PA 19355
 T: 610-240-4900 / F: 610-240-4906
 E-mail: info@testandrain.com
 www.testandrain.com

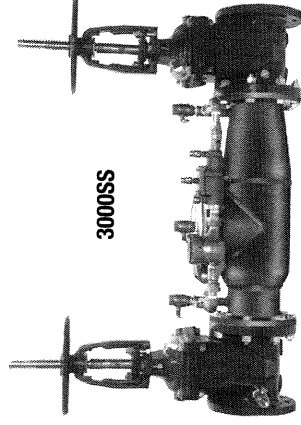
Job Name: _____
 Architect: _____
 Engineer: _____
 Contractor: _____

ES-A-3000SS

Series 3000SS

Double Check Detector Assemblies

Sizes: 2 1/2" – 12" (65 – 300mm)



Features

- Patented Cam-Check Assembly valve provides low head loss
- Short lay length is ideally suited for retrofit installations
- Stainless Steel body is half the weight of competitive designs reducing installation and shipping cost
- Stainless steel construction provides long term corrosion protection and maximum strength
- Single top access cover with two-bolt grooved style coupling for ease of maintenance
- No special tools required for servicing
- Compact construction allows for smaller vaults and enclosures
- Furnished with 5/8" x 3/4" bronze meter (gpm or cfm)
- Detects underground leaks and unauthorized water use
- Maybe installed horizontal or vertical "flow up" position

Available Models

Suffix:

- LG – less shutoff valves
 - OSY – UL/FM outside stem and yoke resilient seated gate valves
 - OSY FxG – flanged inlet gate connection and grooved outlet gate connection
 - OSY GxF – grooved inlet gate connection and flanged outlet gate connection
 - OSY GxG – grooved inlet gate connection and grooved outlet gate connection
 - CFM – cubic feet per minute
 - GPM – gallons per minute meter
- Post indicator plate and operating nut available – consult factory

Specifications

A Double Check Detector Assembly shall be installed on fire protection systems when connected to a potable water supply. Degree of hazard present is determined by the local authority having jurisdiction. The main valve body shall be manufactured from 300 Series stainless steel to provide corrosion resistance, 100% lead free through the waterway. The double check detector assembly consists of two independently operating, spring loaded check valves, two UL, FM, OSY resilient seated gate valves, and bypass assembly. The bypass assembly consists of a meter (cubic ft. or gallons), a double check including shutoff valves and required test cocks. Each cam-check shall be internally loaded and provide a positive drip tight closure against reverse flow. Cam-check includes a stainless steel cam arm and spring, rubber faced disc and a replaceable seat. There shall be no brass or bronze parts used within the cam-check valve assembly. The check valve seats shall be of molded thermoplastic construction. The use of seat screws as a retention method is prohibited. All internal parts shall be accessible through a single cover on the valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have two independently operating modular poppet check valves, and top mounted test cocks. The assembly shall be an Ames 3000SS.

Materials

All internal metal parts: 300 Series stainless steel, Main valve body: 300 Series stainless steel, Check assembly: Noryl® Flange dimension in accordance with AWWA Class D. Noryl® is a registered trademark of General Electric Company.

Job Name _____ Contractor _____
 Job Location _____ Approval _____
 Engineer _____ Contractor's P.O. No. _____
 Approval _____ Representative _____

Ames product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Ames Technical Service. Ames reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Ames products previously or subsequently sold.

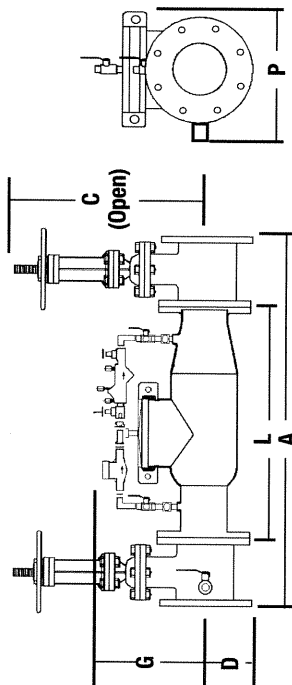
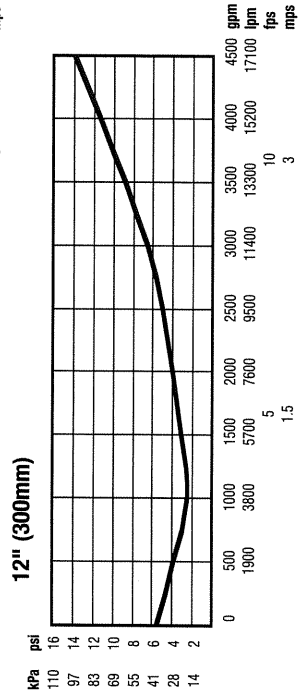
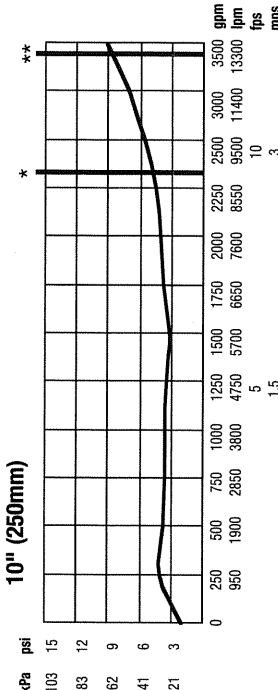
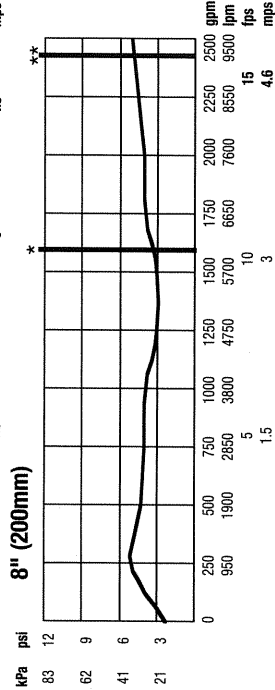
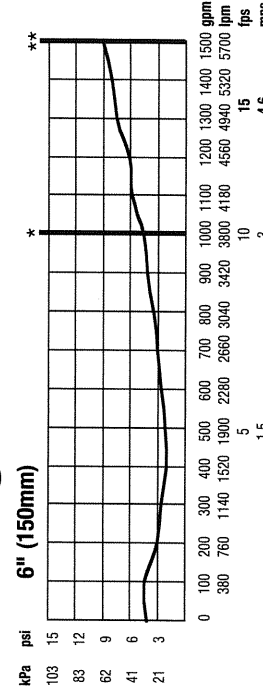
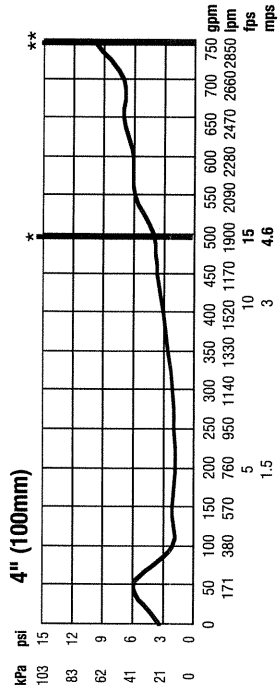
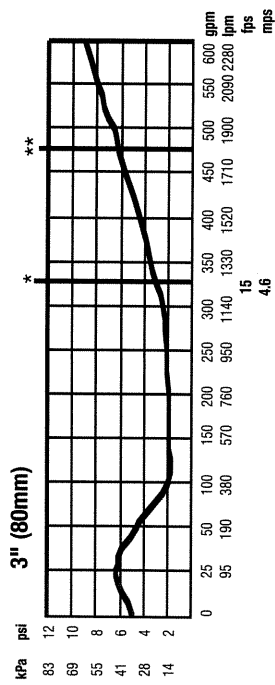
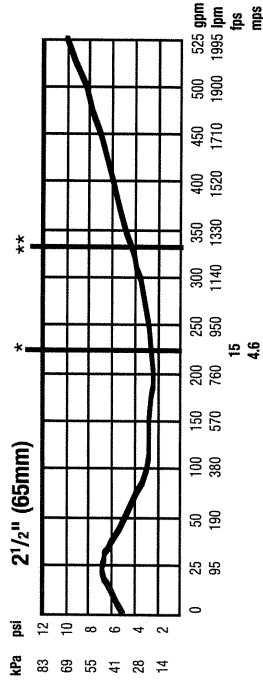
www.amesfirewater.com

Pressure — Temperature

Temperature Range: 33°F – 110°F (0.5°C – 43°C)
 Maximum Working Pressure: 175psi (12 bar)

Capacity

Flow curves as tested by Underwriters Laboratory per UL 1469, 1996. * Rated flow **UL Tested



SIZE (DN)	DIMENSIONS							NET WEIGHT	
	A	C (OSY)	D	G	L	P	w/Gates	w/o Gates	
in.	mm	in.	mm	in.	mm	in.	mm	lb.	kg.
2 1/2	65	16 3/8	416	10	250	12 1/2	318	155	70
3	80	18 7/8	479	10	250	13	330	230	104
4	100	22 3/4	578	10	250	14 1/2	368	240	109
6	150	30 1/8	765	15	381	15 1/2	394	390	177
8	200	37 3/4	959	15	381	18 1/2	464	572	259
10	250	45 3/4	1162	15	381	19 1/2	495	774	351
12	300	53 1/8	1349	15	381	21	533	1044	474



A Watts Water Technologies Company

www.amesfirewater.com

UL Classified (OSY only), FM (sizes 2 1/2" – 10", OSY only)



USA: Backflow - 1427 N. Market Blvd • Suite #9 • Sacramento, CA 95834 • T: 916-928-0123 • F: 916-928-9333
 Control Valves - 18550 Hansen Road • Houston, TX 77075 • T: 713-943-0688 • F: 713-944-9445
 Canada: 5435 North Service Rd. • Burlington, ONT. L7L 5H7 • T: 905-332-4090 • F: 905-332-7068

ES-A-3000SS 0936

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CAL FIRE LISTING

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

Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: Potter Electric Signal Co1609 Park 370 Place, Hazelwood, MO 63042
Contact: Bill Witherspoon (314) 595-6900 Fax (314) 595-6999
Email: BillW@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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSEGIAN**, Program Coordinator
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. 7770-0328:0010

Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: Potter Electric Signal Co 1609 Park 370 Place, Hazelwood, MO 63042
Contact: Bill Witherspoon (314) 595-6900 Fax (314) 595-6999
Email: BillIW@pottersignal.com

DESIGN: Supervisory switches listed below to monitor pressure, OS&Y, gate, globe/gate, PIV, tank temperature or water level valves. Refer to listee's data sheet for detailed product description and operational considerations.

HLS-B	WLS-W	WLS-S	PS-40A
PS-120A	OSYSU-2	OSYS-B	PMS
PTS-B	OSYSU-1	GVS	PCVS-1
PIVS-B	TTS-S	TTS-W	PCVS-2
WLS	PTS-C	PS40	PS120
*RBVS			

RATING:

INSTALLATION: n accordance with listee's printed instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model designation and FM or UL label.

APPROVAL: Listed as sprinkler system supervisory switches.

NOTE: Formerly 7738-0328:010

*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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSEGIAN**, Program Coordinator
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. 7515-0531:0001

Page 1 of 1

CATEGORY: 7515 -- PIPE/FITTINGS

LISTEE: VICTAULIC4901 Kesslersville Rd., Easton, PA 18040
Contact: Michael Erle (610) 923-3739 Fax (610) 923-3115
Email: merle@victaulic.com

DESIGN: Models HP70, 72, 75, 77, 90, 99, 741 and 750 grooved fittings; PLAINLOCK fittings; Model 920 mechanical tee; For grooved, plain or beveled pipe. Refer to listee's data sheet for detailed product description and operational considerations.

RATING:

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, size, working pressure and UL label.

APPROVAL: Listed as fittings for use in fire sprinkler systems.

NOTE: Formerly 7551-0531:001

*Rev 8-21-2003



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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSEGIAN**, Program Coordinator
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. 7515-0531:0104

Page 1 of 1

CATEGORY: 7515 -- PIPE/FITTINGS

LISTEE: VICTAULIC4901 Kesslersville Rd., Easton, PA 18040
Contact: Michael Erle (610) 923-3739 Fax (610) 923-3115
Email: merle@victaulic.com

DESIGN: Models FIRELOCK 001, 002, 003, 005, 45 and 90 elbows, straight tees and couplings. Refer to listee's data sheet for detailed product description and operational considerations.

RATING:

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, part size, working pressure and UL label.

APPROVAL: Listed as fittings for fire sprinkler systems.

NOTE: Formerly 7550-0531:104

*Rev 8-21-2003



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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSEGIAN**, Program Coordinator
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. 7770-1440:0101

Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: KENNEDY VALVE1021 East Water St, Elmira, NY 14901
Contact: Ted Zaparzynski (607) 734-2211 Fax (800) 952-4771
Email: ted.zaparzynski@kennedyvalve.com

DESIGN: Figures 01G, 02G* grooved-end and 01W wafer end butterfly valves in the 2-1/2", 3", 4", 6" and 8" sizes. These valves may employ internal supervisory tamper switches. The 4, 5, 6, and 8" size valves incorporated a new EPDM disc rubber Compound Buckhorn 060-3. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Rated pressure: 300 psi

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as butterfly valves for use as a water supply control valve for fire protection systems. Suitable for indoor/outdoor use. Refer to listee's Installation Instruction Manual for details.

*Rev. 08-22-08 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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSEGIAN**, Program Coordinator
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. 7770-1440:0102

Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: KENNEDY VALVE 1021 East Water St, Elmira, NY 14901
Contact: Ted Zaparzynski (607) 734-2211 Fax (800) 952-4771
Email: ted.zaparzynski@kennedyvalve.com

DESIGN: Models G300 and G300E grooved ends butterfly valves in the 2-1/2", 3", 4", and 6" sizes.
Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Rated pressure: 300 psi

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as butterfly valves for use as a water supply control valve for fire protection systems. Suitable for indoor/outdoor use. Refer to listee's Installation Instruction Manual for details.

08-22-08 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, 2014**

Listing Expires **June 30, 2015**

Authorized By: **JAMES PARSESIAN**, Program Coordinator
Fire Engineering Division

Appendix D

Plumbing Cut Sheets

Appendix D

Plumbing Cut Sheets

Table of Contents

#	MARK	DESCRIPTION
PLUMBING		
1	WC-1 & WC-2	TOILET BOWL
2	WC-1 & WC-2	FLUSHVALVE
3	WC-1 & WC-2	CARRIER
4	L-1 & L-2	LAVATORY
5	L-1	LAVATORY FAUCET
6	L-2	LAVATORY FAUCET
7	UR-1	URINAL & FLUSHOMETER
8	S-1	CLASSROOM SINK
9	S-1	CLASSROOM SINK FAUCET
10	S-1	CLASSROOM SINK FAUCET AERATOR
11	S-1	CLASSROOM SINK BUBBLER
12	SS-1	SERVICE SINK
13	SS-1	SERVICE SINK FAUCET
14	SS-1	SERVICE SINK FAUCET AERATOR
15	DF-1	DRINKING FOUNTAIN
16	FD-1/DD-1	FLOOR DECK DRAIN
17	RR-1	ROOF RECEPTOR
18	HD-1	HUB DRAIN
19	HB-1	RECESSED HOSE BIBB
20	TP-1	TRAP PRIMER
21	WHA-1	WATER HAMMER ARRESTOR
22	BFP-1	BACKFLOW PREVENTER
23	WH-1	INSTANTANEOUS WATER HEATER

American Standard

Style That Works Better

 BARRIER FREE

AFWALL™ ELONGATED 1.6 GPF FLUSHOMETER TOILET

VITREOUS CHINA with EVERCLEAN®

AFWALL™ ELONGATED TOILET with EVERCLEAN®

- Wall-mounted flushometer valve toilet
- Vitreous china
- Low-consumption (6.0 Lpf/1.6 gpf)
- EverClean® surface inhibits the growth of stain and odor-causing bacteria, mold, and mildew on the surface
- Condensation channel
- Elongated bowl
- Powerful direct-fed siphon jet action
- 1-1/2" inlet spud
- Fully-glazed 2-1/8" trapway
- 10" x 12" water surface area
- 100% factory flush tested

- 3351.160** Elongated bowl only, top spud
- 3351.001** Same as above, Universal Bowl
- 3352.160** Elongated bowl only, top spud with slotted rim for bedpan holding (White only)
- 3352.001** Same as above, Universal Bowl
- 3353.160** Elongated bowl only, back spud (White, Bone, and Linen only)
- 3353.001** Same as above, Universal Bowl
- 3354.160** Elongated bowl only, back spud with slotted rim for bedpan holding (White only)
- 3354.001** Same as above, Universal Bowl

Component Parts:

- 047007-0070A** Inlet Spud (furnished with bowl)

Nominal Dimensions:

660 x 356 x 381mm
(26" x 14" x 15")

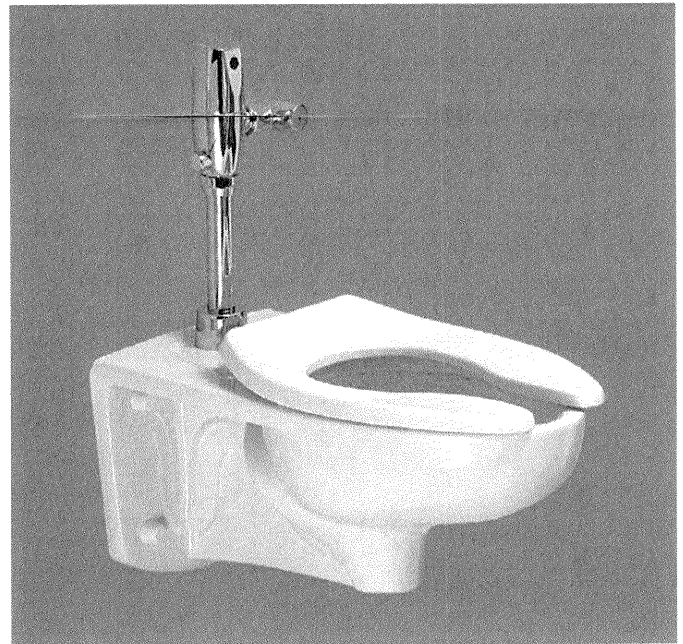
Recommended working pressure—between
25 psi at valve when flushing and 80 psi static

Fixture only, less seat, bolt caps, and flush valve

Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.2-2008/CSA B45.1-08 for Vitreous China Fixtures



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

To Be Specified:

- Color: White Bone Linen Black
- Seat:
 - American Standard #5901.100 Heavy duty open front less cover
 - American Standard #5905.100 Extra heavy duty open front less cover
- Flushometer Valve:
 - American Standard Selectronic™ #6065.161.002 DC Power (Top Spud)
 - American Standard Selectronic™ #6065.262.007 DC Power (Concealed Back Spud)
 - American Standard Selectronic™ #6067.262.007 AC Power (Concealed Back Spud)
 - American Standard Selectronic™ #6068.262.007 Multi AC Power (Concealed Back Spud)

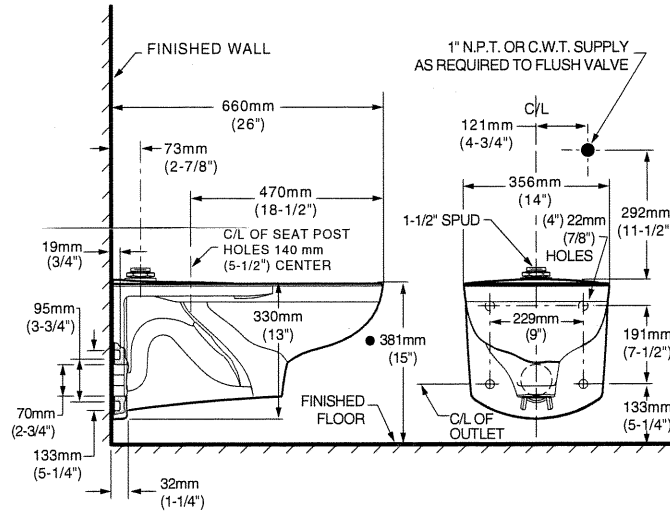


MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR ACCESSIBLE AND USABLE BUILDING FACILITIES - CHECK LOCAL CODES.

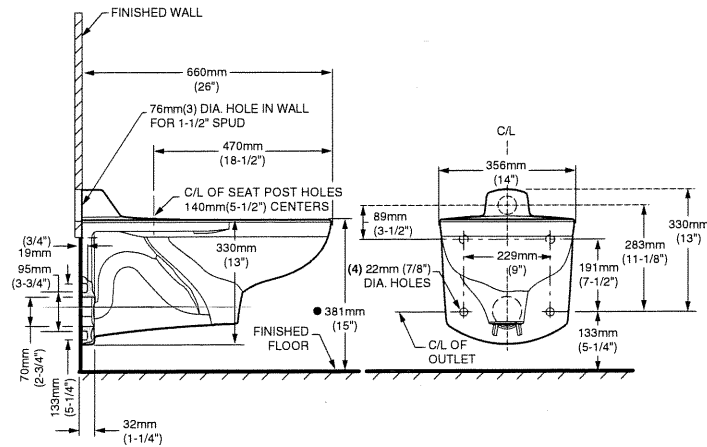
- When installed so top of seat is 432 to 483mm (17" to 19") from the finished floor.

EVERCLEAN®
Surface

3351.160/3352.160
3351.001/3352.001



3353.160/3354.160
3353.001/3354.001



NOTES:

● Toilet designed to meet ADA accessibility standards when top of seat height set at 432 to 483mm (17" to 19") from finished floor.

PRODUCTS 3351 and 3353 SHOWN, 3352 and 3354 SAME AS EXCEPT WITH SLOTTED RIM FOR BED PAN HOLDING.

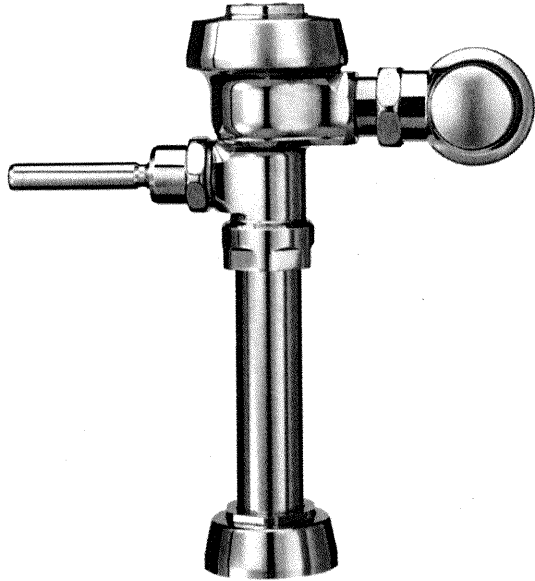
WASTE OUTLET SEAL RING MUST BE NEOPRENE OR GRAPHITE-FELT (WAX RING NOT RECOMMENDED).

SUGGESTED 2mm (1/16) CLEARANCE BETWEEN FACE OF WALL AND BACK OF BOWL. TO COMPLY WITH AREA CODE GOVERNING THE HEIGHT OF VACUUM BREAKER ON THE FLUSHOMETER VALVE, THE PLUMBER MUST VERIFY DIMENSIONS SHOWN FOR SUPPLY ROUGHING.

FLUSHOMETER VALVE NOT INCLUDED WITH FIXTURE AND MUST BE ORDERED SEPARATELY.

CARRIER FITTING AS REQUIRED TO BE FURNISHED BY OTHERS. PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORT.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages



Royal® Model Flushometer

111-1.28

► **Description**
Exposed Water Closet Flushometer, for floor mounted or wall hung top spud bowls.

► **Flush Cycle**
Model 111-1.28 High Efficiency (1.28 gpf/4.8 Lpf)

- **Specifications**
Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer for left or right hand supply with the following features:
- PERMEX™ Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
 - ADA Compliant Metal Oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
 - 1" I.P.S. Screwdriver Bak-Chek® Angle Stop
 - Free Spinning Vandal Resistant Stop Cap
 - Adjustable Tailpiece
 - High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
 - Spud Coupling and Flange for 1½" Top Spud
 - Sweat Solder Adapter w/Cover Tube & Cast Wall Flange w/Set Screw
 - High Copper, Low Zinc Brass Castings for Dezincification Resistance
 - Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
 - Flush Accuracy Controlled by CID™ Technology
 - Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker molded from PERMEX™ Rubber Compound for Chloramine Resistance

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037.

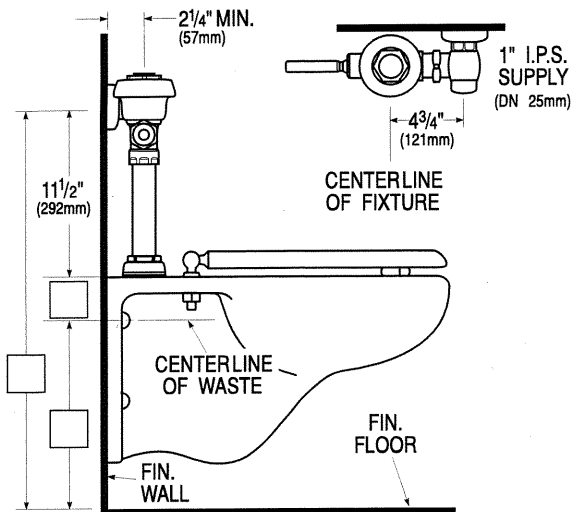
- **Variations**
- XYV Valve Less Vacuum Breaker
 - SG SaniGuard® Antimicrobial Handle and Socket

► **Accessories**
See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.

► **Fixtures**
Consult Sloan for Sloan brand matching fixture options.



Made In The
USA



This space for Architect/Engineer approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Variations Specified _____

Customer/Wholesaler _____

Contractor _____

Architect _____

The information contained in this document is subject to change without notice.



SLOAN VALVE COMPANY • 10500 SEYMOUR AVE. • FRANKLIN PARK, IL 60131
Ph: 1-800-982-5839 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380
www.sloanvalve.com

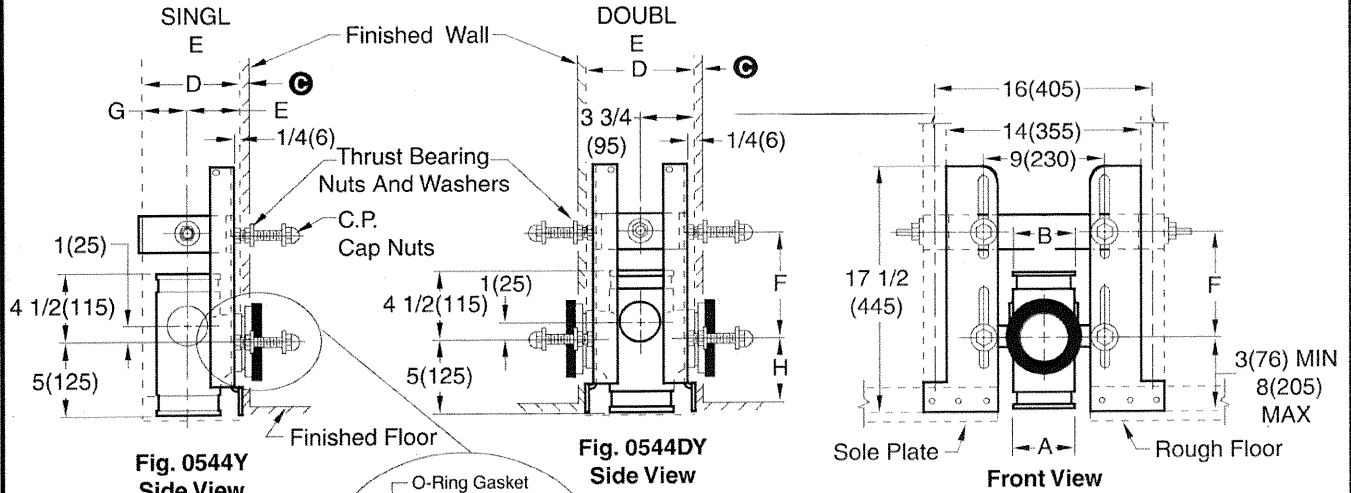
SMITH® JAY R. SMITH MFG. CO.®
 DIVISION OF SMITH INDUSTRIES, INC.
 POST OFFICE BOX 3237
 MONTGOMERY, ALABAMA 36109-0237 (USA)
 TEL: 334-277-8520 FAX: 334-272-7396 www.jrsmith.com



LOCATION

COMPACT FIXTURE SUPPORTS FOR SIPHON JET WATER CLOSETS WITH VERTICAL CENTER LINE FITTINGS

STUD-MOUNT FRAME FOR NO-HUB SYSTEMS



A SIZE	B SIZE	D STUD	E	G
3(80)	2(51)	2X6	3 1/2(89)	1 3/4(44)
3(80)	3(76)	2X6	3 1/2(89)	1 3/4(44)
4(100)	2(51)	2X8	3 1/2(89)	3 1/2(89)
4(100)	4(100)	2X8	3 1/2(89)	3 1/2(89)

- Fig. 0532Y . . . 3"(80) NO-HUB w/2"(51) Vent
- Fig. 0533Y . . . 3"(80) NO-HUB w/3"(76) Vent
- Fig. 0542Y . . . 4"(100) NO-HUB w/2"(51) Vent
- Fig. 0544Y . . . 4"(100) NO-HUB w/4"(100) Vent
- Fig. 0544DY . . . 4"(100) NO-HUB Double w/4"(100) Vent

NOTE: Coupling should extend 5/16"(8) beyond finished wall.
NOTE: When using closet with bar hanger, add suffix-H to figure numbers shown.
NOTE: See roughing-in table on reverse side for "F" and "H" dimensions and list of compatible fixtures. Double support for use with gravity flush tank type water closets only.
NOTE: Longer closet studs and couplings available when required.
 ① 1"(25) MIN to 1 1/4"(32) MAX regularly furnished. Other dimensions available upon request. Service weight regularly furnished.

INSTALLATION INSTRUCTIONS

- A. Center stack between two studs back "E" dimension (shown in table) from stud faces. 0544DY must be centered in sole plate.
- B. Cut out hole in sole plate and floor for stack.
- C. To determine the height of the stack in relation to the finished floor, subtract the "H" dimension from the 5"(125) dimension.
- D. The fitting should now be coupled into the stack.
- E. The face plates are assembled to the reinforcing strap and to the arms of the fitting by means of the fixture studs and then nailed to the sole plate. The two vertical studs are set into place, then drilled for permanently anchoring the reinforcing strap with the stud bolts, nuts and washers.
- F. Thread locknut on male thread of adjustable coupling approximately 1"(25) and push "O"-Ring against locknut.
- G. Apply No. 90 Smith Seal to male threads on coupling. Install coupling and adjust it to extend 5/16"(8) beyond finished wall. Thread locknut snugly.
- H. Assemble the bearing nuts and washers to the fixture supporting studs. The fixture studs should extend 2 1/4"(57) beyond finished wall.
- I. Adjust bearing nuts so that washers extend 1/16"(2) beyond finished wall.
- J. After wall is erected, remove any plaster grout touching the fixture studs, bearing nuts washers and coupling.
- K. Place gasket in closet recess and set closet on studs protruding from wall making sure that closet outlet is centered on coupling.
- L. Place fiber washers on studs. Apply the two bottom and top left cap nuts tighten securely. Apply the top right cap nut hand tight and snug up 1/4 turn with wrench.

NOTE: When installing closet with bar hanger support follow the same instructions as above, except that the hanger plate should be mounted on the top fixture studs. Adjust the top bearing nuts so that the face of the hanger extends 1/16"(2) beyond the finished wall, then lock in place with hex nuts.

NOTE: SEE REVERSE SIDE FOR ROUGH-IN TABLE.

NOTE: Dimensions shown in parentheses are in millimeters.

DRAWING NUMBER
S0532Y

SIZE
A

SCALE:
NONE

DATE:
1-17-86

APPROVED BY:
SB

CHECKED BY:
JD

DRAWN BY:
CM

0532Y, 0533Y,
0542Y, 0544Y

WE CAN ASSUME NO RESPONSIBILITY FOR USE OF SUPERSEDED OR VOID DATA

DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCE AND CHANGE WITHOUT NOTICE

REV.	DATE	DESCRIPTION	BY	CKD. BY	WEIGHT POUNDS	VOLUME CUBIC FEET	FIGURE NUMBER
F	1-27-06	Revised Note & Removed Note	RN	CL			0532Y, 0533Y, 0542Y, 0544Y
E	8-26-05	Revised Note	TBW	CL			
D	8-2-96	Added Millimeters	EMB	BS			
C	6-14-94	Revised	EMB	BS			

American Standard

Style That Works Better

BARRIER FREE

DECLYN™
WALL-HUNG LAVATORY
VITREOUS CHINA

DECLYN™ WALL-HUNG LAVATORY

- Wall-hung sink
- Vitreous china
- Rear overflow
- Soap depression
- Faucet ledge
Shown with 2000.101 Ceramix faucet (not included)

- 0321.026** With wall hanger (Illustrated)
Faucet holes on 102mm (4") centers
- 0321.075** For concealed arms support
Faucet holes on 102mm (4") centers

Nominal Dimensions:

470 x 432mm
(18-1/2" x 17")

Bowl sizes:

362mm (14-1/4") wide
273mm (10-3/4") front to back
152mm (6") deep

Compliance Certifications -

Meets or Exceeds the Following Specifications:

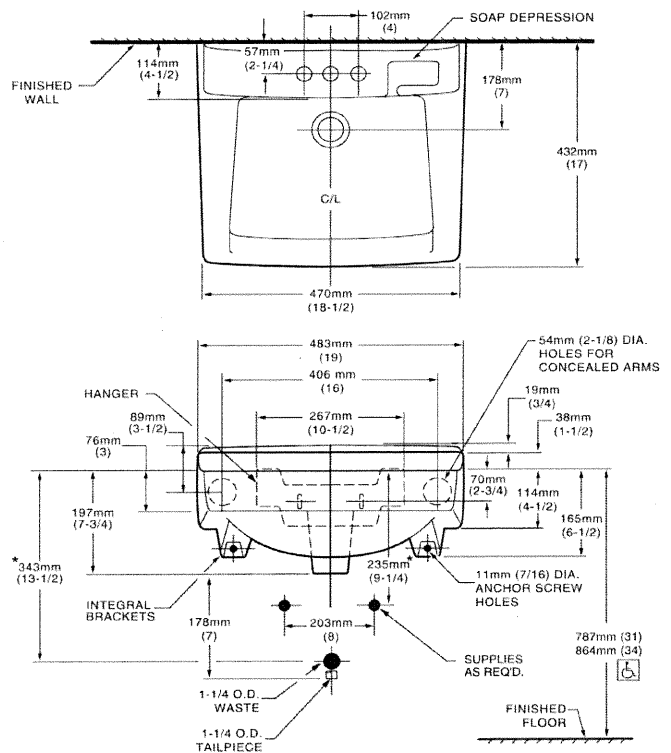
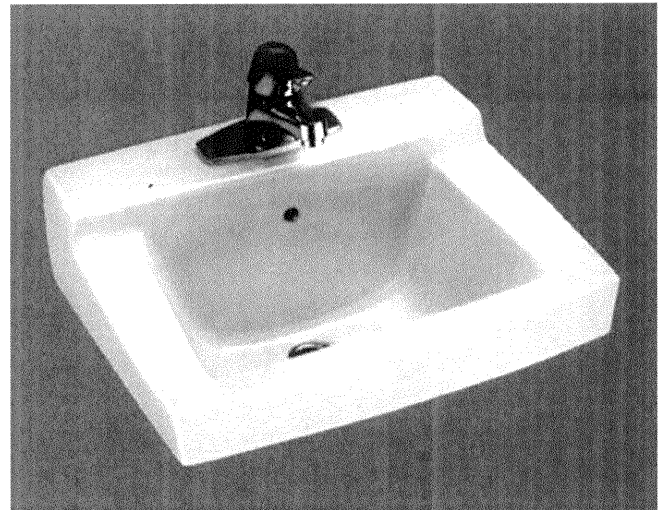
- ASME A112.19.2 for Vitreous China Fixtures

To Be Specified:

- Color: White Bone Silver
- Faucet*:
- Faucet Finish:
- Supplies:
- 1-1/4" Trap:
- Nipple:
- Concealed Arms Support (by others):

* See faucet section for additional models available

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.
Top of front rim mounted 864mm (34") from finished floor.



NOTES:
* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

MVP FAUCETS

857-E2805-665PSHABCP

Manual Faucets



a Geberit company

Product Type

Deck Mounted 4" Fixed Centers Single Supply Metering Sink Faucet

Features & Specifications

- 4" Fixed Centers
- 0.5 GPM (1.9 L/min) Vandal Proof Non-Aerating Spray
- 1-3/4" Vandal Proof MVP Metering Push Handle
- MVP Metering Adjustable Cycle Time Closure Cartridge
- 1/2" NPSM Supply Inlets and Coupling Nut for 3/8" or 1/2" Flexible Riser
- 4" Center to Center Deck Cover Plate
- 4 1/8" Center to Center Integral Cast Brass Spout
- ECAST® design provides durable construction with total lead content equal to or less than 0.25% by weighted average

Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

Warranty

- Lifetime Limited Faucet Warranty
- Year Limited Cartridge Warranty
- Year Limited Finish Warranty

Codes & Standards

- ASME A112.18.1/CSA B125.1
- California Health and Safety Code 116875 (AB1953-2006)
- Vermont Bill S.152
- NSF/ANSI 372 Low Lead Content
- ADA ANSI/ICC A117.1
- CALGreen

Job Name _____

Item Number _____

Section/Tag _____

Model Specified _____

Architect _____

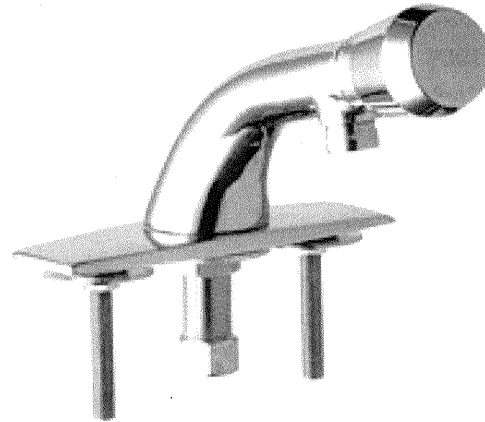
Engineer _____

Contractor _____

Submitted as Shown

Submitted with Variations

Date _____



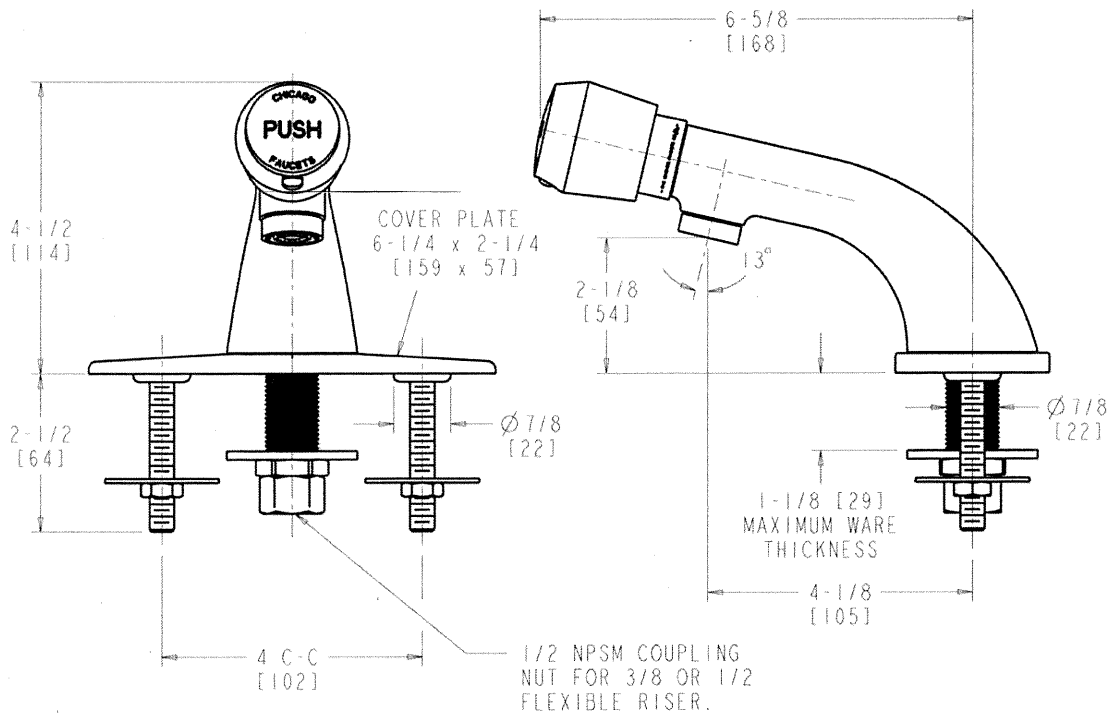
ECAST

ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.



Architect/Engineer Specification

Chicago Faucets No. 857-E2805-665PSHABCP, Sink Faucet, metering, single-supply, deck-mounted with 4" fixed centers, chrome plated. Integral, cast brass spout, 4-1/8" center-to-center. 0.5 GPM (1.9 L/min) vandal-proof, pressure compensating, Econo-Flo, non-aerating spray. 1-3/4" metal, vandal-proof, push handle with blue or red index button. MVP self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallon/cycle. 1/2" NPSM supply inlets and coupling nut for 3/8" or 1/2" flexible riser. Deck cover plate, 4" center-to-center. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen compliant. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen). This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen).



Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at www.chicagofaucets.com.

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.



2100 South Clearwater Drive
Des Plaines, IL
P: 847/803-5000
F: 847/803-5454
Technical: 800/TEC-TRUE
www.chicagofaucets.com

MECHANICAL FAUCETS

895-317E2805-5ABCP



a Geberit company

Manual Faucets

L-2
LAVATORY FAUCET

Product Type

Deck Mounted 4" Fixed Centers Hot and Cold Water Sink Faucet

Features & Specifications

- 4" Fixed Centers
- 3-1/2" Rigid / Swing Gooseneck Spout
- 0.5 GPM (1.9 L/min) Vandal Proof Non-Aerating Spray Outlet
- 4" Vandal Proof Wristblade Handle
- Quatern Compression Operating Cartridge
- 1/2" NPSM Supply Inlets and Coupling Nut for 3/8" or 1/2" Flexible Riser
- ECAST® design provides durable brass construction with total lead content equal to or less than 0.25% by weighted average
- CFNow! Item Ships in 5 Days

Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

Warranty

- Lifetime Limited Faucet Warranty
- 5-Year Limited Cartridge Warranty
- 1-Year Limited Finish Warranty

Codes & Standards

- ASME A112.18.1/CSA B125.1
- Certified to NSF/ANSI 61, Section 9 by CSA
- California Health and Safety Code 116875 (AB1953-2006)
- Vermont Bill S.152
- NSF/ANSI 372 Low Lead Content
- ADA ANSI/ICC A117.1
- CALGreen

Job Name _____

Item Number _____

Section/Tag _____

Model Specified _____

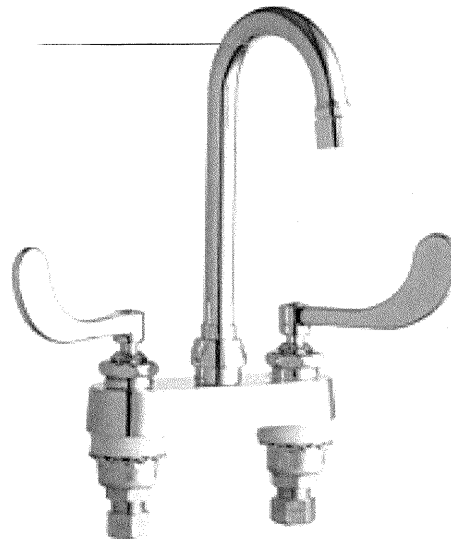
Architect _____

Engineer _____

Contractor _____

Submitted as Shown Submitted with Variations

Date _____



ECAST

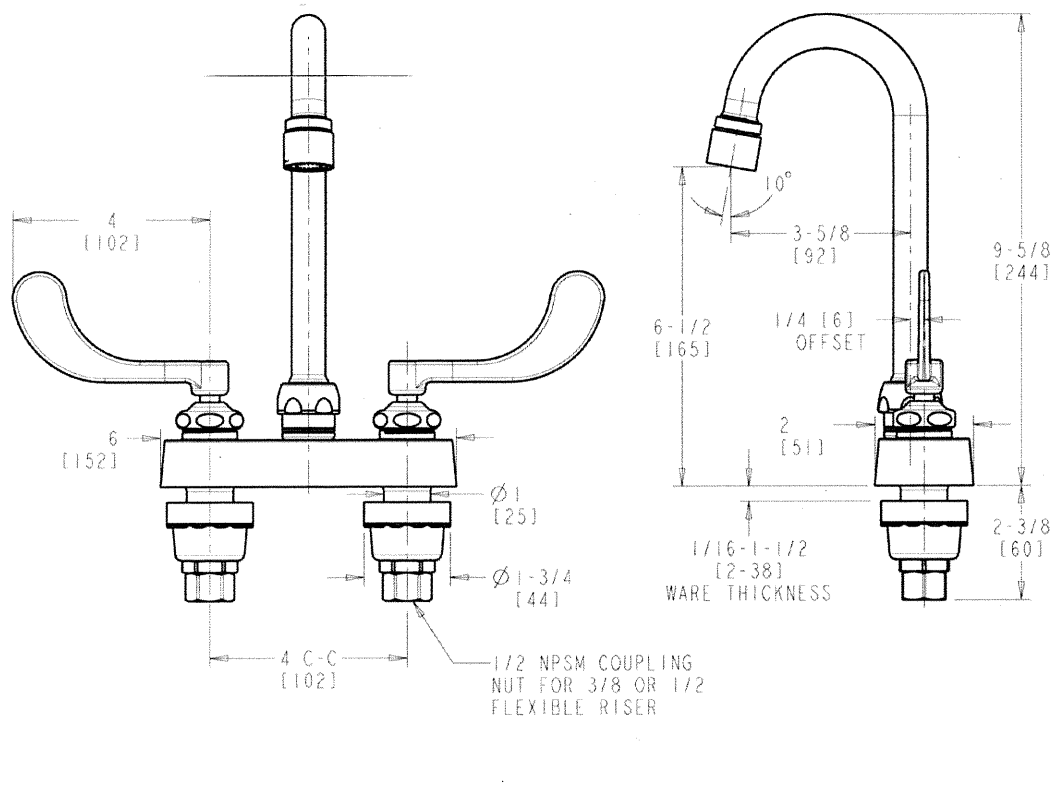
ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.



2100 South Clearwater Drive
Des Plaines, IL
P: 847/803-5000
F: 847/803-5454
Technical: 800/TEC-TRUE
www.chicagofaucets.com

Architect/Engineer Specification

Chicago Faucets No. 895-317E2805-5ABCP, Deck Mounted 4" Fixed Centers Hot and Cold Water Sink Faucet, Chrome Plated solid brass construction. 3-1/2" Center to Center Rigid / Swing Gooseneck Spout. 0.5 GPM (1.9 L/min) Vandal Proof Non-Aerating Spray Outlet. 4" Metal Vandal Proof Wristblade handle(s) with Sixteen Point Tapered Broach and Secured Blue and Red Buttons. Quatern™ rebuildable compression cartridge, opens and closes 90°, closes with water pressure, features square tapered stem. 1/2" NPSM Supply Inlets and Coupling Nut for 3/8" or 1/2" Flexible Riser. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen Compliant. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen).


Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at www.chicagofaucets.com.

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.



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www.chicagofaucets.com



Model
WEUS-1000.1001-0.13
Manual HEU Flushometer and HEU Urinal

DESCRIPTION

Complete HEU system with exposed manual Royal® urinal Flushometer and vitreous china urinal.

Flush Cycle

Model WEUS 1000.1001-0.13 (0.13 gpf/0.5 Lpf)



Meets the American Disabilities Guidelines and ANSI A117.1 requirements when installed according to these requirements.



NOTE: Plumbing System Requirements
√ Minimum **Flowing** Pressure: 25 PSI

SPECIFICATIONS

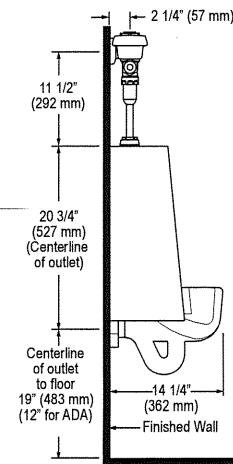
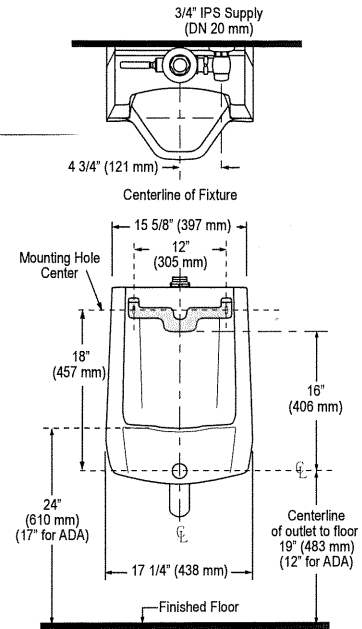
Quiet, exposed, diaphragm type, chrome plated urinal Flushometer and vitreous china urinal with the following features:

Flushometer

- PERMEX® Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- ADA compliant metal oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
- 3/4" I.P.S. Screwdriver Bak-Chek® Angle Stop
- Free spinning Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Spud Coupling and Flange for 3/4" Top Spud
- Sweat Solder Adapter w/Cover Tube and Cast Wall Flange with Set Screw
- High copper, low zinc brass castings for dezincification resistance
- Non-Hold-Open Handle, Fixed Metering Bypass and no external volume adjustment to ensure water conservation
- Flush accuracy controlled by CID® technology
- Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker molded from PERMEX® rubber compound for chloramine resistance
- Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037/ ASME A112.19.2/CSA B45.1

Urinal

- Wall hung vitreous china
- Washdown flushing action
- 3/4" I.P.S. top spud inlet
- 2" NPT outlet flange
- All mounting hardware included
- Integral flushing rim
- 100 % factory flush tested
- Compliant to the applicable sections of ASME A112.19.2/CSA B45.1
- Carrier not included
- Compatible with Jay R. Smith Carrier 0636 or 0637
- Compliant with Buy American Act when purchased as a combination



Sloan Valve Company is buying renewable energy certificates to meet 100% of the company's purchased electricity use at its Franklin Park, Illinois facility.

SLOAN

Sloan Valve Company
10500 Seymour Avenue
Franklin Park, IL 60131
Phone: 1-800-9-VALVE-9 (982-5839)
or 1-847-671-4300
Fax: 1-800-447-8329 or 1-847-671-4380
www.sloanvalve.com

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Rev. 0b (07/10)

This space for Architect/Engineer approval	
Job Name	Date
Model Specified	Quantity
Variations Specified	
Customer/Wholesaler	
Contractor	
Architect	



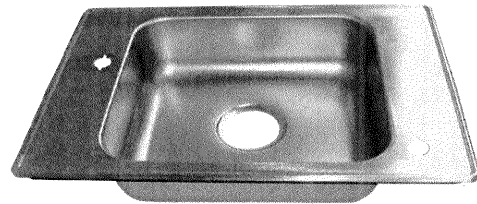
model **4210**
Deck Sink

FEATURES & BENEFITS

OPTIONS

- ❑ Drinking Faucet : Model 5054LF, lever handle, polished chrome-plated brass deck mounted drinking faucet with automatic stream regulation.
- ❑ Sink Faucet: Model 5510LF, stay-open lever handle, polished chrome-plated brass gooseneck faucet.
- ❑ Sink Faucet: Model 5530LF, stay-open hot-and-cold lever handled chrome-plated brass gooseneck faucet.
- ❑ Drinking Faucet: Model 5051LF, polished chrome-plated, self-closing, lever handle, sink or deck mounted bubbler valve with adjustable stream regulation.

To see all options for this model, visit www.hawesco.com



SPECIFICATIONS

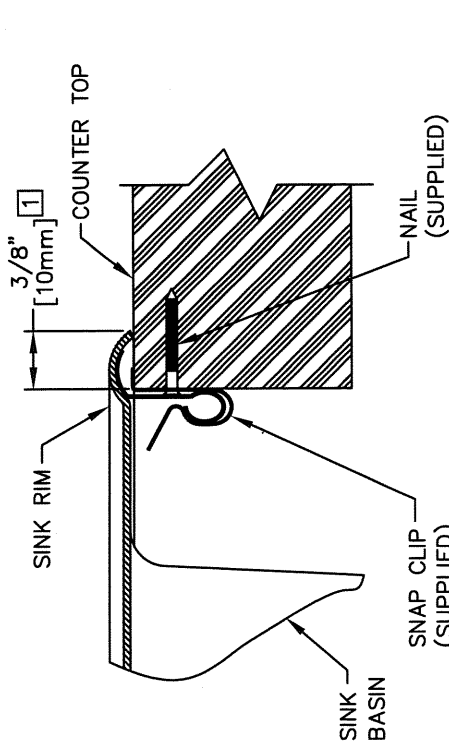
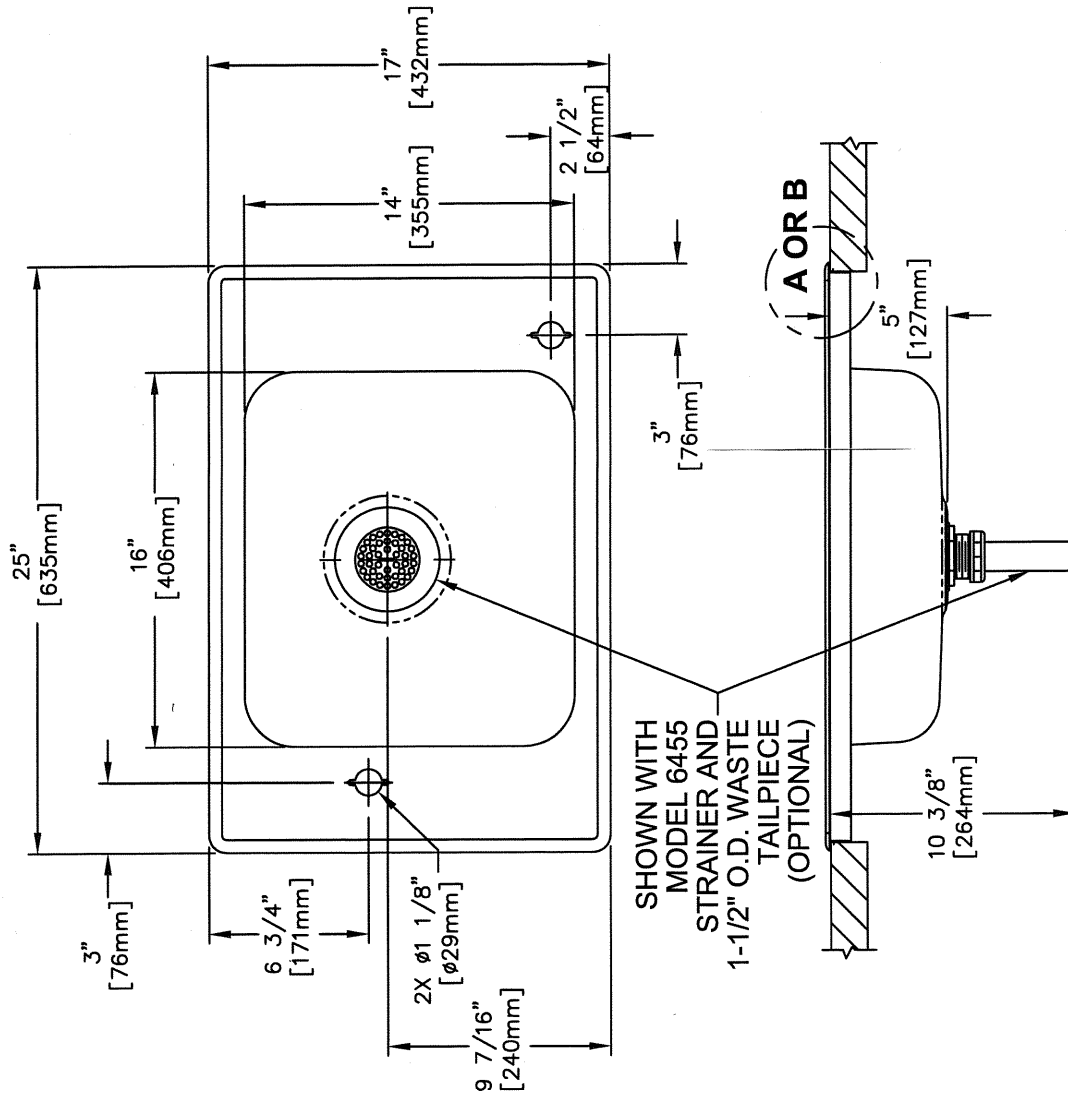
Model 4210 deck mounted sink shall include a Type 304 Stainless Steel satin-finish, 18 gauge stainless steel basin with integral rim and 25" x 17" x 5" (63.5 x 43.2 x 12.7 cm) deep dimensions and barrier-free capabilities when installation guidelines are followed, and two cross-slotted holes to accept faucets.

APPLICATIONS

Perfect for either public or private indoor settings, the 4210 is a great fit in areas where a countertop is the best fit for a drinking faucet/sink mount. Specifically, this type of deck mounted sink may be placed in settings such as: schools classrooms, laboratories, and other facilities where the need for a deck mounted sink/fountain is present. Dual purpose abilities allow the unit to provide multiple functions in one area and not take up excess space. Model meets all current Federal Regulations for the disabled including those in the Americans with Disabilities Act. Haws manufactures drinking fountains and electric water coolers to be lead-free by all known definitions including NSF/ANSI Standard 61, Section 9, NSF/ANSI 372, California Proposition 65, and the Federal Safe Drinking Water Act.

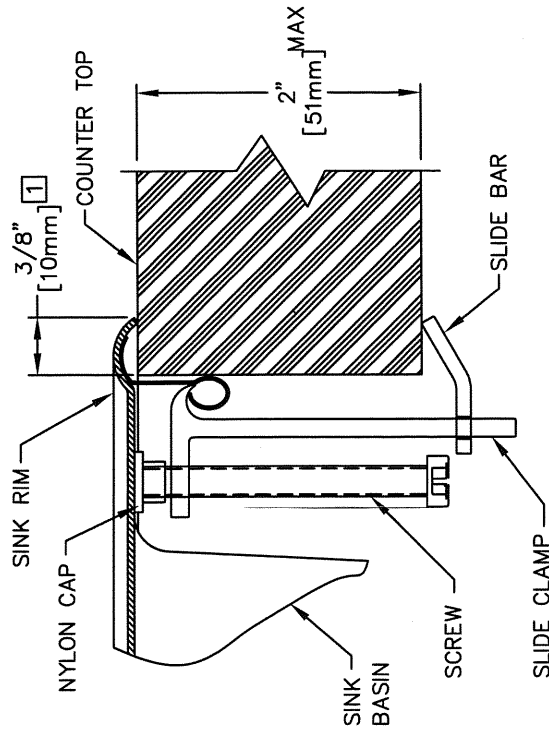


THIS DOCUMENT IS TRUE AND CORRECT AT TIME OF PUBLICATION. CONTINUED PRODUCT IMPROVEMENTS MAKE SPECIFICATIONS AND MEASUREMENTS SUBJECT TO CHANGE WITHOUT NOTICE.



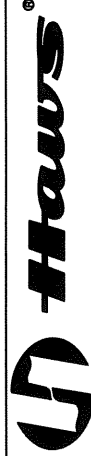
DETAIL A

SNAP CLIP MOUNTING SYSTEM (STANDARD)



DETAIL B

ADJUSTABLE SINK CLAMP MOUNTING SYSTEM (OPTIONAL) P/N 0001690117



1455 KLEPPE LANE
SPARKS, NEVADA 89431
(775) 359-4712 FAX (755) 359-7424
E-MAIL: HAWS@HAWS.CO.COM
WEBSITE: WWW.HAWS.CO.COM

ECN NO. REVISED PER BY:	ECN: 4603	HM	CHRD:	MODEL(S)	000207501 D
DRAWN:	DATE:	04/93	CJL	DRAWING NO.	02042C00 17
APPROVED:	DATE:			PART NUMBER	000207501 D
				SCALE: 1/8"	DRAWING TYPE: (REVISED)
				4210	SIZE: A 1 SHEET 1 OF 1

NOTE:

- 1 MAKE SURE CUTOUT IS 3/8" LESS THAN SINK RIM AROUND ALL EDGES.
- CAUTION: DO NOT CUT HOLE IN COUNTERTOP UNTIL SINK IS AT HAND.

MECHANICAL FAUCETS

350-E35-244ABCP



a Geberit company

Manual Faucets

Product Type

Deck Mounted Single Hole Single Supply Sink Faucet

Features & Specifications

- Single Hole
- 5-1/4" Rigid / Swing Gooseneck Spout
- 1.5 GPM (5.7 L/min) Aerator
- 2-3/8" Lever Handle
- Klo-Self Self-closing Cam and Cap Design Operating Cartridge
- 1/2" NPSM Supply Inlet with Coupling Nut for 3/8" or 1/2" Flexible Riser
- ECAST® design provides durable brass construction with total lead content equal to or less than 0.25% by weighted average

Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

Warranty

- Lifetime Limited Faucet Warranty
- 5-Year Limited Cartridge Warranty
- 1-Year Limited Finish Warranty

Codes & Standards

- ASME A112.18.1/CSA B125.1
- Certified to NSF/ANSI 61, Section 9 by CSA
- California Health and Safety Code 116875 (AB1953-2006)
- Vermont Bill S.152
- NSF/ANSI 372 Low Lead Content
- ADA ANSI/ICC A117.1
- CALGreen

Job Name _____

Item Number _____

Section/Tag _____

Model Specified _____

Architect _____

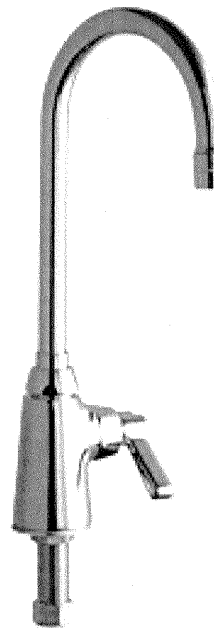
Engineer _____

Contractor _____

Submitted as Shown

Submitted with Variations

Date _____



ECAST

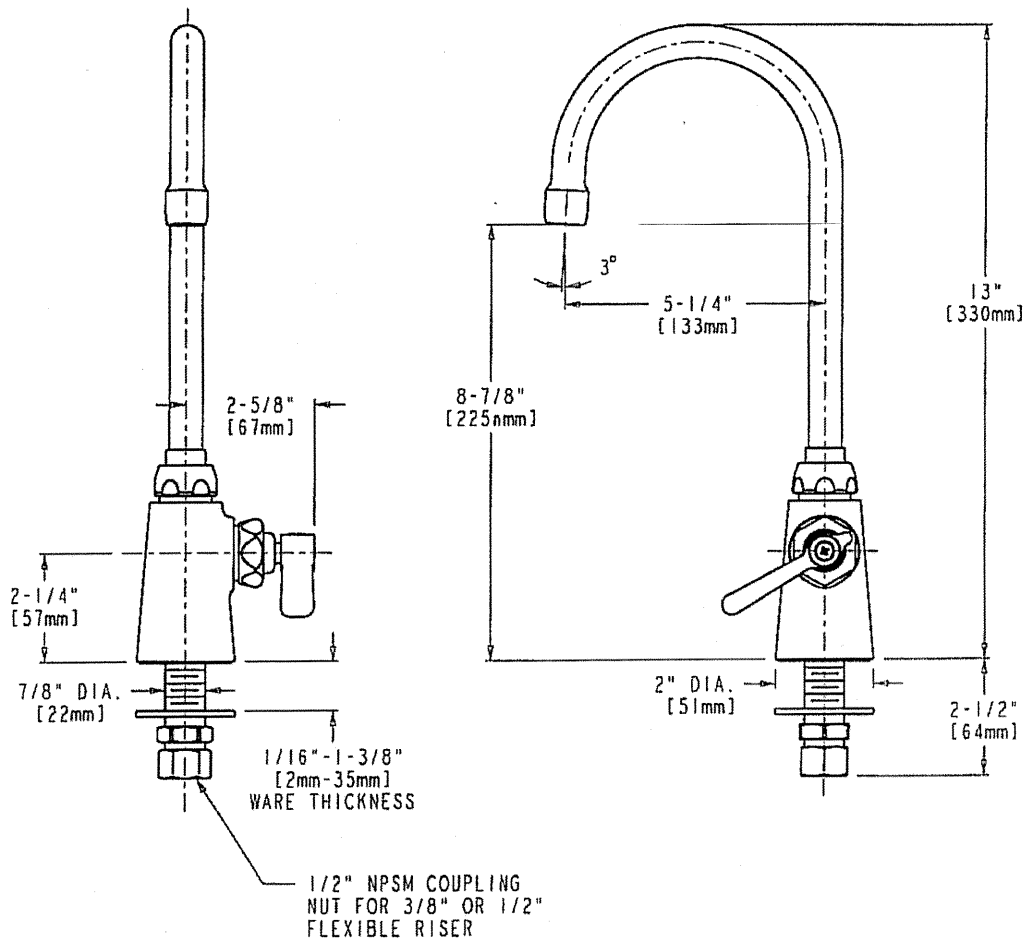
ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.



2100 South Clearwater Drive
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P: 847/803-5000
F: 847/803-5454
Technical: 800/TEC-TRUE
www.chicagofaucets.com

Architect/Engineer Specification

Chicago Faucets No. 350-E35-244ABCP, Deck Mounted Single Hole Single Supply Sink Faucet, Chrome Plated solid brass construction. 5-1/4" Center to Center Rigid / Swing Gooseneck Spout. 1.5 GPM (5.7 L/min) Pressure Compensating Softflo Aerator. 2-3/8" Metal Lever handle(s) with Sixteen Point Tapered Broach and Secured Blue Button. Klo-Self™ rebuildable self-closing cartridge, immediate shut-off, opens and closes 90° bi-directional, features square tapered stem. 1/2" NPSM Supply Inlet with Coupling Nut for 3/8" or 1/2" Flexible Riser. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen Compliant. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen).


Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at www.chicagofaucets.com.

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.



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www.chicagofaucets.com

MVP FAUCETS

748-665ABCP



a Geberit company

S-1 CLASSROOM SINK BUBBLER

Drinking Fountains

Product Type

Deck Mounted Single Hole Drinking Fountain

Features & Specifications

- Single Hole
- 1 3/4" Vandal Proof MVP Metering Push Handle
- MVP Metering Adjustable Cycle Time Closure Cartridge
- 1/2" NPSM Supply Inlet and Coupling Nut for 3/8" or 1/2" Flexible Riser
- Anti-Rotational Pins for Optional Field Installation
- Vandal Resistant Recessed Manual Volume Control
- ECAST® design provides durable brass construction with total lead content equal to or less than 0.25% by weighted average
- CFNow! Item Ships in 5 Days

Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

Warranty

- Lifetime Limited Faucet Warranty
- 5-Year Limited Cartridge Warranty
- 1-Year Limited Finish Warranty

Codes & Standards

- ASME A112.18.1/CSA B125.1
- Certified to NSF/ANSI 61, Section 9 by CSA
- California Health and Safety Code 116875 (AB1953-2006)
- Vermont Bill S.152
- NSF/ANSI 372 Low Lead Content
- ADA ANSI/ICC A117.1

Job Name _____

Item Number _____

Section/Tag _____

Model Specified _____

Architect _____

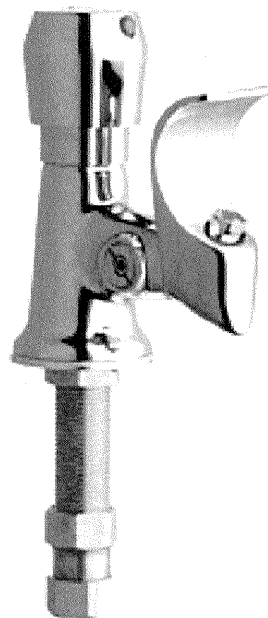
Engineer _____

Contractor _____

Submitted as Shown

Submitted with Variations

Date _____



ECAST

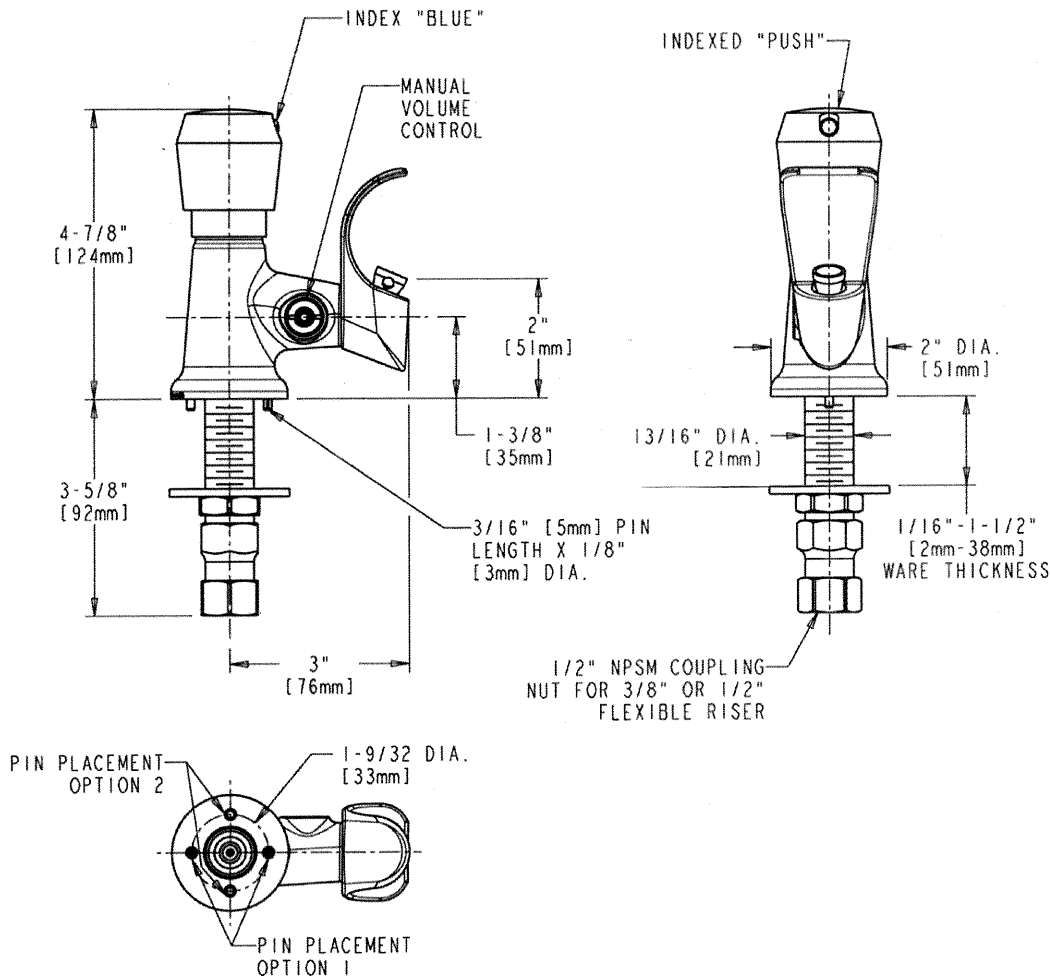
ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.

2100 South Clearwater Drive
 Des Plaines, IL
 P: 847/803-5000
 F: 847/803-5454
 Technical: 800/TEC-TRUE
 www.chicagofaucets.com



Architect/Engineer Specification

Chicago Faucets No. 748-665ABCP, Deck Mounted Single Hole Drinking Fountain, polished chrome plated solid brass construction. 1 3/4" Metal Vandal Proof MVP Metering Push handle(s) with Blue or Red Button. MVP™ self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.25 gallon/cycle. 1/2" NPSM Supply Inlet and Coupling Nut for 3/8" or 1/2" Flexible Riser. Anti-Rotational Pins for Optional Field Installation. Vandal Resistant Recessed Manual Volume Control. Mounting hardware included. ECAST® construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, and NSF/ANSI 372 Low Lead Content.



Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at www.chicagofaucets.com.

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.



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FLORWELL™ SERVICE SINK

- Enameled cast iron
- 3" outlet
- Corner model

7741.000 Fixture only - Less rim guard

7745.811 Removable vinyl rim guard

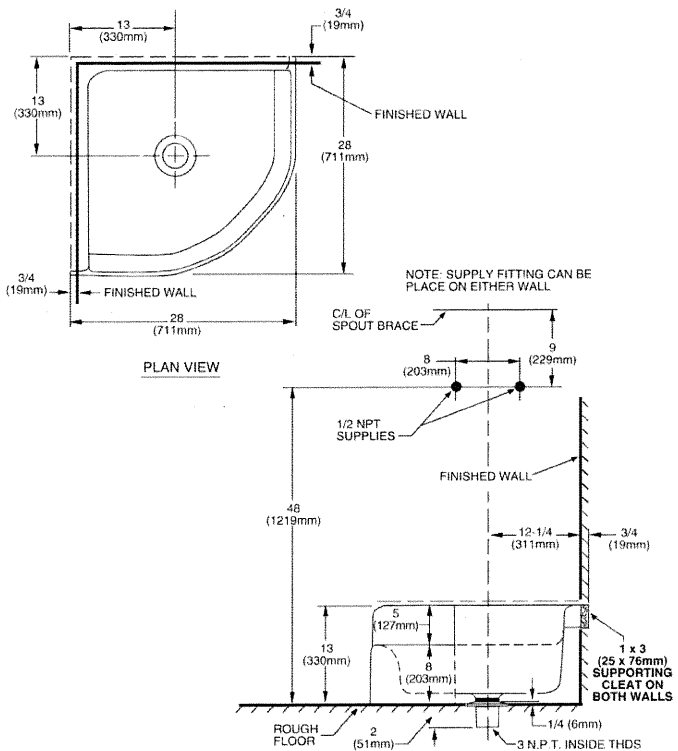
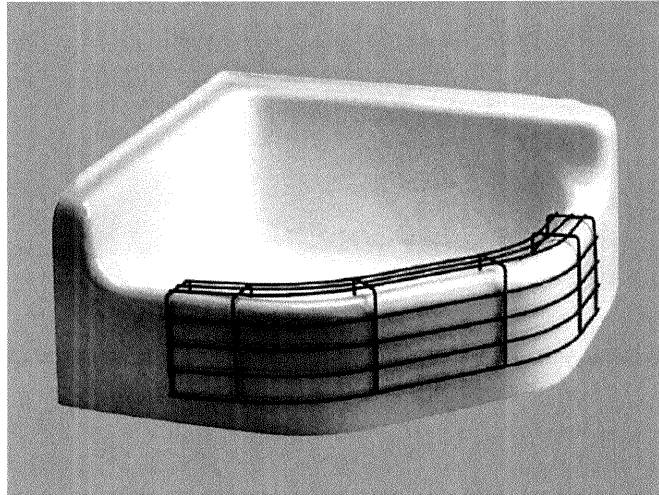
Nominal Dimensions:

711 x 711 x 330mm
(28" x 28" x 13")

Compliance Certifications -

Meets or Exceeds the Following Specifications:

- ASME A112.19.1 for Cast Iron Plumbing Fixtures



To Be Specified:

- Faucet: 8344.112 faucet with top brace, stops, and vacuum breaker
- Alternative Faucet:
- Drain: 7721.038 flat grid drain
- Removable vinyl-coated rim guard: 7745.811 (black)

NOTES:
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

MECHANICAL FAUCETS

445-897SRCXKCP



a Geberit company

SS-1 SERVICE SINK FAUCET

Sink Faucets

Product Type

Wall Mounted 3 3/8" Body, Adjustable Arms 3" - 8 3/8" Hot and Cold Water Sink Faucet

Features & Specifications

- 3 3/8" Body, Adjustable Arms 3" - 8 3/8"
- 5 3/4" Rigid Vacuum Breaker Spout with 3/4" Male Hose Thread and Pail Hook
- 2 3/8" Lever Handle
- Ceramic 1/4 Turn Operating Cartridge
- 2 1/2" Offset Supply Arm with Integral Shut-off Stop and Check Valve with 1/2" NPT Female Thread Inlet
- 2 5/16" Diameter Slip Flange
- Atmospheric Vacuum Breaker, Not Intended for Continuous Pressure Applications
- Atmospheric Vacuum Breaker, Not Intended for Continuous Pressure Applications
- CFNow! Item Ships in 5 Days

Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

Warranty

- Lifetime Limited Faucet Warranty
- 5-Year Limited Cartridge Warranty
- 1-Year Limited Finish Warranty

Codes & Standards

- ASME A112.18.1/CSA B125.1
- ADA ANSI/ICC A117.1

Job Name _____

Item Number _____

Section/Tag _____

Model Specified _____

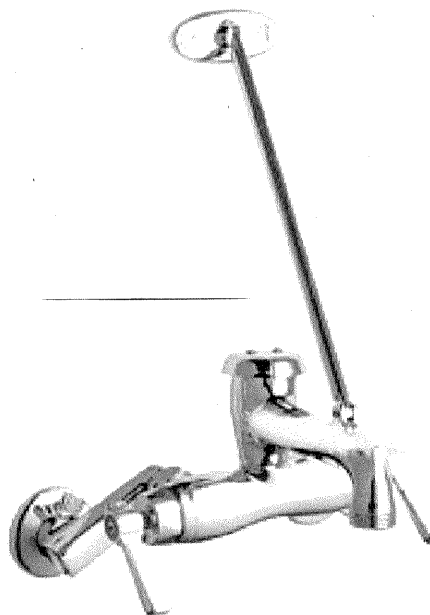
Architect _____

Engineer _____

Contractor _____

Submitted as Shown Submitted with Variations

Date _____



2100 South Clearwater Drive
Des Plaines, IL
P: 847/803-5000
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Technical: 800/TEC-TRUE
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model 1117L

Barrier-Free Dual Wall Mount Fountain

FEATURES & BENEFITS

PUSH BUTTON

With its patented stainless steel, push-button activated valve assembly which allows for front access stream adjustment as well as cartridge and strainer access, this fountain offers 100% lead free waterways. The valve works at an operating pressure range of 30 to 90 psi (2.1 to 6.2 bar).

CONSTRUCTION

Heavy-duty 14 gauge Type 304 Stainless Steel construction with integral 1/4" (.6 cm) mounting plates for extra durability. Unit also includes vandal-resistant bottom plates for added peace-of-mind.

INTEGRATED TRAP

Spacious fountain design allows for the trap to be internally mounted which allows for easy access, and aids and reduces the installation process.

QUALITY CONTROL

Both fountains are pre-built and fully water and pressure tested to ensure no leaks and proper function for reduced installation time and added peace of mind.

BACK PANEL

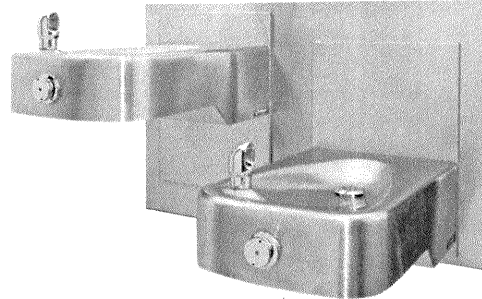
Stainless steel back panel helps to protect the wall from inadvertent splashing, and its decorative satin finish increases location visibility and completes the fountains attractive appearance.

CONFIGURABLE

Supplied with a low profile bowl, individual adjustable panels, and multiple mounting positions, this fountain can be configured for adult and child ADA considerations.

BUBBLER HEAD

Polished chrome-plated brass bubbler head features an integral basin shank for added strength, and is equipped with a shielded, anti-squirt orifice that provides a steady sanitary source of water.



SPECIFICATIONS

Model 1117L low profile "Hi-Lo" wall mounted barrier-free drinking fountain shall include dual 14 gauge Type 304 Stainless Steel satin finish basins with integral 1/4" (.6 cm) stainless steel mounting plates. Push-button operated stainless steel valves with front-accessible cartridge and flow adjustment provide 100% lead free waterways, polished chrome-plated brass vandal-resistant bubbler heads, polished chrome-plated brass vandal-resistant waste strainers, vandal-resistant bottom plates, stainless steel satin finish back panel, adjustable mounting allowing either basin high or low, in-wall mounting plate, and 1-1/4" IPS integral traps. Unit can be mounted to meet ADA or Child ADA specifications. REQUIRES MODEL 6717 PRICED SEPARATELY.

APPLICATIONS

Perfect for either public or private indoor/outdoor settings, Model 1117L is a great fit in areas where aesthetics are important to the overall appeal of the architecture. This series is precisely mounted, making it a nice addition to any surrounding. Beautiful satin finish helps to maintain the fountains overall appeal so it always remains looking as new as it did when it was installed. Specifically, this type of wall mounted drinking fountain may be placed in settings such as: schools and other locations in and around office buildings where the temperature remains above freezing. Model meets all current Federal Regulations for the disabled including those in the Americans with Disabilities Act. Haws manufactures drinking fountains and electric water coolers to be lead-free by all known definitions including NSF/ANSI Standard 61, Section 9, NSF/ANSI 372, California Proposition 65, and the Federal Safe Drinking Water Act. Product is compliant to California Health and Safety Code 116875 (AB 1953-2006).

OPTIONS

- ❑ Water Filter: Model 6426, 12" x 2" (30.5 x 5.1 cm), in-line lead removal element that reduces lead from incoming water supply.
- ❑ Support Frame: Model 6800 universal in-wall mounting support for use with most fountains.
- ❑ Remote Chiller: Model HCR8, 8 gph (30.3 L) remote water chiller provides instantaneous cooling to meet a continuous demand for chilled water.

To see all options for this model, visit www.hawsc.com



SMITH® JAY R. SMITH MFG. CO.®
 DIVISION OF SMITH INDUSTRIES, INC.
 POST OFFICE BOX 3237
 MONTGOMERY, ALABAMA 36109-0237 (USA)
 TEL: 334-277-8520 FAX: 334-272-7396 www.jrsmith.com



LOCATION

DRAWING NUMBER
S3980

SIZE
A

SCALE:
NONE

DATE:
9-19-85

APPROVED BY:
SJM

CHECKED BY:
JD

DRAWN BY:
PJ

3980

WE CAN ASSUME NO RESPONSIBILITY FOR USE OF SUPERSEDED OR VOID DATA

DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCE AND CHANGE WITHOUT NOTICE

ROOF-CEPTOR® INDIRECT WASTE DRAINS

12 1/2"(320) TOP - MEDIUM DEPTH RECEPTORS

FUNCTION: Recommended for use in roof areas to receive waste water from air conditioning units, cooling towers and other mechanical equipment installed on the roof. The solid water dam prevents storm water from entering the waste line. The large vandal proof dome bottom strainer provides ample drainage and prevents entry of debris.

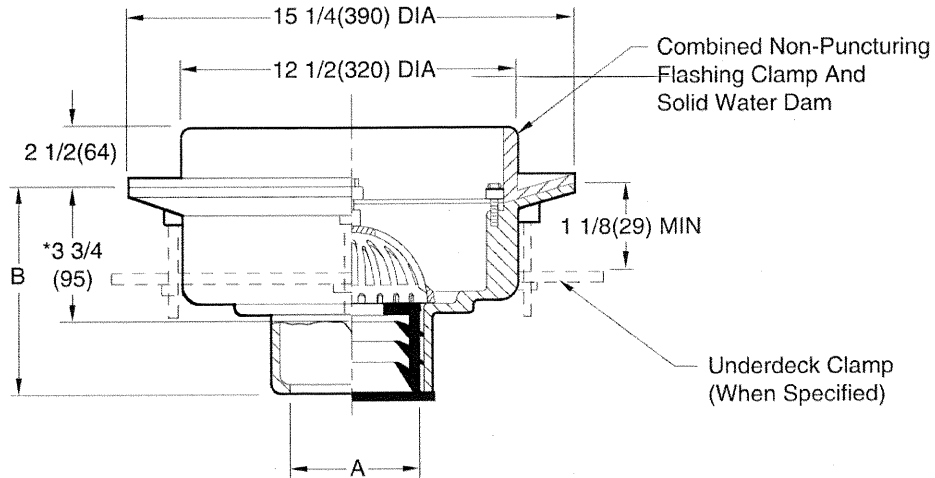


Fig. 3980C ... CAULK OUTLET
 Fig. 3980Y ... NO-HUB OUTLET

*This Dimension to Internal Stop of Speedi-Set Gasket

recommended deck openings:
 with suffix -R - 17"(430)
 less suffix -R - 14"(355)

A SIZE	02 (50)	03 (80)	04 (100)	05 (125)	06 (150)
B	5(125) for Caulk, NO-HUB and Speedi-Set. 3 3/4(95) for Threaded				

REGULARLY FURNISHED:
 Duco Cast Iron Receptor with Solid Water Dam and Cast Iron Dome Bottom Strainer Secured with Stainless Steel Vandal Proof Screws.

VARIATIONS:

- Extension -E
- L Speedi-Set Service Weight 02(50), 03(80) & 04"(100) sizes only
- LXH Speedi-Set Extra Heavy 02(50), 03(80) & 04"(100) sizes only
- Roof Sump Receiver -R
- Underdeck Clamp -UDC
- T Threaded Outlet

OPTIONAL MATERIALS:
 All Galvanized -G

NOTE: Dimensions shown in parentheses are in millimeters.

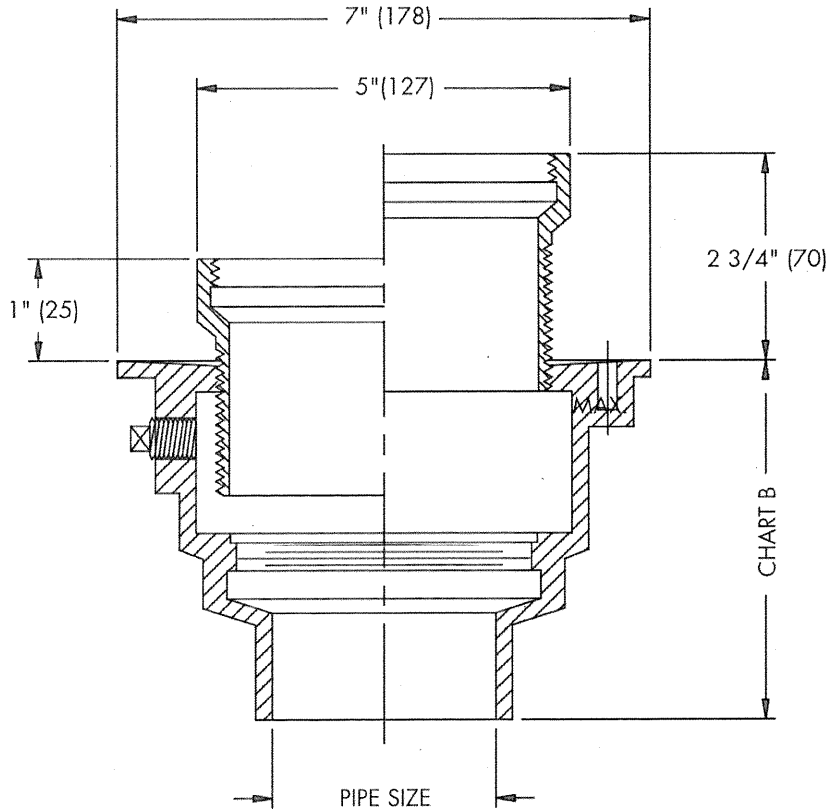
FIGURE NUMBER	REV.	DATE	DESCRIPTION	BY	CKD. BY	WEIGHT POUNDS	VOLUME CUBIC FEET	FIGURE NUMBER
3980	C	04/22/04	Added UDC to Variations Added Millimeters Submittal Update	JJ	CL			3980
	A	8-27-96		EMB	BS			
		7-26-94		EMB	BS			



FD-200-DD
Tag: _____

Floor Drain with Hub Funnel

SPECIFICATION: Watts Drainage FD-200-DD on-grade epoxy coated cast iron floor drain with anchor flange, weepholes, cast iron hub funnel, and no hub (standard) outlet.



Suffix	Free Area Sq. In.
DD-1	14
DD-50	14

Pipe Size	NH(MJ)	P	60/61
	No Hub	Push On	PVC/ABS
2"	4-1/2" (114)	5-1/2" (140)	4" (102)
3"	4-1/2" (114)	5-1/2" (140)	4" (102)
4"	4-3/4" (121)	5-1/2" (140)	4" (102)

Components	
Pipe Sizing (Select One)	
Suffix	Description
2	2" (51) Pipe Size <input type="checkbox"/>
3	3" (76) Pipe Size <input type="checkbox"/>
4	4" (102) Pipe Size <input checked="" type="checkbox"/>
Outlet Type (Select One)	
Suffix	Description
NH	No Hub (MJ) <input checked="" type="checkbox"/>
P	Push On <input type="checkbox"/>
Strainer (Select One)	
Suffix	Description
DD-1	Nickel Bronze <input type="checkbox"/>
DD-50	Cast Iron <input checked="" type="checkbox"/>
Options (Select One or More)	
Suffix	Description
-5	Sediment Bucket <input type="checkbox"/>
-6	Vandal Proof <input checked="" type="checkbox"/>
-7	Trap Primer Tapping <input type="checkbox"/>
-8	Backwater Valve <input type="checkbox"/>
-13	Galvanized Body <input type="checkbox"/>
Optional Body Material	
Suffix	Description
-60	PVC Body w/Socket Outlet <input type="checkbox"/>
-61	ABS Body w/Socket Outlet <input type="checkbox"/>

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

WATTS Drainage reserves the right to modify or change product design or construction without prior notice and without incurring any obligation to make similar changes and modifications to products previously or subsequently sold. See your WATTS Drainage representative for any clarification. Dimensions are subject to manufacturing tolerances.



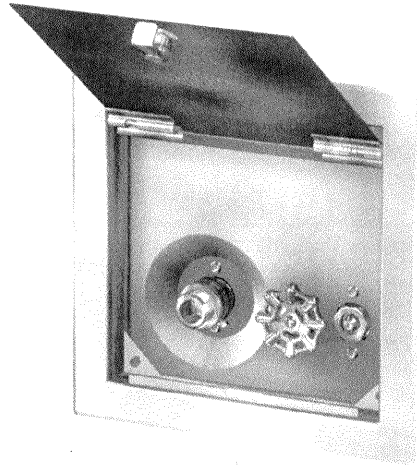
Specification Drainage Products

USA: 100 Watts Road, Spindale, NC, 28160-2298; TEL: 828-288-2179 TOLL-FREE: 1-800-338-2581 www.watts.com



Hose & Supply Boxes 8140 Series

Stainless Steel Recessed Hose Box with Wall Flange (Single Temperature)



8151

Fixture May Show Some Available Options

Please visit www.acorneng.com for most current specifications.

Stainless Steel Recessed Hose Box with Wall Flange (Single Temperature)

These Acorn Stainless Steel Recessed Hose Boxes are CUPC® by IAPMO certified for U.S. and Canada. Boxes are designed for attractive service in both interior and exterior walls not subject to freezing. Recessed design prevents accidents which are common to surface-mounted or protruding hose valves.

Hose Box is seamless construction, fabricated from 18 gage, type 304 stainless steel and is furnished with four stainless steel clips for anchoring to the wall construction. Wall flange is 16 gage stainless steel polished to a satin finish. Flange is furnished with four corner tappings and screws for anchoring to box.

Door is provided with Cam Cylinder Lock with two keys. Hinges are concealed type. Door can be easily removed after opening by releasing hinge pins with a screwdriver.

Valve and Stop Body is cast bronze with exposed parts chrome-plated. Valve and Stop feature tamper-resistant lockshield bonnets and replaceable cartridges containing all wearing parts including the seat. The body casting is gasketed where it joins the box and is securely anchored with stainless steel tamper-resistant screws. Supply inlet is 3/4" NPT female. Outlet is 3/4" male hose thread.

-SSLF stainless steel lead free option provides a rough finish, cast stainless steel valve body, stainless steel stop assembly, stainless steel lockshield cartridge and meets the lead free requirements where the wetted surface of this product contacted by water contains less than 0.25% lead. On models that include vacuum breakers, a lead-free brass vacuum breaker is provided.

Screwdriver Stop in supply permits servicing the control valve without shutting down the water supply. Vacuum breaker models prevent contamination of the potable water supply. Vacuum breakers are atmospheric type and conform to the requirements of ASSE Standard 1011. Check local code authority for vacuum breaker requirements.

GUIDE SPECIFICATION

Provide and install Acorn Recessed Hose Box model (specify model number) with Wall Flange. Box shall be fabricated from 18 gage, type 304 stainless steel with satin finish exterior. Flange shall be 16 gage stainless steel and be polished to a satin finish. Valve shall be cartridge-operated type with vandal-resistant lockshield, removable loose key wheel handle and screwdriver operated Stop. Door shall be 16 gage satin finish with removable hinge and Cylinder Lock.

Hose & Supply Boxes 8140 Stainless Steel Recessed Hose Box with Wall Flange (Single Temperature)



BASE MODEL NUMBER (Must Specify)

HOSE BOX WITH WALL FLANGE LESS DOOR

- 8140 Single Temperature Less Vacuum Breaker
- 8141 Single Temperature With Vacuum Breaker

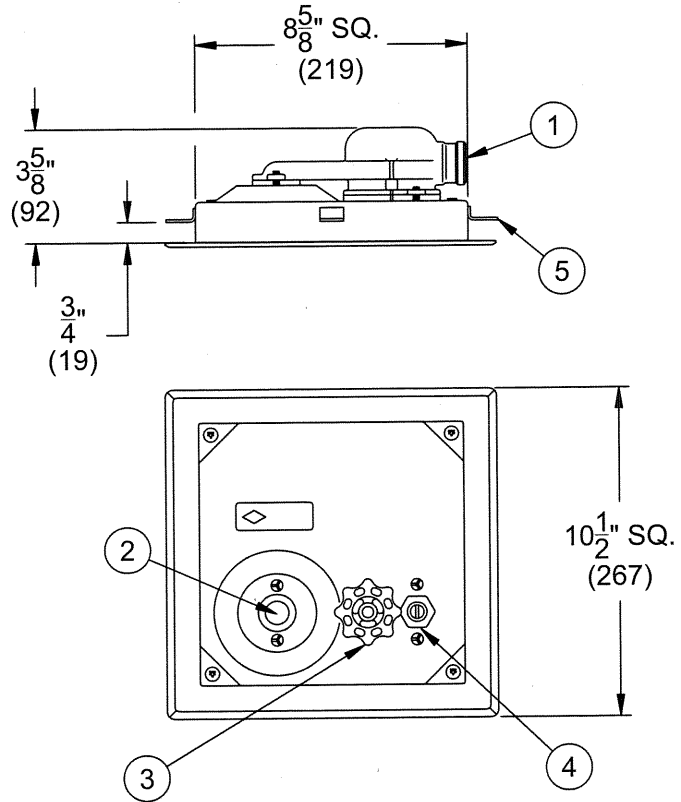
HOSE BOX WITH WALL FLANGE AND DOOR

- 8150 Single Temperature Less Vacuum Breaker
- 8151 Single Temperature With Vacuum Breaker

PRODUCT OPTIONS (Must Specify)

- SSLF Stainless Steel Lead Free

Please visit www.acorneng.com for most current specifications.



NOTES:

1. Supply Connection.
2. Hose Connection.
3. Wheel Handle (removable).
4. Screwdriver Stop.
5. Anchor Clips.

MODEL# 8140

<p>Important: Installation instructions and current rough-in are furnished with each fixture. Do not rough in without certified dimensions. Dimensions are subject to manufacturer's tolerance of plus or minus 1/4" and change without notice. Acorn assumes no responsibility for use of void or superseded data. © Copyright 2009 Acorn Engineering Company</p>	
<p style="text-align: center;">Selection Summary</p> <p>Model No. & Option _____</p> <p>Quantity _____</p>	<p style="text-align: center;">Approved for Manufacturing</p> <p>Company _____ Title _____</p> <p>Signature _____ Date _____</p>



Precision Plumbing Products

"Specify with Confidence - Install with Pride"

**MODEL P-1 & P-2
TRAP PRIMER VALVE**

www.pppinc.net

**"... Automatically maintains
a constant water seal in floor
drain traps."**

The Model P-1 & P-2 Trap Primer Valve is a precision device designed to deliver potable water to seldom used floor drains.

A pressure drop of 10 P.S.I.G. (70 Kpa) is required to activate the priming valve.

The Trap Primer must be installed on cold fresh water lines of 1 1/2" diameter or less.

The valves operating range is 20 to 80 PSIG (138 to 552 kpa).

SPECIFICATIONS:

Adjustable to line pressure.

Model P-1 will prime 1 - 4 floor drains using the P.P.P. Patented distribution system.

Model P-2 will prime 1 - 2 floor drains using the P.P.P. Patented distribution system.

The priming valve must have a minimum elevation of 12 inches (305mm) above the finished floor.

Must be installed on a cold water line serving a frequently used fixture such as urinal or a water closet.

PROJECT SUBMITTAL

Project: _____

Contractor: _____

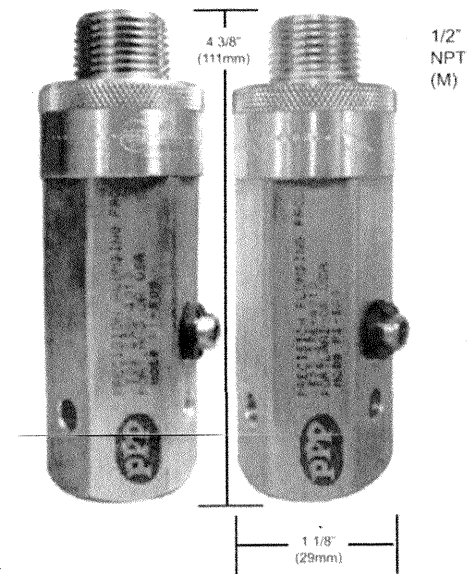
Engineer: _____

Date Submitted: _____

Prepared By: _____

Model P-1

Model P-2



MODEL P-1 & P-2 FLOOR DRAIN TRAP PRIMER VALVE

Machined of corrosion resistant brass. Piston operated, contains no springs or diaphragms. Easily adjusted to high or low pressures. Install anywhere on the line - at least 12" above the traps to insure proper flow.

Inlet opening is 1/2" NPT (M) (12mm BSP).

Outlet opening is 1/2" NPT (F) (12mm BSP).

PATENT NO. 5,263,508



TRAP PRIMER DISTRIBUTION UNITS

Distribution Units DU-4 & DU-U:

A metered amount of fresh cold water from the floor drain trap primer is distributed to as many as four (4) individual floor drain traps by means of the patented distribution unit.

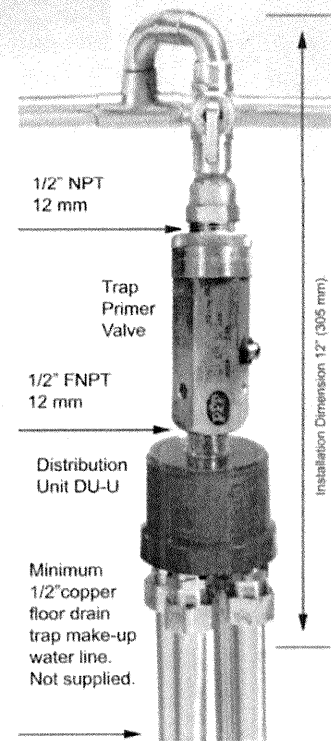
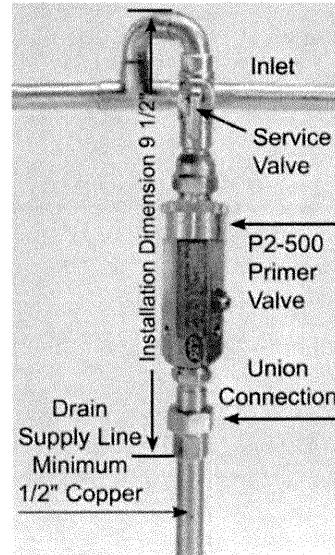
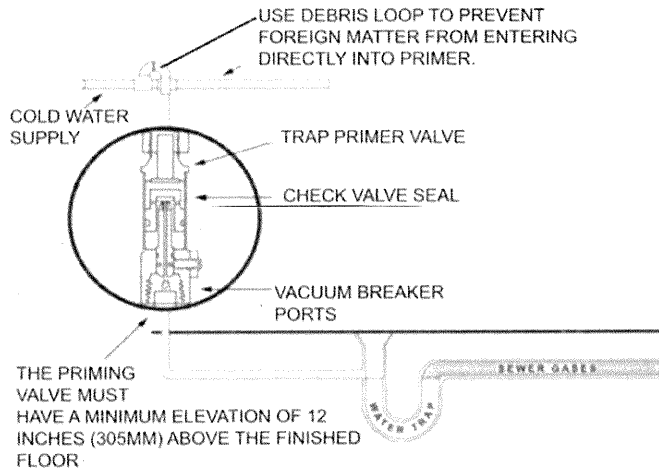
Primer Model	# of Drains	Distribution Units
P2-500	1	N/A
P2-500	2	DU-4/DU-U
P1-500	3	DU-4/DU-U
P1-500	4	DU-4/DU-U

NOTE: Consult plumbing inspector prior to installing distribution units.

DISTRIBUTION UNIT INSTALLATION:

- Must be installed level.
- Must be installed with clear plastic cover.
- Must be installed with access for periodic inspection.
- Do not subject Trap Primer Valve to rough in pressure test.

For further detail see information sheet specific for the distribution units.



Precision Plumbing Products

Division of JL Industries, Inc.

Airport Business Center
6807 NE 79th Court, Suite E
Portland, Oregon 97218

T (503) 256-4010
F (503) 253-8165

www.pppinc.net





Precision Plumbing Products
"Specify with Confidence - Install with Pride"

WHA

SYSTEM RATED PLUS WATER HAMMER ARRESTORS

PPP WATER HAMMER ARRESTORS ARE SPECIFIED FOR MANY INSTALLATIONS!

ONLY ONE MOVING PART!

SIZED IN ACCORDANCE WITH SERVICE PIPE DIMENSION

SYSTEM-RATED PLUS

Water Hammer Arrestors are specified for commercial, industrial and residential uses.

A maintenance-free installation is assured when using this type of arrestor...the only moving part is the free-moving piston furnished with "O"ring seals which have been tested for reliability in excess of normal operating ranges.

FLUID HAMMER IN FLUID TRANSMISSION LINES – a definition.

Fluid Hammer is a series of hydraulic shock waves generated within the confines of a piping system due to the sudden stopping of fluid flow. This condition is caused by fast closing of positive valves incorporated within the system. The effect of fluid hammer is damaging if allowed to exist for any length of time and will result in broken pipes and damage to other components in the system.



**40 Years
of outstanding performance**



SPECIFICATIONS & INSTALLATIONS

INSTALLATION: May be installed in new or existing plumbing systems with a standard pipe tee.

MAINTENANCE: Maintenance free – the piston is the only moving part.

TEMPERATURE RANGE: -40°F to + 212°F (-4.4°C to + 100°C)

CONSTRUCTION: Barrel-fabricated of type "L" hard drawn copper.

Cap: Machined of free turning brass, attached to barrel with 95-5 solder.

Piston and threaded adapter: Machined of free turning brass.

Seals: "O" rings: EPDM.

Seal Lubricant: Dow-Corning Silicone Compound #111, FDA listed for use in potable water systems.

Nickel Plated: For Salt Water Application.

OPERATING PRESSURE: Designed to operate on all domestic and commercial systems. Normal operating pressure 0 to 200 P.S.I.G., Max spike Pressure 400 P.S.I.G.

PDI SIZING AND SELECTION TABLE

PIPE SIZE	FIXTURE UNITS	CROSS REF. PDI
1/2"	1-11	A
3/4"	12-32	B
1"	33-60	C

Extract from: PDI WH201-06

NO ACCESS PANEL REQUIRED.
(CONSULT LOCAL CODE)

PROJECT SUBMITTAL

Project: _____

Contractor: _____

Engineer: _____

Date Submitted: _____

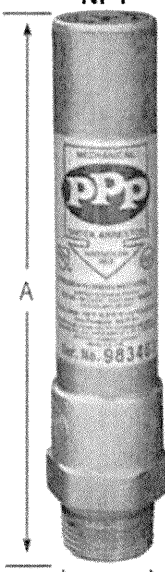
Prepared By: _____

SIZING INFORMATION

For equipment and fixtures not listed below, size in accordance with load values (WSFU) assigned the same. Extract from: PDI WH201-06

FIXTURE	TYPE OF SUPPLY CONTROL	WEIGHT IN FIXTURE UNITS			
		Public		Private	
		C.W.	H.W.	C.W.	H.W.
Water Closet	Flush Valve	8	-	5	-
Water Closet	Flush Tank	5	-	2.5	-
Pedestal Urinal	Flush Valve	4	-	-	-
Stall or Wall Urinal	Flush Valve	4	-	-	-
Stall or Wall Urinal	Flush Tank	2	-	-	-
Lavatory	Faucet	1 1/2	1 1/2	1	1
Bathub	Faucet	2	3	1 1/2	1 1/2
Shower Head	Mixing Valve	2	3	1	2
Bathroom Group	Flush Valve Closet	-	-	8	3
Bathroom Group	Flush Tank Closet	-	-	6	3
Separate Shower	Mixing Valve	-	-	1	2
Service Sink	Faucet	3	3	-	-
Laundry Tubs (1-3)	Faucet	-	-	3	3
Comb. Fixture	Faucet	-	-	3	3

NPT



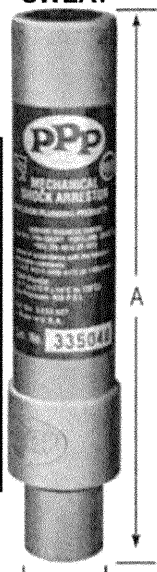
A

← B →

DIMENSIONAL AND AIR LOADING DATA

A O.A.L.	B N.P.T.	NITROGEN PRELOAD PSI	PART NUMBER
5"	1/2" brass	60	SC-500
6"	3/4" brass	60	SC-750
6 3/4"	1" brass	60	SC-1000
5"	1/2" brass	60	SWA-500
6"	3/4" brass	60	SWA-750
6 7/8"	1" brass	60	SWA-1000

SWEAT



A

← B →

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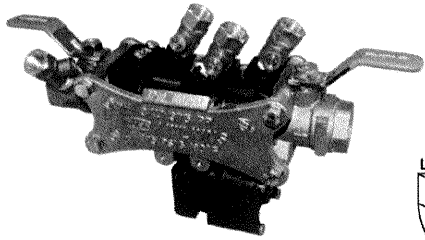




Model 375XL

Reduced Pressure Principle Assembly

SPECIFICATION SUBMITTAL SHEET



FEATURES

- Sizes: 1/2" 3/4" 1" 1-1/4" 1-1/2" 2"
- Maximum working water pressure 175 PSI
 Maximum working water temperature 180°F
 Hydrostatic test pressure 350 PSI
 End connections Threaded FNPT ANSI B1.20.1

OPTIONS

- (Suffixes can be combined)
- with full port QT ball valves (standard)
 - L - less ball valves, male pipe thread
 - S - with Model SXL lead-free bronze "Y" type strainer
 - FT - with integral male 45° flare SAE test fitting
 - AG - with air gap
 - SAG - with Model SXL lead-free bronze "Y" strainer and air gap
 - BOF - with Blow out/Flush fitting

ACCESSORIES

- Repair kits
- Thermal expansion tank (Mdl. XT)
- Soft seated check valve (Mdl. 40XL)
- Shock arrester (Model 1250XL)
- QT-SET Quick Test Fitting Set
- Test Cock Lock (Model TCL24)
- Blow out / Flush fitting (RK34-375BOF (1/2" or 3/4"), RK1-375BOF or RK114-350-375BOF))

APPLICATION

Ideal for use where lead-free* valves are required. Designed for installation on potable water lines to protect against both backsiphonage and backpressure of contaminated water into the potable water supply. Assembly shall provide protection where a potential health hazard exists.

STANDARDS COMPLIANCE

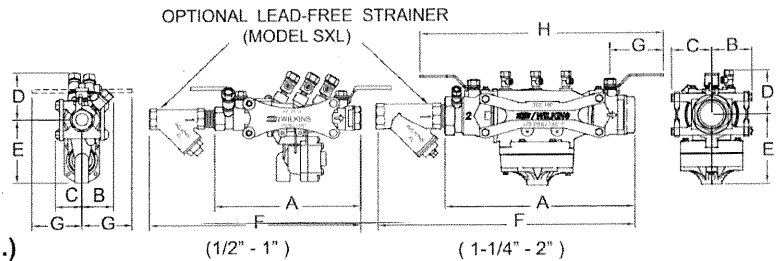
- ASSE® Listed 1013
- IAPMO® Listed
- CSA® Certified B64.4
- AWWA compliant C511
- Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California
- NSF® Listed-Standard 61, Annex G (3/4" - 2")
- UL® Classified (less shut-off valves only, 3/4"-2")
- C-UL® Classified (less shut-off valves only, 3/4"-2")

LEAD PLUMBING LAW COMPLIANCE

- (CA H&S Code §116875, VSA §2470h)
 *(0.25% MAX. WEIGHTED AVERAGE LEAD CONTENT)
- Lead Plumbing Law Certified by IAPMO R&T
 - Annex G Certified by NSF International (3/4" - 2")

MATERIALS

- Housing Reinforced Nylon, FDA approved
- Fasteners Stainless Steel, 300 Series
- Elastomers Silicone (FDA Approved)
- Buna Nitrile (FDA Approved)
- Internals Delrin, Nylon, NSF Listed
- Springs Stainless steel, 300 series
- Ball Valves Cast Bronze, ASTM B 584
- Struts Forged Brass, ASTM B 124



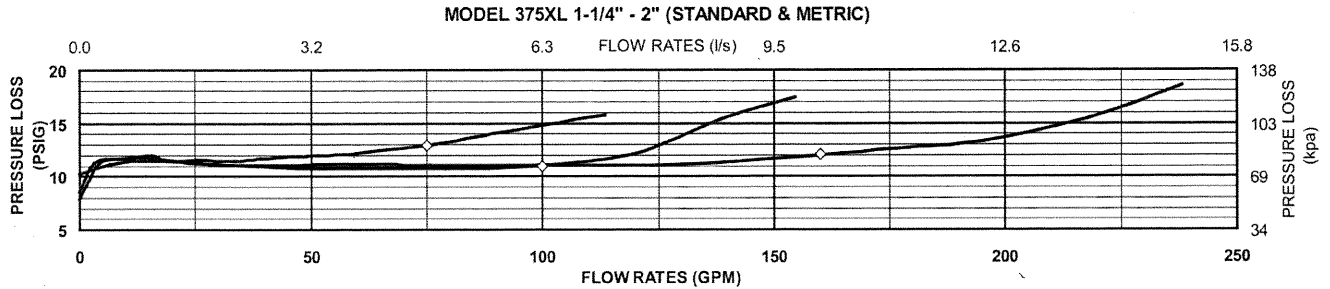
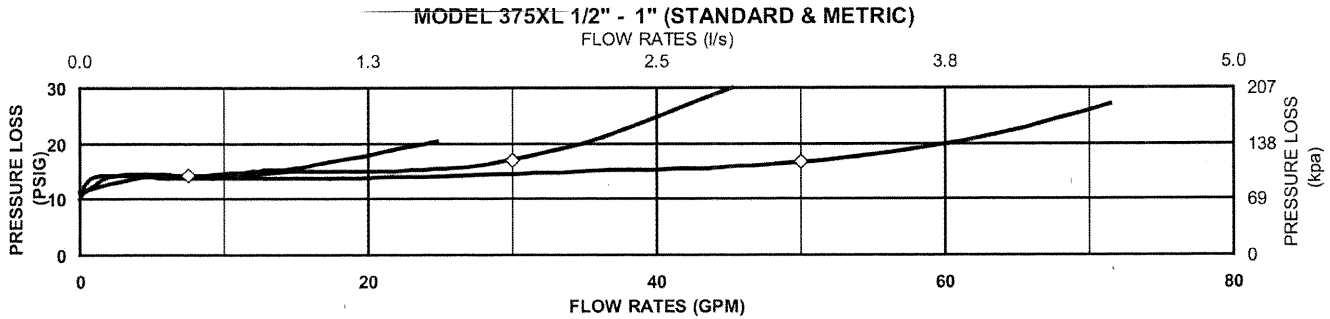
DIMENSIONS & WEIGHTS (do not include pkg.)

MODEL 375XL SIZE	DIMENSIONS (approximate)																				WEIGHT				
	A		A LESS BALL VALVES		B		C		D		E		F		G		H		J		LESS BALL VALVES		WITH BALL VALVES		
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg	lbs.	kg	
1/2	20	8 7/8	225	n/a	n/a	1 15/16	49	1 5/8	41	2 15/16	75	3 7/8	98	12 1/4	311	3	76	10 7/8	276	12 1/4	311	4.7	2.1	5.7	2.6
3/4	20	8 7/8	225	7 1/8	181	1 15/16	49	1 5/8	41	2 15/16	75	3 7/8	98	12 5/8	321	3	76	11	279	12 1/4	311	4.7	2.1	5.7	2.6
1	25	11 3/16	284	8 7/8	225	2 1/4	57	2 1/4	57	3 7/16	87	4	102	14 9/16	370	4	102	13 3/4	349	15 1/4	387	8.2	3.7	9.7	4.4
1-1/4	32	14 7/8	378	14 3/8	367	3 3/8	86	3 3/8	86	3 3/4	95	5 3/4	146	20 1/2	521	3 3/4	95	18	457	18 1/2	470	18.7	8.5	20.5	9.3
1-1/2	40	15 1/4	387	14 3/8	367	3 3/8	86	3 3/8	86	3 3/4	95	5 3/4	146	22	559	4 1/2	114	18 3/4	476	20 1/4	514	18.3	8.0	21.5	9.8
2	50	16	406	14 3/8	367	3 3/8	86	3 3/8	86	3 3/4	95	5 3/4	146	24	610	4 3/4	120.7	20 3/4	527	20 3/4	527	19.4	8.8	23.5	10.7

(Patent No. 6,513,543 & 7,784,483)

DOCUMENT #: BF-375XL(SM) REVISION: 8/11

FLOW CHARACTERISTICS

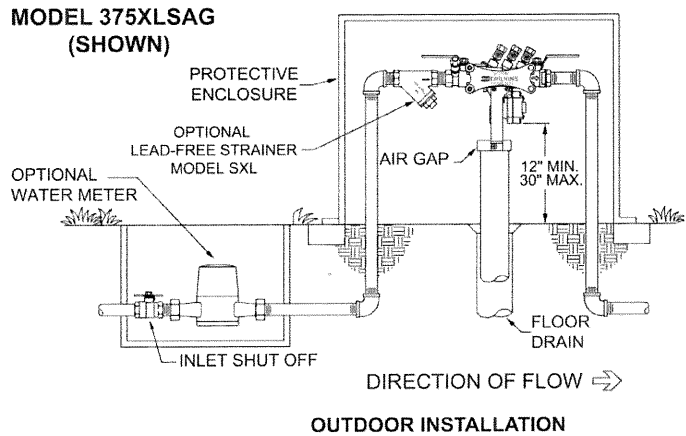
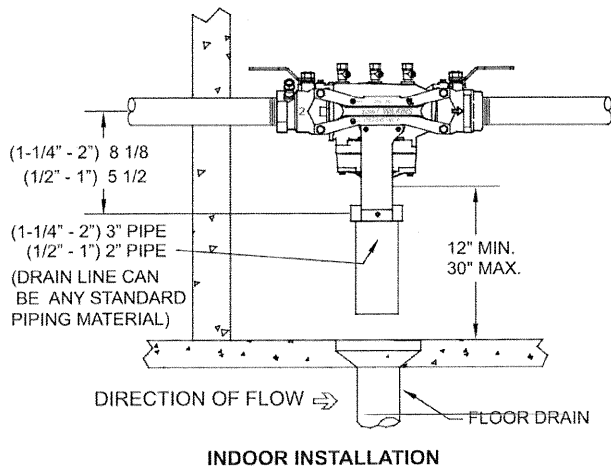


◇ Rated Flow (Established by approval agencies)

TYPICAL INSTALLATION

Local codes shall govern installation requirements. To be installed in accordance with the manufacturers' instructions and the latest edition of the Uniform Plumbing Code. Unless otherwise specified, the assembly shall be mounted at a minimum of 12" (305mm) and a maximum of 30" (762mm) above adequate drains with sufficient side clearance for testing and maintenance. The installation shall be made so that no part of the unit can be submerged.

Capacity thru Schedule 40 Pipe				
Pipe size	5 ft/sec	7.5 ft/sec	10 ft/sec	15 ft/sec
3/8"	3	4	6	9
1/2"	5	7	9	14
3/4"	8	12	17	25
1"	13	20	27	40
1 1/4"	23	35	47	70
1 1/2"	32	48	63	95
2"	52	78	105	167



SPECIFICATIONS

The Reduced Pressure Principle Backflow Preventer shall be ANSI 3rd party certified to comply with states' lead plumbing law 0.25% maximum weighted average lead content requirement, shall be ASSE® Listed 1013, rated to 180°F, and supplied with full port ball valves. The main body shall be Nylon and the seat disc elastomers shall be silicone. If installed indoors, the installation shall be supplied with an air gap adapter. The Reduced Pressure Principle Backflow Preventer shall be a WILKINS Model 375XL.



Configure your tankless water heater

Select from the options below to find a product that will best fit you.



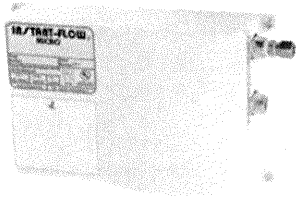
Voltage

Find the tankless water heater that will support your voltage output.
Choose the voltage coming from your facility.

Choose your voltage to proceed to the next step

[208 Volts](#) [240 Volts](#) [277 Volts](#)

Chronomite M-40



- 208 Volts
- 1.0 GPM Flow Rate
- Temp Rise: 57 °F
- Preset: 110, or 120 °F
- 40 Amps
- 8320 Watts
- 99% Energy Efficient

Please record this model number for your records

[Share / Save](#)

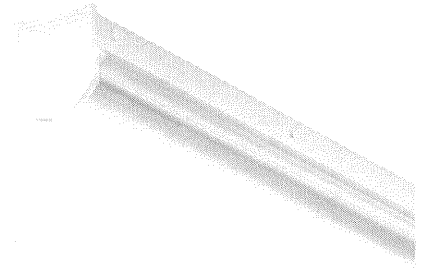
[Print This Page](#)

Appendix F

Light Fixture Cut Sheets

Revolutionize linear lighting with LED

FLUXSTREAM LED LINEAR



PHILIPS DAY-BRITE/CFI FLUXSTREAM LED LINEAR

The FluxStream LED linear is a new, high performing luminaire delivering smooth diffuse light ideal for light industrial, commercial and residential applications with the unparalleled energy efficiency of Philips LED lighting.

Project: HOOVER HS
 Location: _____
 Catalog No: _____
 Fixture Type: A1, A1E
 Mfg: _____ Qty: _____
 Notes: _____

Ordering guide

example: LF8FR3940USZT

Series	Length	Lens	Lumens ¹	Color	Voltage	Driver	Options
<input type="checkbox"/> LF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LF FluxStream	4 4' length 8 8' length (nominal)	FR 100% Frost 10 10% Frost	31 3100 lumens ² 39 3900 lumens ² 41 4100 lumens ³ (nominal)	40 4000K 35 3500K	U Universal 120/277V 3 347V	LAG LED driver DZT 0-10v dimming SZT Step dimming (100-40)	EM⁴ Factory wired remote emergency pack. Nominal 1100 lm

- Lumen package per 4' nominal length
- Only available with (FR) 100% frost lens option.
- Only available with (10) 10% frost lens option.
- Emergency (EM) – factory wired surface mount housing assembly is remote mounted from the fixture. Standard flex length is 6'. Consult factory for optional lengths. Nominal 1100 lumen output.
- LF43940 FluxStream input power is 40W compared to a 2x2F28T5 strip drawing 63W.

Accessories (order separately)

- LCFPL** – Continuous Row Joiner: Required for row mounting. Number of joiners required per row is equal to one less than the number of luminaires per row.
- FH360-120** – 120V motion sensor, field installed via 7/8" KO on end cap
- FH360-277** – 277V motion sensor, field installed via 7/8" KO on end cap
- FH360-347** – 347V motion sensor, field installed via 7/8" KO on end cap
- LF4WGW** – Wireguard, white
- LF4LNFR** – 100% frosted replacement lens
- LF4LN10** – 10% frosted replacement lens

General Notes:

Many luminaire components, such as reflectors, refractors, lenses, sockets, lampholders, and LEDs are made from various types of plastics which can be adversely affected by airborne contaminants. If sulfur based chemicals, petroleum based products, cleaning solutions, or other contaminants are expected in the intended area of use, consult factory for compatibility.

Mounting Accessories (order separately)

Stem and Canopy Sets: Suspend the luminaire 12", 18", 24", 36", or 48" from surface. Two per luminaire recommended.

SV5F12 – 12" **SV5F24** – 24" **SV5F48** – 48"
SV5F18 – 18" **SV5F36** – 36"

Chain Hanging Kit: Includes two 24" heavy duty link chains with sturdy "V" hook for luminaire suspension.

EE9HC – Two 24" chains and "V" hooks

Aircraft Cable Kit:

Power feed cable/canopy kit (adjustable 6" to 60")
SVCC60-UNV – 120/277V **SVCC60-347** – 347V
 Cable and canopy kit (adjustable 6" to 60")
SVC60



PHILIPS
Day-Brite

PHILIPS
CFI

FLUXSTREAM LED LINEAR

Features

- Sleek and compact design ideal for installation in tight spaces.
- Rugged 100% frost acrylic lens shields LEDs from direct view.
- Capable of providing 3900 lm per 4' (nominal) length with 100% frost lens.
- High lumen package with 10% frost lens provides up to 4100 lm per 4' (nominal) length.
- Long life LEDs provide 100,000 hours (L70) LED lumen maintenance.
- Variety of mounting options for installation flexibility.
- Wall mountable – ADA compliant.
- Snap in LED pan and single grounding screw for easy installation.
- Row mountable with continuous row joiner.
- 3900 lm package version capable of providing similar light levels to a (2) 28W T5 strip while using 33% less energy⁵.

- Dimming options and motion detector accessories available.
- Ideal for installation in refrigerated areas (down to -20°C).
- Enclosed lens minimizes penetration of dust, insects and other debris into the lamp compartment.
- 8' tandem unit available.
- Fully enclosed wiring and LED diodes.
- 80+ CRI and excellent color consistency.
- Fluxstream luminaires are Designlights Consortium[®] qualified. Please see the DLC QPL list for exact catalog numbers (<http://www.designlights.org/QPL>).

Finish

Baked white acrylic matte high reflectance paint finish.

Shielding

Contoured frosted acrylic lens.

Electrical

LED boards and drivers are RoHS (Restriction of Hazardous Substances) compliant. 0-10V dimming and 100/40 step dimming options available. Total system life rated at 50,000 hours. Maximum ambient temperature of 25°C when surface mounted or 30°C when suspended. Suitable for cold locations - minimum ambient temperature of -20°C. Predicted L70 lifetime based on LED manufacturer's supplied LM-80 data and in-situ laboratory testing.

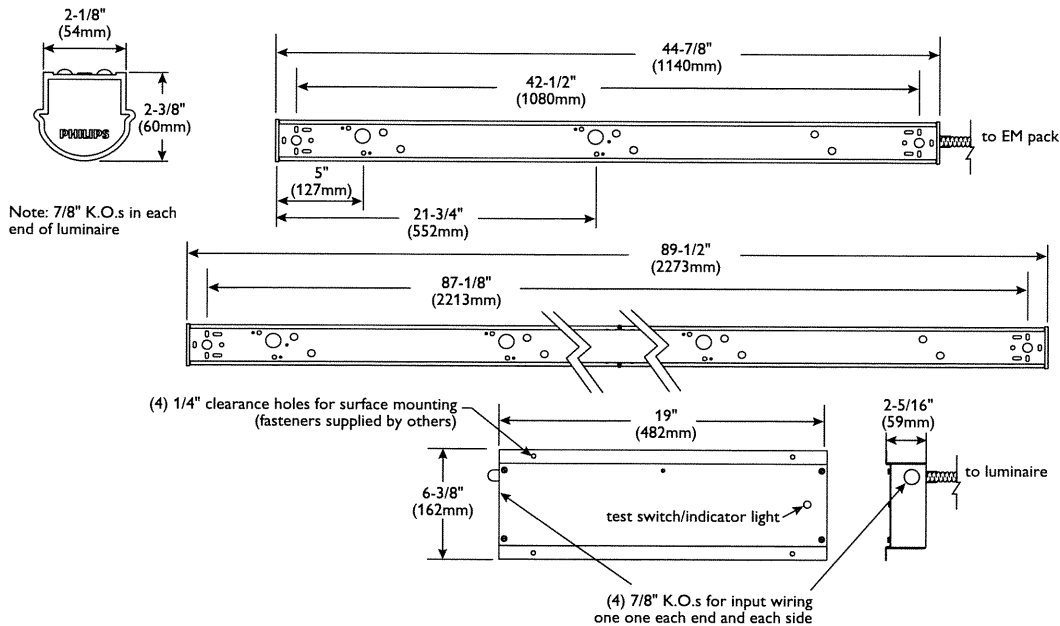
Materials

Heavy gauge cold rolled steel housing and LED pan. Polycarbonate injection molded end caps.

Labels

cETLus listed.
Suitable for damp locations.

Dimensions



FluxStream 4' with 10% frost lens, 40W LED, 4000K, 4100 lumens

Cat No: LF4104140ULAG

Report no¹: C12188
Output lumens: 4134lms
CCT²: 4000K
Input watts³: 40.5W
Efficacy: 102.0lm/w
CIE type: Direct
Plane: 0° 90°
Spacing crit.: 1.3 1.2
Luminous length: 44.04 2.04

Candela distribution

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0	1265	1265	1265	
5	1255	1272	1236	122
15	1195	1222	1192	341
25	1077	1121	1110	511
35	912	982	990	605
45	716	816	842	615
55	512	632	676	548
65	324	454	507	432
75	170	303	359	301
85	52	188	242	185
90	6	145	196	
95	3	109	158	105
105	3	60	100	58
115	3	14	56	21
125	3	12	4	10
135	3	13	11	8
145	3	9	15	5
155	2	5	10	3
165	2	3	3	1
175	2	2	2	0
180	2	2	2	

Zonal summary (total efficiency)

Zone	Lumens	%Luminaire
0-30	1109	26.86
0-40	1818	44.03
0-60	3211	77.76
0-90	4063	98.40
40-90	2245	54.37
60-90	852	20.64
90-180	66	1.60
0-180	4129	100.00

Average Luminance (cd/m²)

Vertical Angle	Horizontal Angle		
	0°	45°	90°
45	23302	2453	23586
55	21354	23345	22746
65	17550	21514	20989
75	12144	1872	18502
85	6012	21234	21037

Coefficients of utilization

Ceiling	80%			50%			30%			
	70	50	30	50	30	10	50	30	10	
RC	Zonal cavity method									
RW	Effective floor reflectance = 20%									
Room Cavity Ratio	1	109	104	100	97	94	92	93	91	89
	2	100	92	86	86	82	77	83	79	75
	3	91	82	74	77	71	66	74	69	64
	4	84	73	65	69	62	57	67	61	56
	5	78	65	57	62	55	49	60	54	49
	6	72	59	50	56	48	43	54	47	42
	7	66	52	44	50	42	37	48	42	37
	8	61	48	39	45	38	33	44	37	33
	9	56	43	35	41	34	29	40	33	29
	10	52	39	31	38	31	26	37	30	25

FLUXSTREAM LED LINEAR

FluxStream 4' with 100% frost lens, 40W LED, 4000K, 3900 lumens

Cat No: LF4FR3940ULAG

Report no¹: C12167
 Output lumens: 3874 lms
 CCT²: 4000K
 Input watts³: 40.1W
 Efficacy: 97 lm/w
 CIE type: Direct
 Plane: 0° 90°
 Spacing crit.: 1.2 1.3
 Luminous length: 44.04 2.04

Candela distribution

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0	1265	1265	1265	
5	1255	1272	1236	122
15	1195	1222	1192	341
25	1077	1121	1110	511
35	912	982	990	605
45	716	816	842	615
55	512	632	676	548
65	324	454	507	432
75	170	303	359	301
85	52	188	242	185
90	6	145	196	
95	3	109	158	105
105	3	60	100	58
115	3	14	56	21
125	3	12	4	10
135	3	13	11	8
145	3	9	15	5
155	2	5	10	3
165	2	3	3	1
175	2	2	2	0
180	2	2	2	

Zonal summary (total efficiency)

Zone	Lumens	%Luminaire
0-30	974	25.16
0-40	1579	40.81
0-60	2742	70.86
0-90	3659	94.55
40-90	2080	53.74
60-90	917	23.69
90-180	211	5.45
0-180	3870	100.00

Coefficients of utilization

Ceiling	80%			50%			30%			
	70	50	30	50	30	10	50	30	10	
Wall	70	50	30	50	30	10	50	30	10	
RC	Zonal cavity method									
RW	Effective floor reflectance = 20%									
Room Cavity Ratio	1	107	102	98	94	91	88	89	86	84
	2	97	89	82	82	77	73	78	74	70
	3	89	79	71	73	67	62	70	64	60
	4	82	70	61	65	58	53	62	56	51
	5	75	62	53	58	50	45	55	49	44
	6	69	56	47	52	45	39	50	43	38
	7	63	50	41	47	39	34	45	38	33
	8	59	45	36	42	35	30	41	34	29
	9	54	41	32	38	31	26	37	30	25
	10	50	37	29	35	28	23	33	27	22

Average Luminance (cd/m²)

Vertical Angle	Horizontal Angle		
	0°	45°	90°
45	17826	20399	21062
55	15710	19492	20844
65	13501	19007	21223
75	11548	20621	24541
85	10428	38152	49146

FluxStream 4' with 100% frost lens, 40W LED, 4000K, 3100 lumens

Cat No: LF4FR3140ULAG

Report no¹: C12185
 Output lumens: 3135 lms
 CCT²: 4000K
 Input watts³: 31.0W
 Efficacy: 101.0 lm/w
 CIE type: Direct
 Plane: 0° 90°
 Spacing crit.: 1.2 1.3
 Luminous length: 44.04 2.04

Candela distribution

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0	1027	1027	1027	
5	1020	1033	1002	99
15	971	993	968	277
25	875	912	901	415
35	739	798	804	492
45	579	661	684	499
55	412	512	550	444
65	260	367	412	349
75	135	244	292	242
85	40	151	197	148
90	4	116	160	
95	1	87	129	84
105	1	48	83	47
115	1	10	45	16
125	1	9	3	7
135	1	10	10	6
145	1	7	13	4
155	1	4	8	2
165	1	2	3	1
175	2	2	1	0
180	1	1	1	

Zonal summary (total efficiency)

Zone	Lumens	%Luminaire
0-30	791	25.26
0-40	1283	40.96
0-60	2225	71.06
0-90	2964	94.65
40-90	1682	53.69
60-90	739	23.59
90-180	168	5.35
0-180	3132	100.00

Coefficients of utilization

Ceiling	80%			50%			30%			
	70	50	30	50	30	10	50	30	10	
Wall	70	50	30	50	30	10	50	30	10	
RC	Zonal cavity method									
RW	Effective floor reflectance = 20%									
Room Cavity Ratio	1	107	102	98	94	91	88	89	86	84
	2	97	89	82	82	77	73	78	74	70
	3	89	79	71	73	67	62	70	64	60
	4	82	70	61	65	58	53	62	56	51
	5	75	62	53	58	50	45	55	49	44
	6	69	56	47	52	45	39	50	43	38
	7	63	50	41	47	39	34	45	38	33
	8	59	45	36	42	35	30	41	34	29
	9	54	41	32	38	31	26	37	30	25
	10	50	37	29	35	28	23	33	27	22

Average Luminance (cd/m²)

Vertical Angle	Horizontal Angle		
	0°	45°	90°
45	14426	16537	17114
55	12664	15782	16940
65	10836	15368	17249
75	9194	16591	19951
85	8003	30534	40026

1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSLG C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
3. Wattage controlled to within 5%.
4. Refer to www.designlights.org for complete DLC listings.



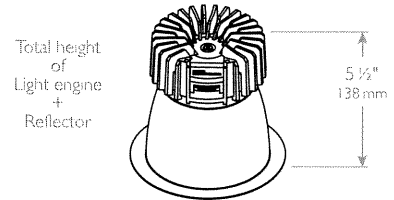
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 Specifications are subject to change without notice.
www.philips.com/luminaires

Philips Lighting
 North America Corporation
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 Somerset, NJ 08873
 Tel. 855-486-2216

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 281 Hillmount Rd,
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 Tel. 800-668-9008

Blend performance & comfort in a downlight.

C4L-DL-VB CALCULITE WHITE LED 4" ROUND DOWNLIGHT



PHILIPS LIGHTOLIER, CALCULITE, PROFESSIONAL-GRADE
DOWNLIGHTING, WHITE LED 4" ROUND APERTURE
DOWNLIGHT, WIDE 500/1000/1500LM, C4L-DL-VB

Calculite LED 4" features an LED array of high brightness white light LEDs. The new LED boards in Calculite LED ensure a less than 2-step SDCM color variation between luminaires.

Complete product = Frame-in kit + Trim kit
Lumen package for the frame-in kit must match the trim kit.

Project: _____
Location: _____
Catalog No: _____
Fixture Type: **B1, B1E**
Mfg: _____ Lamps: _____ Qty: _____
Notes: _____

Frame-in kit

example: C4L05NUVBZ10V

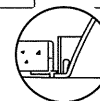
Series	Lumens	Installation	Input voltage	Version	Dimming	Options'
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VB	<input type="checkbox"/>	<input type="checkbox"/>
C4L Calculite 4" LED round aperture	05 500lm	N New construction	U Universal (120/277 V)	VB Version B	Z10V 0-10V dimming LD Lutron driver	EM Emergency ³
	10 1000lm	R Remodeler				LC Chicago Plenum
C4L Calculite 4" LED round aperture (347v configurations)	15 1500lm	N New construction	1 120V 2 277V	VB Version B	Z10V 0-10V dimming LD Lutron driver	EM Emergency ³
	05 500lm	R Remodeler				LC Chicago Plenum
C4L Calculite 4" LED round aperture (347v configurations)	10 1000lm	N New construction	1 120V	VB Version B	Z10V 0-10V dimming	-347 347V ⁴
	15 1500lm	R Remodeler				
CUL Calculite LED Universal aperture	05 500lm	J J-box mount retrofit	U Universal (120/277 V)	VB Version B	Z10V 0-10V dimming	Existing wiring will determine if dimming is an option.
	10 1000lm	S Screw-in base retrofit				1 120V

Trim kit

example: C4L10DL35KCCDPVB

Series	Lumens	Style	CCT	Reflector	Flange	Version ²
C4L	<input type="checkbox"/>	DL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VB
C4L Calculite 4" LED round aperture	05 500lm	DL Downlight	27K 2700K	CL Clear CCL Comfort clear CCD Comfort clear diffuse CCZ Champagne bronze WH White (painted)	W White (painted) P Polished (matches aperture) FT Flangeless (flush-mount) ^{1,2}	VB Version B
	10 1000-1500lm		30K 3000K 35K 3500K 40K 4000K			

1. Available for new construction (**N**) installation frame-in kits only.
 2. Accessory **CA4FMR** required for gypsum applications (minimal 1/4" reflector flange).
 3. Consult LED-EM spec sheet for **EM** option details and restrictions.
 4. Consult factory for availability of other 347V fixture configurations.
- NOTE:** See page 3 for Energy Star[®] compatibility.



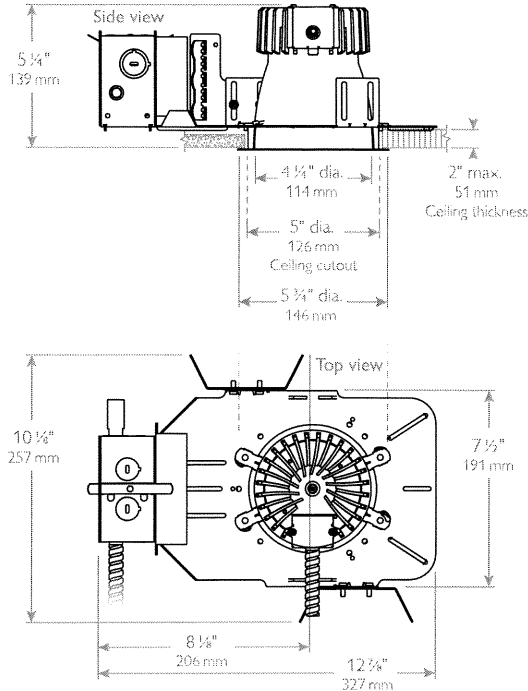
CA4FMR
Flangeless trim with plaster ring accessory.
(Recommended for gypsum installations)



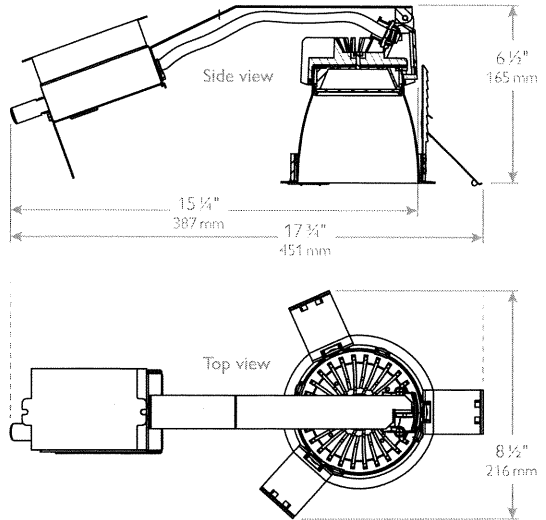
**PHILIPS
LIGHTOLIER**

C4L-DL-VB CALCULITE WHITE LED 4" ROUND DOWNLIGHT

New Construction



Remodeler



Frame-in kits

New construction

Mounting frame: Galvanized stamped steel for dry or plaster ceilings.

Vertical adjustment: Light engine adjusts in frame below ceilings up to 2" max.

Mounting brackets: Galvanized Steel.

Adjustable through aperture. Use 3/4" or 1 1/2" lathing channel, 1/2" EMT or optional mounting bars.

Remodeler

Compatibility: Flanged downlight only.

Power pack: Swivel junction box for tight plenum spaces. Snap-off covers permits wiring from top.

Spring holder: Galvanized steel. Accepts up to 2 1/2" (64mm) ceiling thickness.

Retrofit

Compatibility: Downlight only.

Capability: Converts 4 1/2" (115mm) or 6" (153mm)

Lightolier incandescent frame-in kit without additional wiring using existing Calculite E26 base.

Socket cup support: Spun steel.

Holds Calculite incandescent socket cup.

Socket extender: Phenolic E26 base.

Connect to existing lampholder.

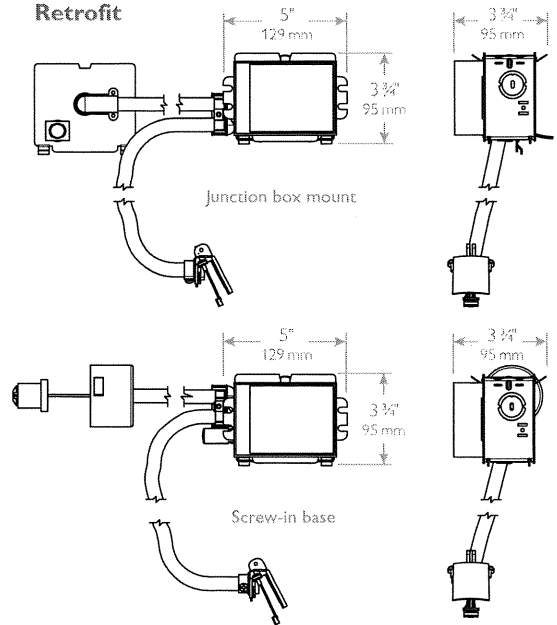
Quick-ship

Philips is committed to providing customers with the products they need when they need them.

Service Smart Two-day quick-ship	Spec Smart Two-week quick-ship
Frame-in kits C4L10NUVBZ10V C4L15N1VBZ10V C4L15N2VBZ10V	Frame-in kits C4L10NUVBLD C4L10NUVBZ10VEM C4L10NUVBZ10VLC C4L15N1VBLD C4L15N1VBZ10VEM C4L15N1VBZ10VLC C4L15N2VBZ10VEM
Trim kits None available	Trim kits C4L10DL30KCCLWVB C4L10DL35KCCLWVB

Quick-ship SKUs apply to the United States only.

Retrofit

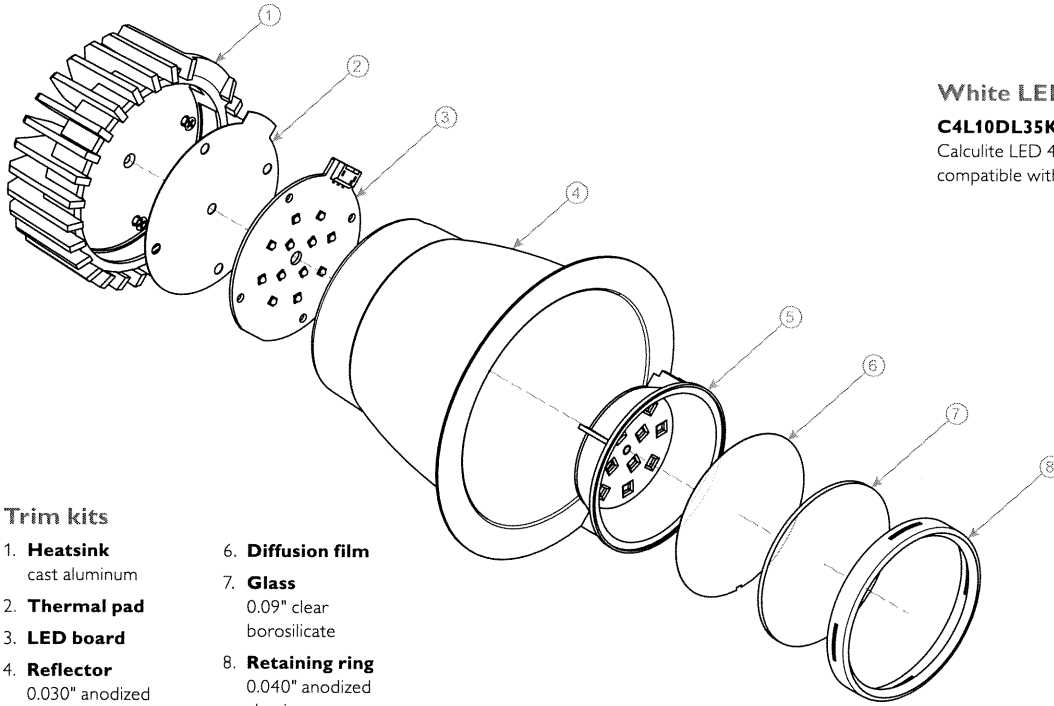


C4L-DL-VB CALCULITE WHITE LED 4" ROUND DOWNLIGHT

White LED 4"

C4L10DL35KCCDPVB

Calculite LED 4" Trim kits are backwards compatible with all Calculite LED 4" Frame-in Kits.



Trim kits

- | | |
|--|--|
| <p>1. Heatsink
cast aluminum</p> <p>2. Thermal pad</p> <p>3. LED board</p> <p>4. Reflector
0.030" anodized or panted aluminum</p> <p>5. Mixing chamber
injection molded polycarbonate</p> | <p>6. Diffusion film</p> <p>7. Glass
0.09" clear borosilicate</p> <p>8. Retaining ring
0.040" anodized aluminum</p> |
|--|--|

Features

Ceiling cutout: 4" aperture; 5 1/8" (130mm) cutout.
Depth: 5 1/2" (138mm) including light engine.
Power connection: Attaches to light engine via push-in connector (on frame). Removable cover provides access.
Junction box: Allows inspection from below.
Thermal protector: Meets NEC & UL requirements. Do not install insulation above or within 3" of luminaire.
Thermal Management: Heat sink and thermal design along with the clean room assembly process ensures specified performance levels are maintained.

Options and accessories

Dimming capability: 0-10V or Lutron dimming. See LED-DIM specification sheet.
Emergency capability: Inverter; See LED-LMI specification sheet. Integral (4, 6, & 7 inch); See LED-EM spec sheet (add "EM" suffix).
Sloped ceilings: Compatible with slope ceiling adaptors. See specification sheet SCA. Round apertures require SCAHID accessory.

Energy Star®

All new construction (N) frame-in and trim kit configurations are Energy Star certified except for the following.
 Frame-in Kits: Universal voltage configurations used in 277V applications; C4L05NUVBZ10V, C4L05NUVBLD, C4L10NUVBZ10V.
 Trim Kits: Champagne bronze reflector finish configurations; C4L05DL--KCCZ..., C4L10DL--KCCZ...
 All EM option configurations are NOT Energy Star certified.

Electrical

Electronic power supply: 120 or 277V, 50/60Hz, encased, overload and short circuit protected, thermal regulation to protect against overheating, sound rating, "A", -20°C minimum starting temperature, 35°C maximum ambient environment.
Rated life: 60,000 hrs at 70% lumen maintenance based on IES LM-80-08 and TM-21-11.

Labels

cULus, I.B.E.W.
 Suitable for wet locations.
 5 year warranty.
 Energy Star certified (see above for exclusions).

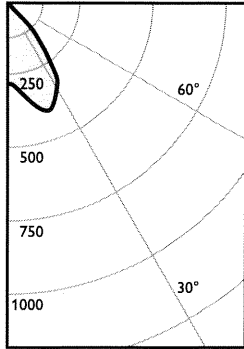
Frame-In kit Electrical specifications	Input volts	Input freq.	Input current	LED drive current	Input power*	LED power	THD factor	Power factor
C4L05_VBZ10V 500lm w/0-10V dimming	120V	50/60Hz	0.07A	350mA	8W	6W	<20%	>0.9
	277V	50/60Hz	0.04A	350mA	8W	6W	<20%	>0.7
C4L10_VBZ10V 1000lm w/0-10V dimming	120V	50/60Hz	0.12A	350mA	14W	11W	<20%	>0.9
	277V	50/60Hz	0.62A	350mA	14W	11W	<20%	>0.8
C4L15_VBZ10V 1500lm w/0-10V dimming	120V	50/60Hz	0.18A	520mA	23W	17W	<20%	>0.9
	277V	50/60Hz	0.09A	520mA	24W	17W	<20%	>0.9

* +/- 5%

C4L-DL-VB CALCULITE WHITE LED 4" ROUND DOWNLIGHT

8W LED, 3500K, 500 lumen

Candela Curve



Frame: C4L05NUVBZ10V
Trim: C4L05DL35KCLWVB

CCT¹: 3500K
Output lumens: 533 lms
Input watts²: 8.3 W
Efficacy: 64.2 lm/w
CRI: 80 min
Spacing Crit.: 1.4
Report no³: F31434

Zonal summary

Zone	Lumens	%Luminaire
0-30	307	57.6%
0-40	470	88.2%
0-60	531	99.6%
0-90	533	100.0%

Angle	Mean CP	Lumens
0	283	
5	292	29
10	324	
15	367	104
20	399	
25	379	173
30	342	
35	271	163
40	166	
45	77	59
50	7	
55	2	2
60	1	
65	1	1
70	0	
75	0	0
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	11	7.0'
6'	8	8.4'
7'	6	9.8'
8'	4	11.2'
9'	3	12.6'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	24.0	0.37
6'	15.7	0.24
7'	11.2	0.17
8'	9.4	0.14
9'	7.5	0.11

38'x38'x10' Room, Workplane 2 1/2' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

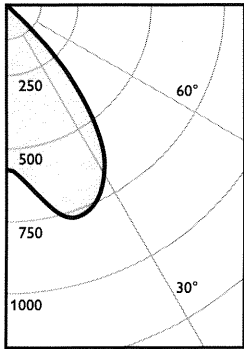
4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

Ceiling	80%					70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	113	110	107	105	108	103	104	100	100	97	93
	2	107	102	97	94	100	93	97	90	94	89	85
	3	101	94	88	84	92	83	90	82	87	81	78
	4	95	87	81	76	85	75	83	75	81	74	71
	5	89	80	74	69	79	69	77	68	76	67	65
	6	84	74	68	63	73	63	72	62	70	62	60
	7	79	69	62	58	68	58	67	57	66	57	55
	8	75	64	58	53	64	53	62	53	61	52	51
	9	70	60	53	49	59	49	58	49	57	48	47
	10	67	56	49	45	55	45	55	45	54	45	43

15W LED, 3500K, 1000 lumen

Candela Curve



Frame: C4L10NUVBZ10V
Trim: C4L10DL35KCLWVB

CCT¹: 3500K
Output lumens: 1078 lms
Input watts²: 14.6 W
Efficacy: 73.8 lm/w
CRI: 80 min
Spacing Crit.: 1.4
Report no³: F31435

Zonal summary

Zone	Lumens	%Luminaire
0-30	612	56.8%
0-40	944	87.6%
0-60	1076	99.8%
0-90	1078	100.0%

Angle	Mean CP	Lumens
0	575	
5	604	61
10	679	
15	755	212
20	774	
25	744	339
30	671	
35	550	333
40	360	
45	161	126
50	15	
55	5	5
60	3	
65	2	2
70	1	
75	1	1
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	23	7.0'
6'	16	8.4'
7'	12	9.8'
8'	9	11.2'
9'	7	12.6'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	48.5	0.65
6'	31.8	0.42
7'	22.7	0.30
8'	18.9	0.25
9'	15.2	0.20

38'x38'x10' Room, Workplane 2 1/2' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

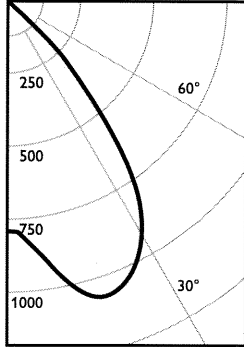
Ceiling	80%					70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	113	110	107	105	108	103	104	100	100	97	92
	2	107	101	97	93	100	92	96	90	93	88	85
	3	101	94	88	84	92	83	90	82	87	80	78
	4	95	86	80	76	85	75	83	74	81	73	71
	5	89	80	74	69	79	68	77	68	75	67	65
	6	84	74	67	63	73	63	72	62	70	62	60
	7	79	69	62	57	68	57	67	57	65	57	55
	8	75	64	57	53	63	53	62	52	61	52	50
	9	70	60	53	49	59	49	58	48	57	48	47
	10	66	56	49	45	55	45	54	45	54	45	43

1. Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSLG C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
2. Wattage controlled to within 5%.
3. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.

C4L-DL-VB CALCULITE WHITE LED 4" ROUND DOWNLIGHT

23W LED, 3500K, 1500 lumen

Candela Curve



Frame: C4L15N1VBZ10V
Trim: C4L10DL35KCLWVB

CCT¹: 3500K
Output lumens: 1492 lms
Input watts²: 22.5 W
Efficacy: 66.3 lm/w
CRI: 80 min
Spacing Crit.: 1.4
Report no³: F31436

Zonal summary

Zone	Lumens	%Luminaire
0-30	845	56.6%
0-40	1305	87.5%
0-60	1488	99.7%
0-90	1492	100.0%

Angle	Mean CP	Lumens
0	797	
5	838	85
10	940	
15	1044	293
20	1071	
25	1030	468
30	930	
35	764	460
40	499	
45	228	175
50	21	
55	7	8
60	4	
65	2	2
70	1	
75	1	1
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	32	7.0
6'	22	8.4
7'	16	9.8
8'	12	11.2
9'	10	12.6

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	67.1	1.00
6'	44.0	0.65
7'	31.5	0.47
8'	26.2	0.39
9'	21.0	0.31

38'x38'x10' Room, Workplane 2½' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%	
	70	50	30	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	113	110	107	105	108	103	104	100	100	97	92
	2	107	101	97	93	100	92	96	90	93	88	85
	3	101	94	88	84	92	83	90	82	87	80	78
	4	95	86	80	76	85	75	83	74	81	73	71
	5	89	80	74	69	79	68	77	68	75	67	65
	6	84	74	67	63	73	63	72	62	70	62	60
	7	79	69	62	57	68	57	67	57	65	57	55
	8	74	64	57	53	63	53	62	52	61	52	50
	9	70	60	53	49	59	49	58	48	57	48	47
	10	66	56	49	45	55	45	54	45	54	45	43

1. Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSLG C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
2. Wattage controlled to within 5%.
3. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.



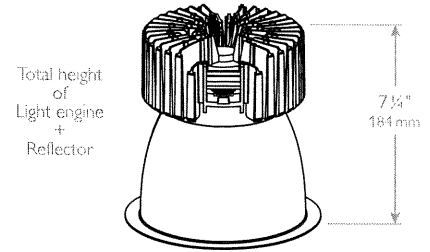
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www.philips.com/luminaires

Philips Lighting
North America Corporation
200 Franklin Square Drive
Somerset, NJ 08873
Phone: 855-486-2216

Philips Lighting Company
281 Hillmount Road
Markham ON, Canada L6C 2S3
Phone: 800-668-9008

Blend performance & comfort in a downlight.

C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT



PHILIPS LIGHTOLIER, CALCULITE, PROFESSIONAL-GRADE DOWNLIGHTING, WHITE LED 6" ROUND APERTURE DOWNLIGHT, MEDIUM 1000/1500/2000LM, WIDE 1500/2000LM, C6L-DL-VB

Complete product = Frame-in kit + Trim kit
Lumen package for the frame-in kit must match the trim kit.

Calculite LED 6" features an LED array of high brightness white light LEDs. The new LED boards in Calculite LED ensure a less than 2-step SDCM color variation between luminaires (2-step in 1000lm and 1-step in 1500/2000lm).

Project: **BALBOA**
Location: _____
Catalog No: _____
Fixture Type: **B2E**
Mfg: _____ Lamps: _____ Qty: _____
Notes: _____

Frame-in kit

example: C6L10NUVBZ10V

Series	Lumens	Installation	Input voltage	Version	Dimming	Options ¹
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> VB	<input type="checkbox"/>	<input type="checkbox"/>
C6L Calculite 6" LED round aperture	05 500lm 10 1000lm	N New construction	U Universal (120/277V)	VB Version B	Z10V 0-10V dimming LD Lutron driver	LC Chicago Plenum
	15 1500lm	N New construction R Remodeler	U Universal (120/277V)	VB Version B	Z10V 0-10V dimming LD Lutron driver	EM Emergency ⁴ LC Chicago Plenum
	20 2000lm	N New construction R Remodeler	1 120V 2 277V	VB Version B	Z10V 0-10V dimming LD Lutron driver	EM Emergency ⁴ LC Chicago Plenum
	05 500lm 15 1500lm 10 1000lm 20 2000lm	N New construction R Remodeler ²	1 120V	VB Version B	Z10V 0-10V dimming	-347 347V ⁶
CUL Calculite LED Universal aperture	15 1500lm	J J-box mount retrofit	U Universal (120/277V)	VB Version B	Z10V 0-10V dimming Existing wiring will determine if dimming is an option.	
	20 2000lm	J J-box mount retrofit	1 120V 2 277V	VB Version B	Z10V 0-10V dimming Existing wiring will determine if dimming is an option.	
	15 1500lm 20 2000lm	S Screw-in base retrofit	1 120V	VB Version B	Existing wiring will determine if dimming is an option.	

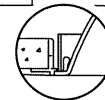
Trim kit

example: C6L1520DL35KWCCDPVB

Series	Lumens	Style	CCT	Beam	Reflector	Flange	Version ⁴
<input type="checkbox"/> C6L	<input type="checkbox"/>	<input type="checkbox"/> DL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> VB
C6L Calculite 6" LED round aperture	05 500lm 10 1000lm 1520 1500-2000lm	DL Downlight	27K 2700K 30K 3000K 35K 3500K 40K 4000K	M Medium, 0.8 s.c. ¹ W Wide, 1.1 s.c. ³	CL Clear CCL Comfort clear CCD Comfort clear diffuse CCZ Champagne bronze WH White (painted)	W White (painted) P Polished (matches aperture) FT Flangeless (flush-mount) ^{1,3}	VB Version B

- Available for new construction (**N**) installation frame-in kits only.
- Available for 1500 and 2000 (**15** or **20**) lumen frame-in kits only.
- Accessory **CA6FMR** required for gypsum applications (minimal 1/4" reflector flange).
- Consult LED-EM spec sheet for **EM** option details and restrictions.
- Available for 1500-2000 (**1520**) lumen trim kits only.
- Consult factory for availability of other 347V fixture configurations.

NOTE: See page 3 for Energy Star[®] compatibility.



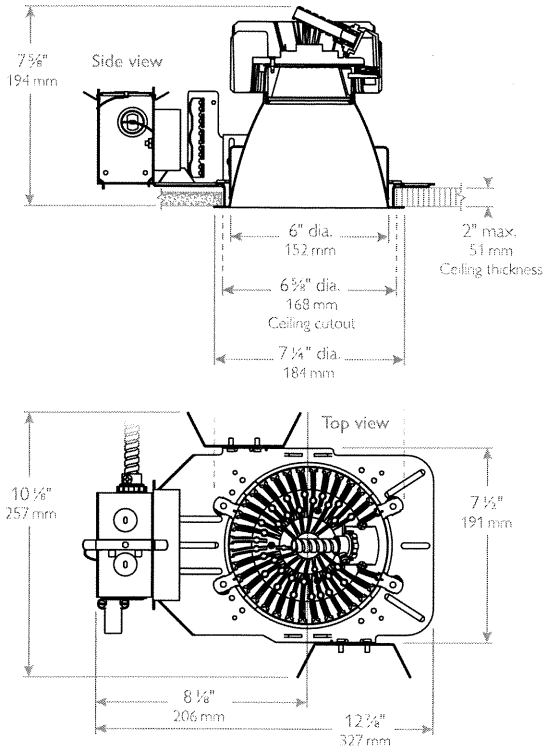
CA6FMR
Flangeless trim with plaster ring accessory.
(Recommended for gypsum installations)



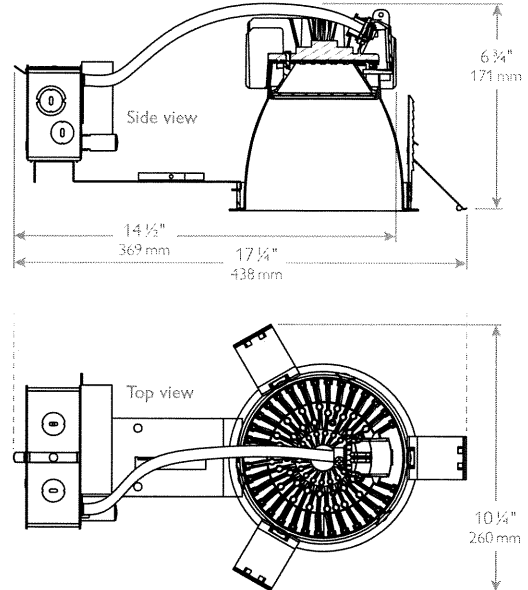
**PHILIPS
LIGHTOLIER**

C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT

New Construction



Remodeler



Frame-in kits

New construction

Mounting frame: Galvanized stamped steel for dry or plaster ceilings.

Vertical adjustment: Light engine adjusts in frame below ceilings up to 1 1/4".

Mounting brackets: Galvanized Steel.

Adjustable through aperture. Use 3/4" or 1 1/2" lathing channel, 1/2" EMT or optional mounting bars.

Remodeler

Compatibility: Wide beam flanged downlight only.

Power pack: Swivel junction box for tight plenum spaces. Snap-off covers permits wiring from top.

Spring holder: Galvanized steel. Accepts up to 2 1/2" (64mm) ceiling thickness.

Retrofit

Compatibility: Wide beam downlight only.

Capability: Converts 6" (153mm) or 7" (178mm)

Lightolier incandescent frame-in kit without additional wiring using existing Calculite E26 base.

Socket cup support: Spun steel.

Holds Calculite incandescent socket cup.

Socket extender: Phenolic E26 base.

Connect to existing lampholder.

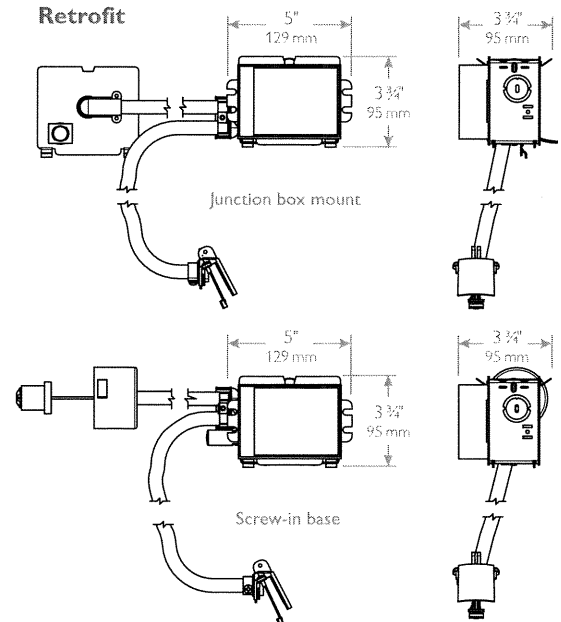
Quick-ship

Philips is committed to providing customers with the products they need when they need them.

Service Smart Two-day quick-ship	Spec Smart Two-week quick-ship
Frame-in kits C6L20N1VBZ10V C6L15NUVBZ10V	Frame-in kits C6L15NUVBLD C6L15NUVBZ10VEM C6L15NUVBZ10VLC C6L20N1VBLD C6L20N1VBZ10VEM C6L20N1VBZ10VLC C6L20N2VBZ10V C6L20N2VBZ10VEM
Trim kits None available	Trim kits C6L1520DL30KMCCLWVB C6L1520DL30KWCCLLWVB C6L1520DL35KMCCLWVB C6L1520DL35KWCCLLWVB

Quick-ship SKUs apply to the United States only.

Retrofit

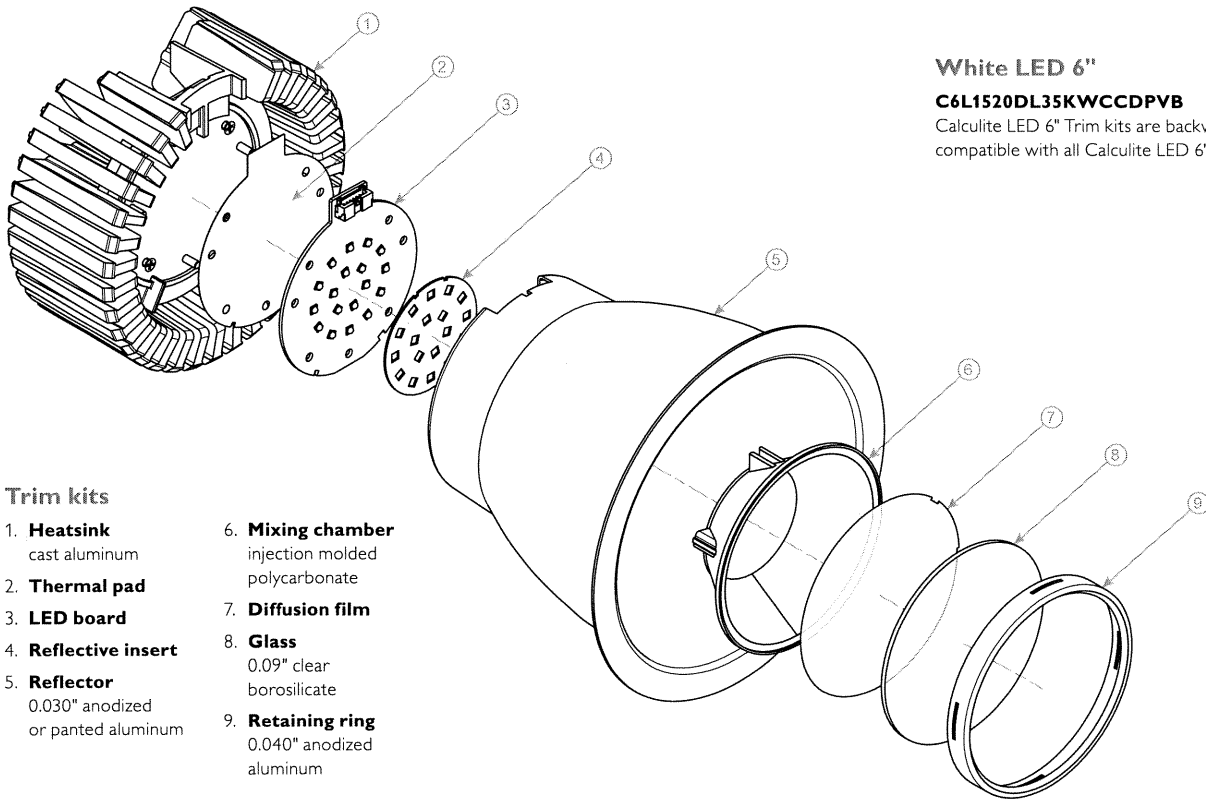


C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT

White LED 6"

C6L1520DL35KWCCDPVB

Calculite LED 6" Trim kits are backwards compatible with all Calculite LED 6" Frame-in Kits.



Trim kits

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Heatsink
cast aluminum 2. Thermal pad 3. LED board 4. Reflective insert 5. Reflector
0.030" anodized
or painted aluminum | <ol style="list-style-type: none"> 6. Mixing chamber
injection molded
polycarbonate 7. Diffusion film 8. Glass
0.09" clear
borosilicate 9. Retaining ring
0.040" anodized
aluminum |
|--|--|

Features

- Ceiling cutout:** 6" aperture; 6 5/8" (167mm).
- Depth:** 7 1/4" (184mm) including light engine.
- Power connection:** Attaches to light engine via push-in connector (on frame). Removable cover provides access.
- Junction box:** UL listed for 8 No. 12 AWG, 90°C through branch circuit connectors. Allows inspection from below.
- Thermal protector:** Meets NEC & UL requirements. Do not install insulation above or within 3" of luminaire.
- Thermal Management:** Heat sink and thermal design along with the clean room assembly process ensures specified performance levels are maintained.

Options and accessories

- Dimming capability:** 0-10V or Lutron dimming. See LED-DIM specification sheet.
- Emergency capability:** Inverter; See LED-LMI specification sheet. Integral; Add "EM" suffix. See LED-EM spec sheet.
- Sloped ceilings:** Compatible with slope ceiling adaptors. See specification sheet SCA. Round apertures require SCAHID accessory.
- Mounting bars:** 1950-18" (set of 2) 1951-27" (set of 2)
- T-Bar anchor clips:** 1956 (set of 4), for use with above.

Energy Star®

All new construction (N) frame-in and trim kit configurations are Energy Star certified except for the following.
Trim Kits: Champagne bronze reflector finish configurations; C6L10DL--KMCCZ..., C6L1520DL--KMCCZ..., C6L1520DL--KWCCZ...,
Frame-in Kits: Universal voltage configurations used in 277V applications; C6L10NUVBZ10V.
All EM option configurations are NOT Energy Star certified.

Electrical

Electronic power supply: 120 or 277V, 50/60Hz, encased, overload and short circuit protected, thermal regulation to protect against overheating, sound rating "A", -20°C minimum starting temperature, 35°C maximum ambient environment.
Rated life: 60,000 hrs at 70% lumen maintenance based on IES LM-80-08 and TM-21-11.

Labels

cULus, I.B.E.W.
Suitable for wet locations.
5 year warranty.
Energy Star certified (see above for exclusions).

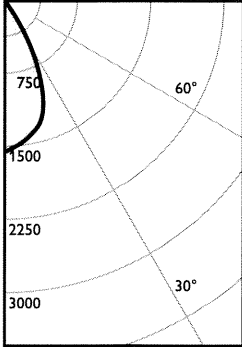
Frame-In kit Electrical specifications	Input volts	Input freq.	Input current	LED drive current	Input power*	LED power	THD factor	Power factor
C6L10_VBZ10V 1000lm w/0-10V dimming	120V	50/60Hz	0.12A	350mA	14W	11W	<20%	>0.9
	277V	50/60Hz	0.62A	350mA	14W	11W	<20%	>0.8
C6L15_VBZ10V 1500lm w/0-10V dimming	120V	50/60Hz	0.17A	350mA	21W	18W	<20%	>0.9
	277V	50/60Hz	0.08A	350mA	21W	18W	<20%	>0.9
C6L20_VBZ10V 2000lm w/0-10V dimming	120V	50/60Hz	0.26A	520mA	32W	26W	<20%	>0.9
	277V	50/60Hz	0.12A	520mA	33W	26W	<20%	>0.9

* +/- 5%

C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT

15W LED, 3500K, Medium 1000 lumen

Candela Curve



Frame: C6L10NUVBZ10V
Trim: C6L10DL35KMCLWVB

CCT¹: 3500K
Output lumens: 1037 lms
Input watts²: 14.6 W
Efficacy: 71.0 lm/w
CRI: 80 min
Spacing Crit.: 0.8
Report no³: F31442

Zonal summary

Zone	Lumens	%Luminaire
0-30	873	84.2%
0-40	1014	97.8%
0-60	1036	99.9%
0-90	1037	100.0%

Angle	Mean CP	Lumens
0	1550	
5	1499	143
10	1420	
15	1334	368
20	1147	
25	825	363
30	438	
35	216	141
40	85	
45	18	21
50	2	
55	1	1
60	1	
65	1	1
70	0	
75	0	0
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	62	4.0'
6'	43	4.8'
7'	32	5.6'
8'	24	6.4'
9'	19	7.2'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	48.1	0.65
6'	31.6	0.42
7'	22.5	0.30
8'	18.8	0.25
9'	15.0	0.20

38'x38'x10' Room, Workplane 2 1/2' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

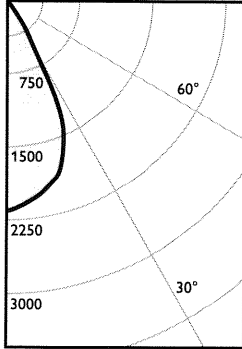
Ceiling	80%				70%				50%				30%				0%
Wall	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	0
RCR	Zonal cavity method - Effective floor reflectance = 20%																
0	119	119	119	119	116	116	111	111	106	106	100	100	106	106	100	100	
1	114	111	109	107	109	105	105	102	102	99	95	95	102	99	95	95	
2	109	105	101	98	103	97	100	95	97	93	89	89	97	93	89	89	
3	104	98	94	90	97	90	95	88	92	87	84	84	92	87	84	84	
4	100	93	88	84	92	84	90	83	90	83	88	82	88	82	79	79	
5	95	88	83	79	87	78	85	78	84	77	75	75	84	77	75	75	
6	91	83	78	74	82	74	81	73	80	73	71	71	80	73	71	71	
7	87	79	73	70	78	69	77	69	76	69	67	67	76	69	67	67	
8	83	75	70	66	74	66	73	65	72	65	64	64	72	65	64	64	
9	80	71	66	62	71	62	70	62	69	62	60	60	69	62	60	60	
10	77	68	63	59	68	59	67	59	66	59	57	57	66	59	57	57	

1. Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
2. Wattage controlled to within 5%.
3. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.

C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT

21W LED, 3500K, Medium 1500 lumen

Candela Curve



Frame: C6L15NUVBZ10V
Trim: C6L1520DL35KMCLWVB

CCT¹: 3500K
Output lumens: 1535 lms
Input watts²: 21.4 W
Efficacy: 71.7 lm/w
CRI: 80 min
Spacing Crit.: 0.8
Report no³: 120GFR

Zonal summary

Zone	Lumens	%Luminaire
0-30	1294	84.3%
0-40	1504	98.0%
0-60	1535	100.0%
0-90	1535	100.0%

Angle	Mean CP	Lumens
0	2170	
5	2107	201
10	2022	
15	1908	530
20	1710	
25	1352	563
30	633	
35	325	209
40	131	
45	24	29
50	3	
55	2	1
60	1	
65	0	0
70	0	
75	0	0
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	87	4.0'
6'	60	4.8'
7'	44	5.6'
8'	34	6.4'
9'	27	7.2'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	71.2	0.95
6'	46.8	0.62
7'	33.4	0.44
8'	27.8	0.37
9'	22.3	0.30

38'x38'x10' Room, Workplane 2 1/2' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

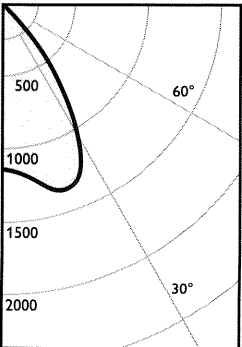
4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

Ceiling	80%				70%				50%				30%		0%
	70	50	30	10	50	10	50	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	50	10	50	10	0
RCR	Zonal cavity method - Effective floor reflectance = 20%														
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	111	111	106	106	100	
	1	114	112	109	107	109	105	105	102	102	99	99	95	95	
	2	109	105	101	98	103	97	100	95	97	93	89	89	84	
	3	104	98	94	90	97	90	94	88	92	87	84	84	79	
	4	100	93	88	84	92	83	90	82	88	82	79	75	75	
	5	95	88	82	78	87	78	85	77	83	77	75	71	71	
	6	91	83	77	74	82	73	81	73	79	72	71	67	67	
	7	87	79	73	69	78	69	77	69	76	68	67	63	63	
	8	83	75	69	65	74	65	73	65	72	65	63	60	60	
	9	80	71	66	62	70	62	70	62	69	61	60	58	58	
	10	76	68	62	59	67	59	66	58	66	58	57	55	55	

21W LED, 3500K, Wide 1500 lumen

Candela Curve



Frame: C6L15NUVBZ10V
Trim: C6L1520DL35KWCLWVB

CCT¹: 3500K
Output lumens: 1614 lms
Input watts²: 21.4 W
Efficacy: 75.4 lm/w
CRI: 80 min
Spacing Crit.: 1.1
Report no³: 122GFR

Zonal summary

Zone	Lumens	%Luminaire
0-30	1061	65.7%
0-40	1513	93.7%
0-60	1612	99.9%
0-90	1614	100.0%

Angle	Mean CP	Lumens
0	1146	
5	1167	115
10	1226	
15	1319	372
20	1352	
25	1279	573
30	1057	
35	736	452
40	409	
45	83	95
50	6	
55	4	4
60	2	
65	2	2
70	1	
75	1	1
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	46	5.5'
6'	32	6.6'
7'	23	7.7'
8'	18	8.8'
9'	14	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	73.4	0.95
6'	48.1	0.62
7'	34.4	0.44
8'	28.7	0.37
9'	22.9	0.30

38'x38'x10' Room, Workplane 2 1/2' above floor, 80/50/20% Reflectances

Finish Adjust. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjust. factors

4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

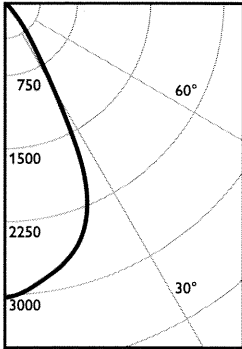
Ceiling	80%				70%				50%				30%		0%
	70	50	30	10	50	10	50	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	50	10	50	10	0
RCR	Zonal cavity method - Effective floor reflectance = 20%														
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	111	111	106	106	100	
	1	113	111	108	106	108	104	104	101	101	98	98	93	93	
	2	108	102	98	95	101	94	98	92	95	90	86	86	80	
	3	102	95	90	86	94	85	91	84	89	83	80	77	77	
	4	96	88	83	78	87	78	85	77	83	76	74	71	71	
	5	91	82	76	72	81	71	80	71	78	70	68	65	65	
	6	86	77	71	66	76	66	74	65	73	65	63	60	60	
	7	81	72	65	61	71	61	70	61	69	60	58	55	55	
	8	77	67	61	57	67	56	65	56	64	56	54	51	51	
	9	73	63	57	53	62	53	62	52	61	52	51	48	48	
	10	69	59	53	49	59	49	58	49	57	49	47	45	45	

1. Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSLG C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
2. Wattage controlled to within 5%.
3. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.

C6L-DL-VB CALCULITE WHITE LED 6" ROUND DOWNLIGHT

32W LED, 3500K, Medium 2000 lumen

Candela Curve



Frame: C6L20N1VBZ10V
Trim: C6L1520DL35KMCLWVB

CCT¹: 3500K
Output lumens: 2146 lms
Input watts²: 32.2 W
Efficacy: 66.6 lm/w
CRI: 80 min
Spacing Crit.: 0.8
Report no³: 121GFR

Zonal summary

Zone	Lumens	%Luminaire
0-30	1808	84.2%
0-40	2101	97.9%
0-60	2145	100.0%
0-90	2146	100.0%

Angle	Mean CP	Lumens
0	3033	
5	2946	281
10	2826	
15	2664	740
20	2387	
25	1888	787
30	886	
35	455	293
40	183	
45	34	41
50	4	
55	2	2
60	1	
65	1	1
70	0	
75	0	0
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	121	4.0'
6'	84	4.8'
7'	62	5.6'
8'	47	6.4'
9'	37	7.2'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	99.5	1.43
6'	65.3	0.94
7'	46.7	0.67
8'	38.9	0.56
9'	31.1	0.45

38'x38'x10' Room, Workplane 2½'
above floor, 80/50/20% Reflectances

Finish Adjst. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjst. factors

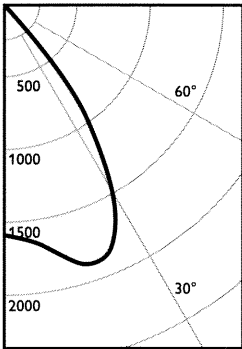
4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

Ceiling	80%				70%				50%				30%				0%	
	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%																	
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100	100	100	99	95		
	1	114	111	109	107	109	105	105	102	102	99	93	89	84	84	79		
	2	109	105	101	98	103	97	100	95	97	93	89	84	84	79	75		
	3	104	98	94	90	97	90	94	88	92	87	84	79	75	71	67		
	4	100	93	88	84	92	83	90	82	88	81	79	75	71	67	63		
	5	95	88	82	78	87	78	85	77	83	77	75	71	67	63	59		
	6	91	83	77	74	82	73	81	73	79	72	71	67	63	59	55		
	7	87	79	73	69	78	69	77	69	76	68	67	63	59	55	51		
	8	83	75	69	65	74	65	73	65	72	65	63	59	55	51	47		
	9	80	71	66	62	70	62	70	62	69	61	60	56	52	48	44		
	10	76	68	62	59	67	59	66	58	66	58	57	53	49	45	41		

32W LED, 3500K, Wide 2000 lumen

Candela Curve



Frame: C6L20N1VBZ10V
Trim: C6L1520DL35KWCLWVB

CCT¹: 3500K
Output lumens: 2250 lms
Input watts²: 32.3 W
Efficacy: 69.7 lm/w
CRI: 80 min
Spacing Crit.: 1.1
Report no³: 123GFR

Zonal summary

Zone	Lumens	%Luminaire
0-30	1480	65.8%
0-40	2111	93.8%
0-60	2248	99.9%
0-90	2250	100.0%

Angle	Mean CP	Lumens
0	1598	
5	1628	161
10	1710	
15	1841	519
20	1887	
25	1784	800
30	1476	
35	1026	630
40	570	
45	115	133
50	8	
55	5	4
60	3	
65	2	2
70	1	
75	1	1
80	0	
85	0	0
90	0	

Single unit data

Height to lighted plane	Initial center beam foot-candles	Beam diameter (ft)*
5'	64	5.5'
6'	44	6.6'
7'	33	7.7'
8'	25	8.8'
9'	20	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq. ft.
5'	102.3	1.43
6'	67.1	0.94
7'	47.9	0.67
8'	39.9	0.56
9'	32.0	0.45

38'x38'x10' Room, Workplane 2½'
above floor, 80/50/20% Reflectances

Finish Adjst. factors

CL = 100%
CCL = 95%
CCD = 87%
CCZ = 63%
WH = 87%

CCT Adjst. factors

4000K = 103%
3500K = 100%
3000K = 97%
2700K = 87%

Coefficients of utilization

Ceiling	80%				70%				50%				30%				0%	
	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%																	
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100	100	100	99	95		
	1	113	111	108	106	108	104	104	101	101	98	93	89	84	84	79		
	2	108	103	98	95	101	94	98	92	95	90	86	80	75	75	71		
	3	102	95	90	86	94	85	91	84	89	83	80	75	71	67	63		
	4	96	89	83	78	87	78	85	77	83	76	74	71	67	63	59		
	5	91	82	76	72	81	72	80	71	78	70	68	65	61	57	53		
	6	86	77	71	66	76	66	75	65	73	65	63	59	55	51	47		
	7	82	72	66	61	71	61	70	61	69	60	58	55	51	47	43		
	8	77	67	61	57	67	57	66	56	64	56	54	51	47	43	39		
	9	73	63	57	53	63	53	62	52	61	52	51	47	43	39	35		
	10	69	59	53	49	59	49	58	49	57	49	47	43	39	35	31		

- Correlated Color Temperature within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.
- Wattage controlled to within 5%.
- Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.



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www.philips.com/luminaires

C6L-DL-VB 03/14 page 6 of 6

Philips Lighting
North America Corporation
200 Franklin Square Drive
Somerset, NJ 08873
Phone: 855-486-2216

Philips Lighting Company
281 Hillmount Road
Markham ON, Canada L6C 2S3
Phone: 800-668-9008

Job:
Type:
Notes:

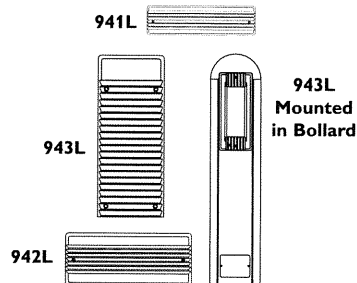
TYPE C, CE, C1

94 Line LED

Page 1 of 3

941L, 942L and 943L Step and Aisle Lights

The Philips Gardco 941L, 942L and 943L recessed aisle lights are architecturally styled luminaires precisely constructed of die cast aluminum, providing light with high performance, long life LED systems. Retrofit kits are also available, making it possible to update installations of classic 941, 942 and 943 Philips Gardco fluorescent and HID step lights to LED without the need to replace the back housing. A field adjustable junction box enhances design flexibility. Self-compensating silicone gasketing completely excludes moisture, insects and contaminants. A choice of three (3) architecturally designed faceplates allows for a variety of applications. The ribbed guard faceplate offers vandal protection for glass lenses.



PREFIX	WALL TYPE	FACEPLATE	LED WATTAGE	LED SELECTION	VOLTAGE	FINISH	OPTIONS

Enter the order code into the appropriate box above. Omit WALL TYPE for 943L-B25 and 943L-B40. Note: Philips Gardco reserves the right to refuse a configuration. Not all combinations and configurations are valid. Refer to notes below for exclusions and limitations. For questions or concerns, please consult the factory.

PREFIX

Complete Luminaires

941L ¹	Horizontal
942L	Horizontal
943L	Vertical
943L-B25	943L Mounted in 25" Bollard
943L-B40	943L Mounted in 40" Bollard

Retrofit Kits¹

RK-941L ^{1,2}	Horizontal
RK-942L ²	Horizontal
RK-943L ²	Vertical

WALL TYPE

D Drywall

Not suitable for concrete pour applications. Also, if insulating material is present, it must be kept at least 3" away from luminaire. Type D units are thermally protected. Non-IC luminaire.

C Concrete Pour

Suitable for concrete pour applications only.

NOTE: WALL TYPE does not apply to 943L-B25 and 943L-B40. Omit WALL TYPE for 943L-B25 and 943L-B40.

FACEPLATES

LV	Louver
DG	Diffuse Glass
RGD ¹	Ribbed Guard with Diffuse Glass

1. 941L and RK-941L are not available with the RGD faceplate.
2. Retrofit kits are available in Wall Type "C" only (Concrete Pour.) Retrofit kits are not available for existing Wall Type "D" (Drywall) luminaires. The step light portion of existing 943BL25 and 943BL40 units may be replaced utilizing RK-943L retrofit kits.

Back housings for concrete pour applications (Type C) are available for pre-shipment. Contact factory for details.

LED WATTAGE with LUMEN DATA

Order Code	Description	LED Current (mA)	Average System Watts ³	Faceplate Finish	Absolute Initial Luminaire Lumens ⁴								
					941			942			943		
					Faceplate		Faceplate	Faceplate		Faceplate	Faceplate		Faceplate
					LV	DG	LV	DG	RGD	LV	DG	RGD	
20LA	20 watt, NW (4,000K), LED integral lens array.	350	20	BRP	78	699	153	807	272	152	738	274	
				WP	226	937	278	1,145	493	335	1,048	501	
31LA	31 watt, NW (4,000K), LED integral lens array.	530	31	BRP	111	927	207	1,037	380	209	1,421	372	
				WP	319	1,321	377	1,474	670	454	1,001	679	
40LA ⁵	40 watt, NW (4,000K), LED integral lens array.	700	40	BRP	See Note 5	See Note 5	250	1,382	467	256	1,251	465	
				WP	See Note 5	See Note 5	472	1,960	836	568	1,775	849	

3. System input wattage may vary based on input voltage, by up to +/- 10%, and based on manufacturer forward voltage, by up to +/- 8%.

4. Lumen values based on photometric tests performed in compliance with IESNA LM-79. Values are for luminaires with a white and bronze faceplate. Values will vary based on faceplate color chosen. Contact OutdoorLighting.Applications@philips.com for values not shown above.

5. 941L is not available in 40LA (700mA) LED wattage. Lumen values shown are based on Bronze painted faceplates. Values will vary based on the faceplate color.



PHILIPS



94 Line LED

941L, 942L and 943L Step and Aisle Lights

LED SELECTION	VOLTAGE	FINISH	OPTIONS
CW 5,700°K , 75CRI	120°	BLP Black Paint	F Fusing (Provide specific input voltage.)
NW 4,000°K , 70CRI	277°	BRP Bronze Paint	TP Tamper Resistant Screws
WW 3,000°K , 80CRI	UNIV⁷	WP White Paint	
AM Amber		NP Natural Aluminum Paint	

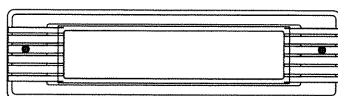
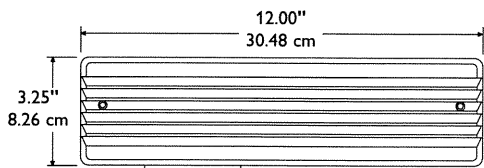
6. Wall Type D luminaires only.
 7. UNIV means 120V through 277V input. Not available on Wall Type D luminaires.

OC Optional Color Paint
 (Specify RAL designation. ex: OC-RAL7024)

SC Special Color Paint
 (Specify. Must supply color chip)

DIMENSIONS

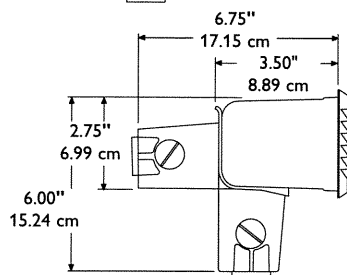
941L Dimensions



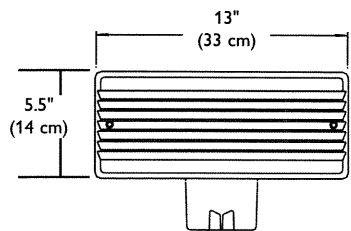
(DG) Diffuse Glass



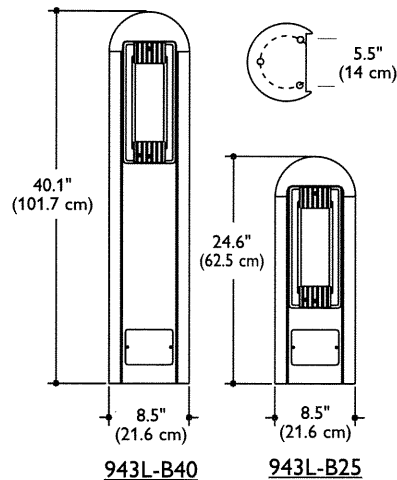
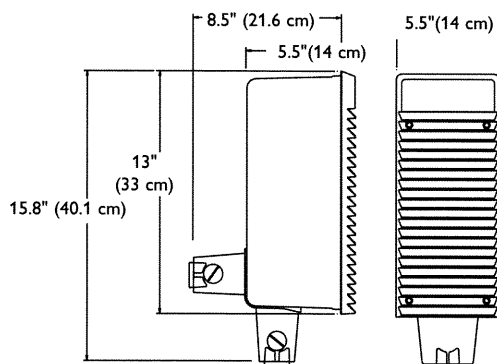
(LV) Louver



942L Dimensions



943L Dimensions



943L-B40

943L-B25

SPECIFICATIONS

GENERAL: The Philips Gardco 941L, 942L and 943L recessed aisle lights are architecturally styled luminaires precisely constructed of die cast aluminum, providing light with high performance, long life LED systems. A field adjustable junction box enhances design flexibility. Self-compensating silicone gasketing completely excludes moisture, insects and contaminants. A choice of three (3) architecturally designed faceplates allows for a variety of applications. The ribbed guard faceplate offers vandal protection for glass lenses.

RETROFIT KITS: Retrofit kits are also available, making it possible to update installations of classic 941, 942 and 943 Philips Gardco fluorescent and HID step lights to LED without the need to replace the back housing. Retrofit kits are available in Wall Type "C" only (Concrete Pour.) Retrofit kits are not available for existing Wall Type "D" (Drywall) luminaires. The step light portion of existing 943BL25 and 943BL40 units may be replaced utilizing RK-943L retrofit kits.

FACEPLATE: All faceplates are constructed of one piece die cast aluminum and are secured to the housing with two (2) recessed and captive hex head socket screws. Integral spring clips ensure positive grounding. Self-compensating single-piece silicone gasketing completely seals the luminaire and allows for varying wall thicknesses.

LOUVER: Die cast louvers span the entire length of the faceplate, providing for vandal resistance and glare control. Louver faceplate include diffuse glass behind the louvers to minimize apparent glare from the luminaire.

DIFFUSE GLASS: The faceplate includes a 3/16" thick diffuse white opal flat tempered glass lens. The lens is internally sealed and mounted and provides a soft, uniform glow.

RIBBED GUARD: 90° die cast louvers span the entire length of the faceplate over a diffuse glass lens. Not available in the 941L and RK-941L.

HOUSING: The housing is corrosion-resistant die cast aluminum.

J-BOX: The field convertible junction box is die cast aluminum. It is shipped factory-mounted to the back of housing. The box can be easily positioned on the bottom of the luminaire via two (2) phillips head screws. Each J-box includes three (3) threaded openings (one on each side and one on the bottom) that accommodate 3/4" conduit.

LED RELIABILITY:

PREDICTED LUMEN DEPRECIATION DATA		
Ambient Temperature °C	Driver mA	L ₇₀ Hours ⁹
25 °C	350 mA	180,000
	530 mA	115,000
	700 mA	95,000
40 °C	350 mA	175,000
	530 mA	100,000
	700 mA	90,000

⁹ Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions. L₇₀ is the predicted time when LED performance depreciates to 70% of initial lumen output.

THERMAL MANAGEMENT: Philips Gardco 94 Line LED step and aisle lights include integral thermal control to provide the excellent thermal management so critical to long LED system life.

ELECTRICAL: Luminaires are equipped with an LED driver that accepts 120V through 277V, 50hz to 60hz, input (Wall Type C) , or with specific 120V or 277V input voltages (Wall Type D). Driver output is based on the LED wattage selected. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600 VAC at 302°F / 150°C or higher. Plug disconnects are listed by UL for use at 600 VAC, 15A or higher. Power factor is not less than 90%. Luminaire consumes 0.0 watts in the off state. Surge protector standard. 10KA per AN SI/IEEE C62.41.2.

FINISH: Each standard color luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) textured polyester powdercoat finish. Standard colors include bronze (BRP), black (BLP), white (WVP), and natural aluminum (NP). Consult factory for specs on optional or custom colors.

LABELS: All luminaires bear UL or CUL (where applicable) Wet Location labels.

WARRANTY: Philips Gardco luminaires feature a 5 year limited warranty. Philips Gardco LED luminaires feature a 5 year limited warranty covering the LED arrays and LED drivers. See Warranty Information on www.sitelighting.com for complete details and exclusions.



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Imported by: Philips Lighting,
A division of Philips Electronics Ltd.
281 Hillmount Rd,
Markham, ON, Canada L6C 2S3
Tel. 800-668-9008

Sync LED

Suspended

Direct/Indirect

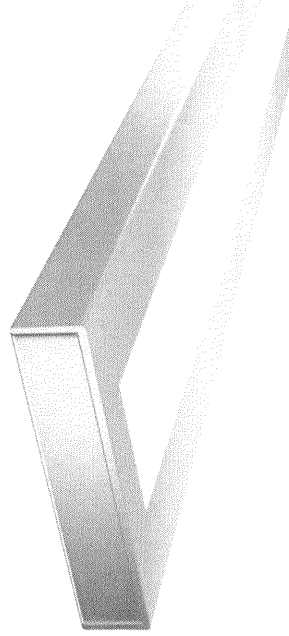
4000K, 4800 lm



Project Name

Spec Type

Notes



Order Guide

Some combinations of product options may not be available. Consult factory for assistance with your specification.

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Product Series & Type Direct/Indirect	Source & Color LA 4000K	Lumen Package C 4800 lm*	Optics QN MesoOptics Lens	Run Length 04 4ft 08 8ft	Wiring 1 lcct 3 lcct w/emergency wiring 7 lcct dimming (0-10V)	Voltage 1 120V 2 277V	Finish W White T Titanium Silver B Black C Custom Color	Controls DS Daylight Response Sensor	For details visit ledalite.com/response				

Mounting Hardware

<input type="text"/>	<input type="text"/>	<input type="text"/>
Mount Type	Suspension Length	Enter distance from ceiling to top of fixture in inches
Consult separate mounting spec sheet for mount type options		

Note: Downlight kits change lumen output. See reverse for details.

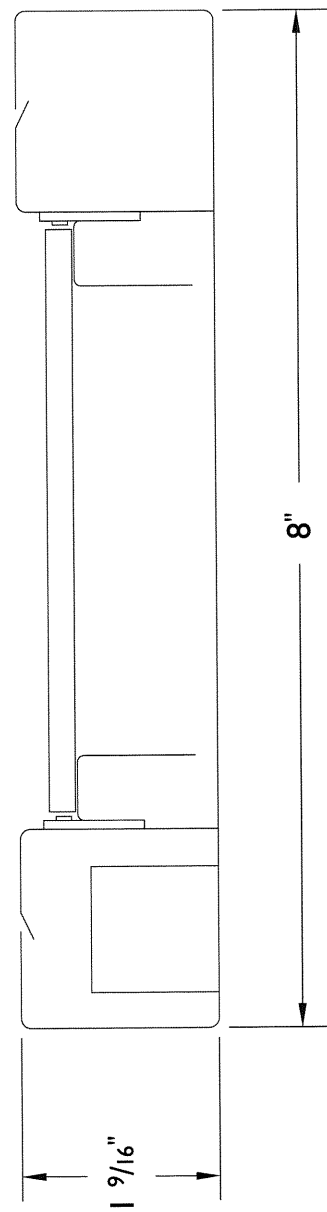
Upgrades

Sculpted EndCap



5 Year Total System Warranty

Sync LED comes with a 5 year total system warranty, that covers the entire luminaire—including the LED board, driver and all fixture components—with world class support backed by Philips Ledalite.



Photometry MesoOptics Lens

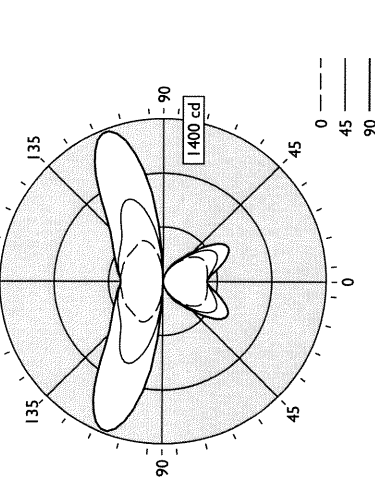
Report No. ITL75659 **CRI** 84 **Power Factor** 0.97 @ 120
Efficacy 101.9 lm/W **R9** 24 **Peak/Zenith Ratio** 38:1
Total Lumens 4767 lm **Input Watts** 46.8 **Peak Candela Value** 1374 @ 110

Meets RP-1-04 recommendations for VDI-intensive spaces

*IESNA LM-79-08 specifies the entire luminaire as the source resulting in a fixture efficiency of 100%.

Light Output (Lumens)	4767	
Watts	46.7	
Lumens per Watt (Efficacy)	102	
Color Accuracy	84	
Light Color Correlated Color Temperature (CCT)	4000 (Bright White)	
Warm White 2700K	Bright White 4000K	Daylight 5000K
Warranty**	Yes	

Candela Distribution



Coefficients of Utilization (%)

RCR	Ceiling					Wall					0				
	70	50	30	10	0	70	50	30	10	0	70	50	30	10	0
0	102	102	102	102	102	91	91	91	91	91	71	71	71	71	27
1	93	89	85	82	83	80	77	62	60	58	24	24	24	24	24
2	85	78	72	67	76	70	65	55	55	49	20	20	20	20	20
3	77	68	62	56	69	62	56	48	44	41	17	17	17	17	17
4	71	61	53	47	63	54	48	43	39	35	15	15	15	15	15
5	65	54	46	40	58	49	42	38	34	30	13	13	13	13	13
6	60	48	40	35	53	43	37	34	30	26	11	11	11	11	11
7	55	43	36	30	49	39	33	31	26	23	10	10	10	10	10
8	51	39	32	27	45	35	29	28	24	20	9	9	9	9	9
9	47	36	28	24	42	32	26	24	21	18	8	8	8	8	8
10	44	32	26	21	39	29	23	22	19	16	7	7	7	7	7

*Based on a floor reflectance of 0.2

Avg. Luminance (cd/m²)

Vertical Angle	Horizontal Angle	
	0	45
55	3180	3333
65	2480	2594
75	1650	1799
85	891	1113

Spacing Criteria

N/A @ 0°
 N/A @ 90°
 N/A @ 180°

Additional Information

Modules

Module length excludes endcaps. Nominal mount spacing for individually mounted modules.

Module	Mount Spacing*
4ft	4" 0"
8ft	8" 0"

* Refer to installation instructions for exact mount spacing

Upper Optics

G 80% Down Kit	J 100% Down Kit
----------------	-----------------



Specifications

Due to continuing product improvements, Philips Ledalite reserves the right to change specifications without notice.

Housing

18 gauge cold-rolled steel, precision formed and welded.

Weight

Maximum 3.5 lb/ft

Optical System

The optical system is comprised of arrays of LEDs, edge-lighting a low profile Light Guide panel. The Light Guide panel allows light to be coupled and transmitted through total internal reflection. The microstructured surface of the panel optimizes the light extraction to create a direct indirect distribution. Light is purified and controlled by MesoOptics film as it passes through the non-glare acrylic lens. Standard distribution is 70% up/30% down.

Lumen Maintenance

At an ambient operating temperature of 25°C, the LED lumen maintenance expectation is L₈₀ > 60,000h.

Electrical

Factory pre-wired to section ends with quick-wire connectors.

Mounting

Tamper-resistant aircraft cable gripper provides infinite vertical adjustment capability. Aircraft cable, crimp and cable gripper are independently tested to meet stringent safety requirements.

Endcaps

Endcaps are diecast aluminum, available in flat (standard) or sculpted (optional).

Driver

Dimming: 0-10V - 5-100%. Output is Class 2 rated.

Approvals

Certified to UL, CSA and IES standards.

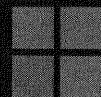
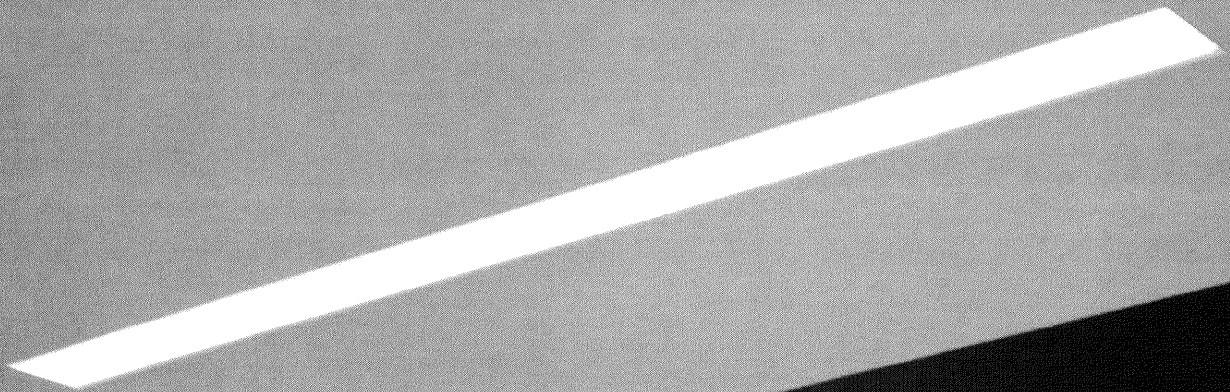
Finish

Standard finish is textured matte White, Black or Titanium Silver.

Environment

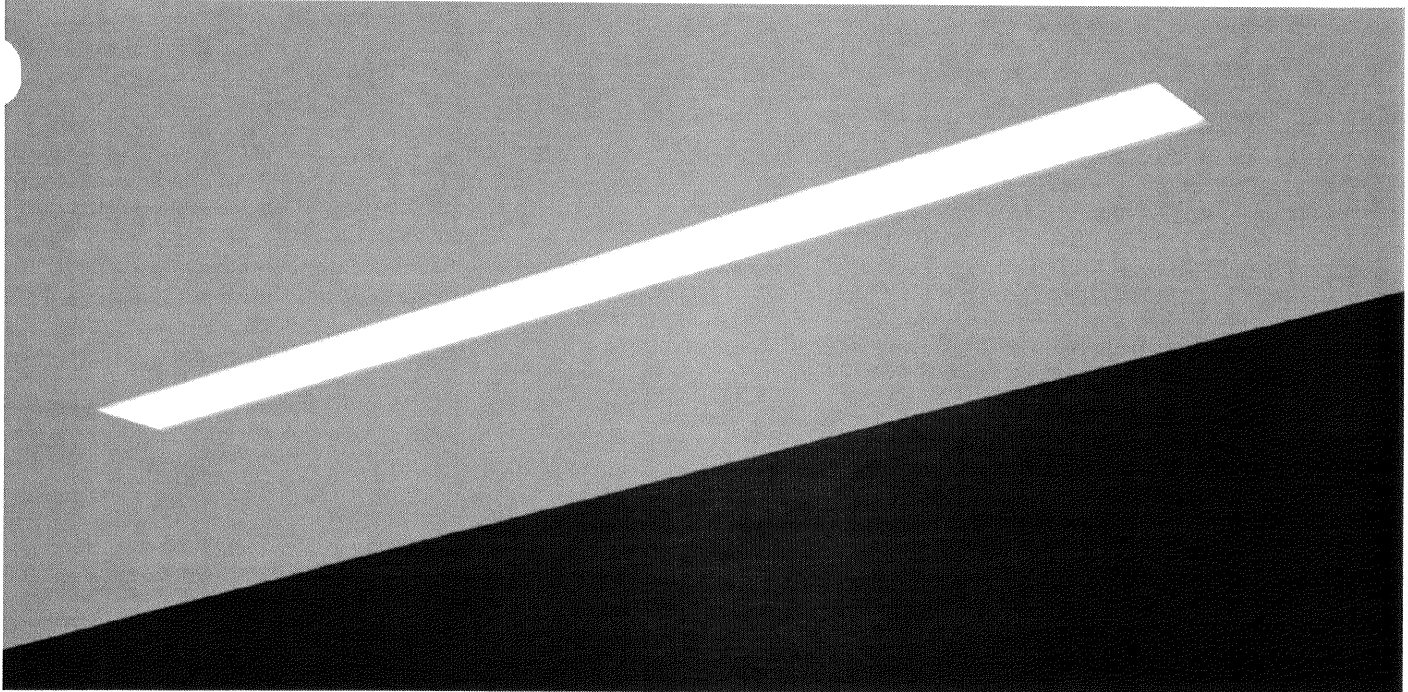
Rated for dry or damp locations in operating ambient temperatures of 0-40°C (32-104°F).

a·light
elements

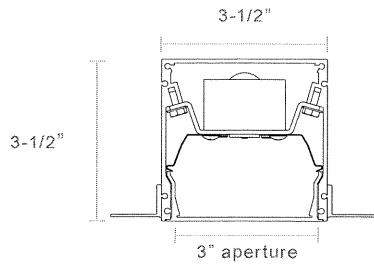


D5
recessed

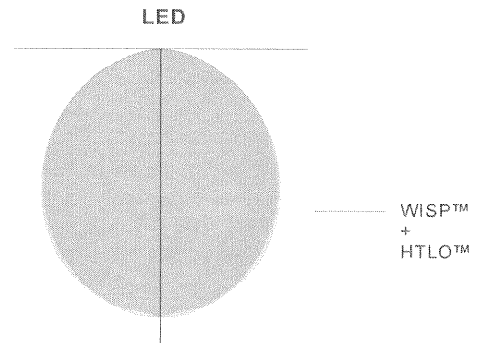
direct



recessed 3"



Numerous lamping/optic/flange configurations available.
LED + lens + gyp flange shown as example.
Do not use above dimensions as a substitute for installation instructions.



LED	1 board in cross	
per foot	watts/ft	lumens/ft
LS	5	600
LH	10	1200

Lumens at board at 4000k.
Consult IES files online for delivered lumens.
Specifications subject to change.

Available Light Platforms:



Available Mounting:



interior exterior

Series: D5

Mounting:

Flush Gypsum/Hard Lid Ceiling or Wall: "Flangeless" appearance for gyp or other hard ceiling/wall. Flange is not visible and is not factory-painted. Raw aluminum flange must be attached to blocking (by others), mudded over and painted by ceiling contractor for flangeless appearance.

1" Regressed Gypsum/Hard Lid Ceiling or Wall: Same as above except regressed flange raises lens 1" into ceiling resulting in a 4.5" height. Interior 1" regressed portion is exposed raw aluminum and visible on both sides unless finish is chosen. Contractor should apply ceiling paint if finish is not chosen.

Trim Flange: 1/2" visible powdercoated flange. Use for any gyp or hard ceiling/wall that requires a minimal flange covering the ceiling cut-out edge. Choose finish color for trim flange.

T-Bar/Grid Ceiling: 9/16" or 15/16" standard T-Bar or 9/16" slot ceiling. Raw aluminum flange sits on T-Bar, is not visible and is not painted. LED & T5 lamping available for all lengths; T8 available only for 8ft & 12ft.

4" Armstrong Techzone™ / USG Logix™ or other 4" Utility Systems: Suitable for use in 4" on-center standard or slot T-Bar systems. Raw aluminum flange sits on T-Bar, is not visible and is not painted. LED & T5 only. N4 is regressed, T4 is flush.

Concealed Grid for Decoustic Ceilencio®: 2-3/4" panel/grid regress. Raw aluminum flange sits on T-Bar, is not visible and is not painted. LED & T5 only.

Lengths:

All length dimensions are nominal, used for general length identification purposes. Actual lengths may vary by several inches. Lengths to 12' are individual fixtures and do not connect. Lengths beginning with "R" designate standard, nominal rows comprised of 4' and/or 8' sections.

Specify all modifications with the "integrations" specification sheet: nominal lengths other than the standards available here, rows longer than 24', exact lengths, patterns, shadowmolding or other mount types.

MR16 Modules:

See MR16 Addendum on www.alights.com for lamp recommendations. Use encapsulated 20w or 35w aluminized reflector or 20w or 37w IR MR16 lamps only (not included).

LED:

5yr warranty, >60,000hr LED life. Tested to LM-79 and LM-80. See wattage/lumen table for specifications per foot. All specifications are subject to change.

T5/T5HO:

Single lamp in cross section only. Program start is factory standard.

T8:

Single lamp in cross section only. Instant start is factory standard: choose low <0.8BF; standard 0.8-1.0BF; high >1.0BF. Specify if program start or custom ballast factor is required.

Construction:

60% recycled aluminum extruded housing. Steel endcap for T-Bar flanges, milled aluminum endcap for gyp or trim flange.

Finish:

Electrostatically applied powder coat finish. Finish applies to MR16 module plates and XP trim flange.

Listing:

UL/CUL. Damp Location.

Wet Label:

Specify in Options. Lens required.

Companion Luminaires:

D6 recessed, D3 wall/suspended/ceiling, D7 recessed

Legend:

- Emergency ballast not applicable on lengths 3ft or less.
- Standard multi-circuiting. see fixture chart below.
- Standard on/off occupancy sensor: Wattstopper FS-205 with minimal 1" diameter.
- Standard occupancy sensor with photocell: Wattstopper FS-205 wired for daylight harvesting. Requires 0-10V dimming ballast.
- Lens is required for use in wet or natatorium locations.
- T5/T5HO only, 1 lamp in cross section.
- Fluorescent only. Staggered lamping not recommended with HTLO™.
- LED only. "SH" optics recommended.
- MR16 modules. 2 modules per fixture, 1 at each end, adds 12" total to luminaire length.
- Not available with staggered or dual lamping.
- Staggered lamping not available on lengths less than 8ft. 8ft length uses 3-3ft lamps. 12ft uses 2-3ft and 2-4ft lamps.
- Not available with LED.
- The N4 mounting requires the housing to sit on top of the slot T-Bar creating a slight regress and will not sit flush to ceiling tile.

Multi-circuit standards



Dimension:

nominal 2'	2
nominal 3'	3
nominal 4'	4
nominal 8'	8
nominal 12'	12
nominal 16' row	R16
nominal 20' row	R20
nominal 24' row	R24

Lamping:

LED standard output	LS
LED high output	LH
T5 (1)	S
T5HO (1)	H
T5 (2)	D
T5HO (2)	O
T5 staggered	2
T5HO staggered	4
T8 (1) low output	T8L
T8 (1) standard output	T8S
T8 (1) high output	T8H
MR16 modules (2)	3

LED Temp (if applicable):

3000k	30
3500k	35
4000k	40

Voltage:

universal 120V - 277V	U
120V	1
277V	2
347V	3

Optics:

a parabola™ louver	P
a parabola™ wall wash louver	W
a cirrus™ lens	A
HTLO™ lens	H
HTLO™ vertical (LED only)	HV
HTLO™ vertical + horizontal (LED only)	HVH
WISP™ lens	S
WISP™ + HTLO™ (LED only)	SH
1/2" regressed lens: choose "A", "H" or "S"	R__
a wash™ kicker + lens: choose "A", "H" or "S"	K__
a wash™ LED kicker (LED only)	KSH
FIT™ white louver	ZW
FIT™ aluminum louver	ZA
a lenszilla™ white louver + lens: choose "A" or "H"	ZW__
a lenszilla™ aluminum louver + lens: choose "A" or "H"	ZA__
a graze™ white louver + specular reflector	GW
35 or 37W MR16 module	MF2
20W MR16 module	MZ2

Mounting:

flush gyp/hard lid - no finish	G
1" regressed gyp - optional finish	RG
trim flange - choose finish	XP
t-bar 9/16" - no finish	T
t-bar 15/16" - no finish	X
t-bar 9/16" slot - no finish	N
4" on center standard t-bar - no finish	T4
4" on center slot t-bar - no finish	N4

Finish:

a-lightenium™	T
satin white	W
satin black	B
textured eggshell white	E
other - specify RAL#	O
no finish (t-bar or gyp/no MR16)	-

Options:

dimming - specify manufacturer, model/series and voltage	D
emergency - specify model/series or lumens	E
external fusing	F
multi-circuit	M
new york city code	N
chicago plenum code	C
occupancy sensor	O
photocell/daylight sensor	P
natatorium application	K
wet label	Q

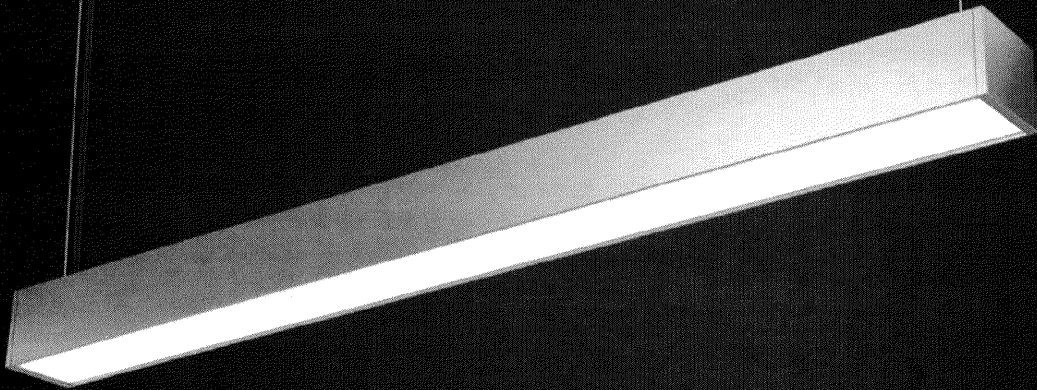


recessed



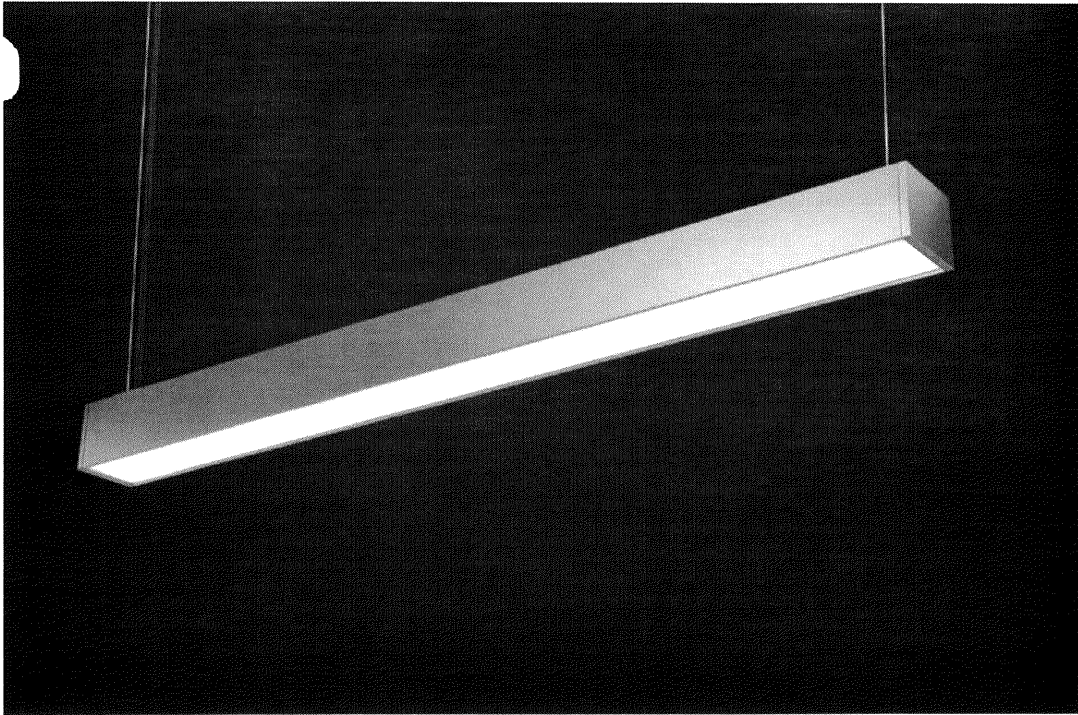
TYPE G SERIES

a·light
elements

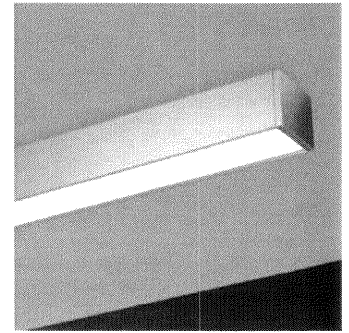


D3
suspended | ceiling | wall

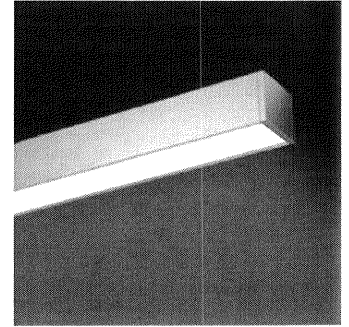
direct



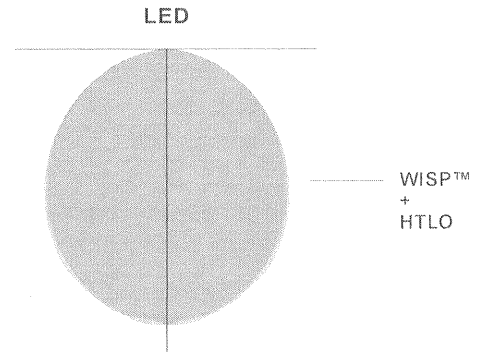
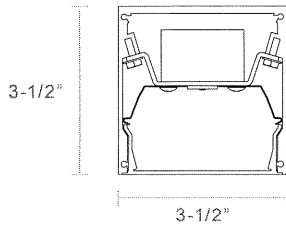
suspended



ceiling



wall



LED	1 board in cross	
per foot	watts/ft	lumens/ft
LS	5	600
LH	10	1200

Lumens at board at 4000k.
Consult IES files online for delivered lumens.
Specifications subject to change.

Available Light Platforms:



Available Mounting:



interior exterior

Mounting:

Single or Dual Cable: (1) or (2) 4', 1mm stainless steel aircraft cable w/ fully adjustable grippers and locking device. 5' plastic-coated, silver-braided, flexible cord. Satin white, square canopy is standard.

Pendant/Stem: 3/8" stem and round canopy, painted white. Indicate pendant length. If specified for earthquake zone, a light will provide swivel canopies.

Standard Wall Mount: Fixture mounts directly to wall. Power connects inside fixture using BX or MX style wiring. ADA compliant.

Wall Blocks: Precisely milled aluminum block mounts provide minimalistic appearance. 3/8", 1/2", 1" or 2" deep. ADA compliant with 3/8" or 1/2" blocks. (2) blocks provided per fixture, lengths 8ft or less; (3) blocks per 12ft.

Horizontal Set-Off Brackets: 1" or 1/2" deep set-off brackets cover a single gang box (by others). ADA compliant with 1/2" set-off. (2) brackets provided per length up to 12ft.

Ceiling/Surface Mount: Fixture mounts directly to ceiling, power connects inside fixture using BX or MX style wiring.

Lengths:

All length dimensions are nominal, used for general length identification purposes. Actual lengths may vary by several inches. Lengths to 12' are individual fixtures and do not connect. Lengths beginning with "R" designate standard, nominal rows comprised of 4' and/or 8' sections.

Specify all modifications with the "integrations" specification sheet: nominal lengths other than the standards available here, rows longer than 24', exact lengths, patterns, span mount, mullion mount, etc.

MR16 Modules:

See MR16 Addendum on www.alights.com for lamp recommendations. Use encapsulated 20w or 35w aluminized reflector or 20w or 37w IR MR16 lamps only (not included).

LED:

5yr warranty. >60,000hr LED life. Tested to LM-79 and LM-80. See wattage/lumen table for specifications per foot. All specifications are subject to change.

T5/T5HO:

Single, dual or single staggered lamps in cross section. Program start is factory standard.

T8:

Single lamp in cross section only. Instant start is factory standard: choose low <0.8BF; standard 0.8-1.0BF; high >1.0BF. Specify if program start or custom ballast factor is required.

Construction:

60% recycled aluminum extruded housing. Precision die-cast endcaps.

Finish:

Electrostatically applied powder coat finish.

Listing:

UL/CUL. Damp Location.

Wet Label:

Specify in Options. Lens required.

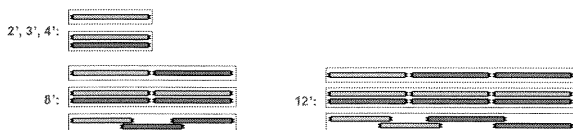
Companion Luminaires:

D1 suspended, D2 suspended/wall, D4 wall, D5 recessed, D7 recessed

Legend:

- Emergency ballast not applicable on lengths 3ft or less.
- Standard multi-circuiting - see fixture chart below.
- Standard on/off occupancy sensor: Wattstopper FS-205 with minimal 1" diameter.
- Standard occupancy sensor with photocell: Wattstopper FS-205 wired for daylight harvesting. Requires 0-10V dimming ballast.
- Lens is required for use in wet or natatorium locations.
- T5/T5HO only, 1 lamp in cross section.
- Fluorescent only. Staggered lamping not recommended with HTLO™.
- LED only. "SH" optics recommended.
- MR16 modules. 2 modules per fixture, 1 at each end, adds 12" total to luminaire length.
- Not available with staggered or dual lamping.
- Staggered lamping not available on lengths less than 8ft. 8ft length uses 3-3ft lamps. 12ft uses 2-3ft and 2-4ft lamps.
- Not available with LED.
- Painted wall wash kicker is visible and is 11/16" below ceiling plane.

Multi-circuit standards



Series: D3

Dimension: _____

nominal 2'	1	2
nominal 3'	1	3
nominal 4'		4
nominal 8'		8
nominal 12'		12
nominal 16' row		R16
nominal 20' row		R20
nominal 24' row		R24

Lamping: _____

LED standard output	8	LS
LED high output	8	LH
T5 (1)		S
T5HO (1)		H
T5 (2)		D
T5HO (2)		O
T5 staggered	11	2
T5HO staggered	11	4
T8 (1) low output		T8L
T8 (1) standard output		T8S
T8 (1) high output		T8H
MR16 modules (2)	8	3

LED Temp (if applicable): _____

3000k	30
3500k	35
4000k	40

Voltage: _____

universal 120V - 277V	U
120V	1
277V	2
347V	3

Optics: _____

a parabola™ louver	6	P
a-parabola™ wall wash louver	6	W
a-cirrus™ lens		A
HTLO™ lens	7	H
HTLO™ vertical (LED only)	8	HV
HTLO™ vertical + horizontal (LED only)	8	HVH
WISP™ lens		S
WISP™ + HTLO™ (LED only)	8	SH
1/2" regressed lens: choose "A", "H" or "S"		R_
a wash™ kicker + lens: choose "A", "H" or "S"	10	K_
a wash™ LED kicker (LED only)	8	KSH
FIT™ white louver	12	ZW
FIT™ aluminum louver	12	ZA
a-lenszilla™ white louver + lens overlay: choose "A" or "H"		ZW_
a-lenszilla™ aluminum louver + lens overlay: choose "A" or "H"		ZA_
a graze™ white louver + specular reflector	10	GW
D7 wall wash flange	13	D7
35 or 37W MR16 module	9	MF2
20W MR16 module	9	MZ2

Mounting: _____

single aircraft cable	S
dual aircraft cable	D
pendant / rigid stem - indicate stem length	P_
pendant / rigid stem for earthquake zone - indicate stem length	PV_
standard wall mount	R
wall mount blocks: choose 1=1" deep, 2=2", 3=3/8", 5=1/2"	M_
horizontal setoff bracket: choose 1=1" deep, 5=1/2"	H_
ceiling/surface mount	F

Finish: _____

a-lightanium™	T
satin white	W
satin black	B
textured eggshell white	E
other - specify RAL#	O

Options: _____

dimming - specify manufacturer, model/series and voltage	D
emergency - specify model/series or lumens	E
external fusing	F
multi-circuit	M
new york city code	N
occupancy sensor	O
photocell/daylight sensor	P
natatorium application	K
wet label	Q

suspended ceiling wall

Sentry

Series Die Cast Aluminum LED Exit Signs

COMMANDING ATTENTION WITH
RUGGED CONSTRUCTION
& STYLISH DESIGN

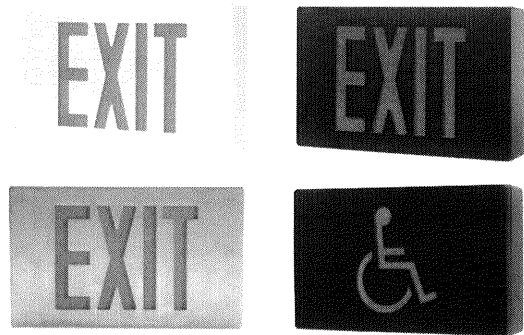
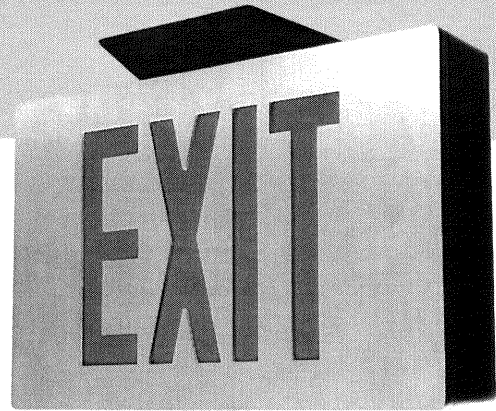
ALWAYS ON DUTY

Sentry Die Cast Aluminum LED exit signs command attention with architectural quality certain to please even the most discriminating eye.

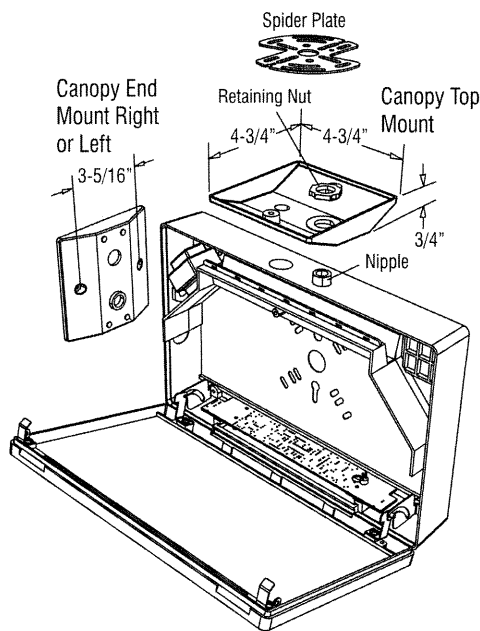
Softened corners and low profile – (just 2.4") – create a sleek effect, further enhanced by chamfered edges.

Available in a standard contrast finish of brushed aluminum stencil over black or white body, or, if you prefer, subtle "all white," dramatic "all black" or architectural "all brushed aluminum" finish.

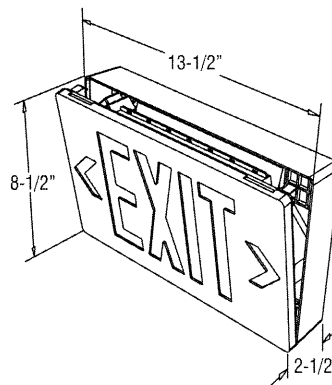
LED Exit Signs



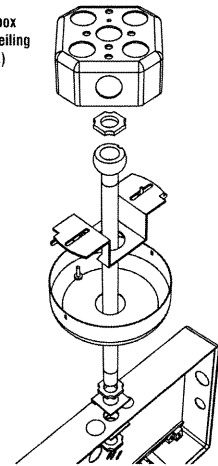
*Shown with SA Option



Top and End Mounting



Octagon junction box (recessed in the ceiling supplied by others)



Swivel Pendant Mounting

**Now available with optional die cast stencil face featuring the 6" International Symbol of Access to meet Connecticut State code requirements, Wire Guard available for wall mount models see data sheet 5.1, Master/Remote model available see data sheet 14.6, Recessing Model available see data sheet 31.1*



ARRA Compliant
for Levels 1&2



3161 State Road, Bensalem, PA 19020 USA
TEL: (800) 872 0879 • FAX: (215) 244 4208 • www.evenlite.com

Project name: BALBOA	Approved By:
Catalog No:	Type No: EX

SENTRY – Die Cast Aluminum LED Exit Signs

FEATURES


- Maintenance-free LED light source, life expectancy of 25+ years
- High-intensity LED array delivers exceptional energy efficiency with just 1-watt power consumption for single & double-face AC models. Battery backup models consume just 2.5 watts, (.77 power factor)
- Vivid legend illumination approximately 4 times the minimum UL requirement
- Injection molded internal cavity reflector provides ease of installation and maintenance together with perfectly even legend illumination
- Spectrally-matched fluorescent diffuser for superior brightness and legend uniformity
- Self diagnostic battery monitoring on all “EM” models
- 4-hour battery backup runtime with premium long-life high-temperature fused Nickel Cadmium battery pack
- 120 or 277 VAC field-selectable input with quick install push wire connectors
- Electronic control circuit applies full wave, low ripple current to each LED, thereby optimizing life and light output
- Remote capability to power one remote exit sign
- A diagnostic self-compensating constant current charger circuit monitors the condition of the battery pack and indicates via a flashing LED when battery needs replacing
- Circuitry includes - zero current LVCO, brownout sensing & line-latch
- Two piece thick wall construction housing from heavy-duty die cast aluminum alloy, removable front stencil face with overlapping light seal
- Fine grain brushed aluminum stencil trim standard. Other finishes available
- Full size 100’ viewing distance field selectable chevron indicators
- Hidden knock out access points and universal pattern
- Low profile universal canopy with cast 3/4” nipple and locking nuts
- Optional recessing frame, polycarbonate face shield with tamper proof access screws, pendant & specialty mounts
- Tested, approved and listed by Underwriters Laboratories to UL 924
- 5-Year Limited Warranty

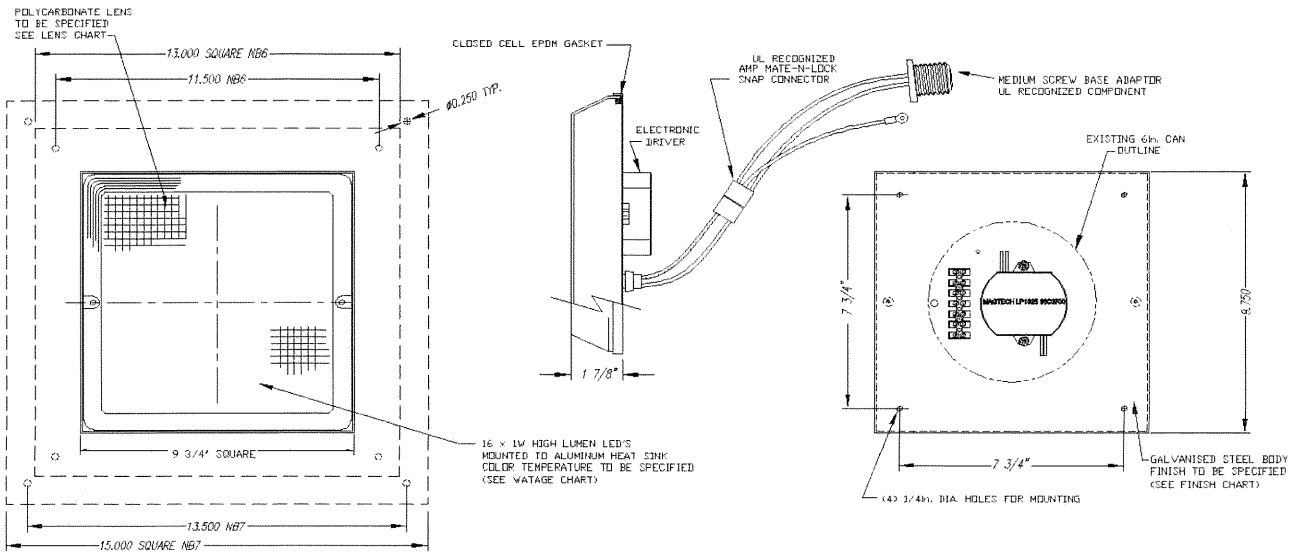
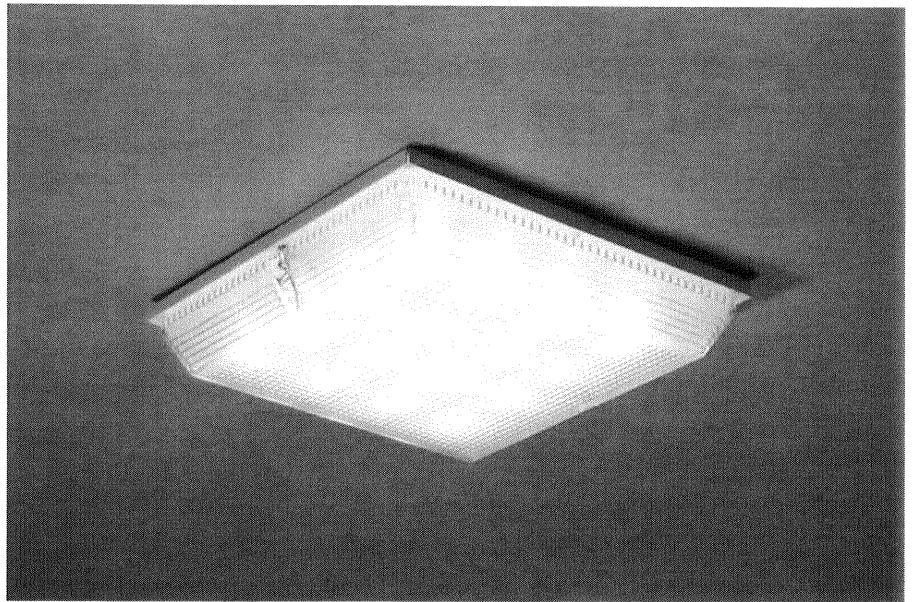
ORDERING GUIDE

Model	Operation	Letter Color	No. of Faces	Body Color	Mounting	Options
CCDS Sentry	AC AC Only 120/277 VAC EM Battery Backup	R Red G Green	1 Single 2 Double	AB Brushed Face Black Body BB All Black WW All White AA All Brushed Aluminum AW Brushed Face White Body CC Custom Color	1B Back mount, No canopy CN Canopy Mounting Kit PA 12” Swivel Pendant Mount PB 24” Swivel Pendant Mount PC 36” Swivel Pendant Mount PD 48” Swivel Pendant Mount	F Flash in Emergency Mode (EM models) or continuous Flash in AC models FZ F option including Buzzer FA Flash in AC and Emergency mode on 12-24V (AC or DC) normally off fire alarm signal. (Available for AC and EM models) FB FA option including Buzzer DK Two Circuit Input 120 or 277 V (AC models) DL Damp Location TP Tamper Proof Screws PC1 1/8” Polycarbonate Faceplate (includes TP) SD Self-Test / Self-Diagnostic IR Infrared Remote Testing Receiver Option TLRT Infrared Remote Hand Held Transmitter (order separately) M990010 Wire Guard (Wall Mount Only) SA 6” Stencil Face Int’l Symbol of Accessibility

Example: CCDS-EM-R-1-AB-CN-SD

LED QUATRO

- . Zinc coated steel body
- . .187" thick UV stabilized polycarbonate lens
- . Lens available in opal clear prismatic diffuser
- .  listed damp label
- . Rated IP44, IK10++
- . 16 x 1W Cree XPE LEDs
- . 1 Integral power supplies 120V-277V
- . Complies with LM79, LM80
- . **ARRA** level II
- . **ADA** compliant
- . Supplied with medium base screw in adaptor
- . Retro-fits over recessed downlight from 6" dia. to 14" square.
- . Energy Star compliant



LED QUATRO W 16 X 1W LEDS

SERIES	PROD. ID	LAMP TYPE	WATTAGE	BODY	FINISH	GRILL	BALLAST	LENS	OPTIONS
	XXX	X	XX	X	XX	X	X	X	XX
NB5 (NOM. 10" SQUARE)	NB5	L-LED	1Q-3000K LEDS	1-SURFACE MOUNT NO CONDUIT ENTRIES	01-Semi-Gloss White	1-STD	C-120V-277V INTEGRAL ELECT.DRIVER	P-CLEAR POLYCARBONATE LENS	0-NONE
NB6 (NOM. 13" SQUARE)	NB6		2Q-4000K LEDS					X-OPAL POLYCARBONATE LENS	
NB7 (NOM. 15" SQUARE)	NB7		3Q-6000K LEDS						

OPERATING COST ANALYSIS LED NOBODY QUATRO

ASSUMPTIONS

ENERGY COST: \$0.1125/KWH (JCPL)
LABOR RATE : \$24.97 INC. OVERHEAD AND BENEFITS (US DEPT. OF LABOR)
BURNING HOURS : 12 HOURS PER DAY
LED HOURS: 50,000
INCANDESCENT HOURS: 750

INCANDESCENT COST (PER YEAR PER FIXTURE)

ENERGY: $100W \times 12 \text{ HOURS} \times 365 \text{ DAYS} / 1000 \times \$0.1125 = \$49.28$
LAMP REPLACEMENT: $\$0.33 \times 12 \text{ HOURS} \times 365 \text{ DAYS} / 750 = 1.93$
LABOR REPLACEMENT $\$24.97 \times .25 \times 4380 / 750 = 36.46$
TOTAL \$87.67

LED COST (PER YEAR PER FIXTURE)

ENERGY: $19.2W \times 12 \text{ HOURS} \times 365 \text{ DAYS} / 1000 \times \$0.1125 = \mathbf{\$9.45}$

SAVINGS OF LED OVER INCANDESCENT \$78.21 (PER FIXTURE/ YEAR)

SAVINGS OVER LIFE OF LED IN DOLLARS

$50,000 \text{ HRS} / (365 \times 12) = 11.4 \text{ YEARS}$ **\$891.58 (PER FIXTURE/ 11.4 YEARS)**

SAVINGS OVER LIFE OF LED IN ENERGY

$(100 (365 \times 12) / 1000) - (19.2(365 \times 12) / 1000) = \mathbf{4036.51 \text{ KWH (PER FIXTURE/ 11.4 YEARS)}}$

designplan 

79 Trenton Avenue
Frenchtown, NJ 08825

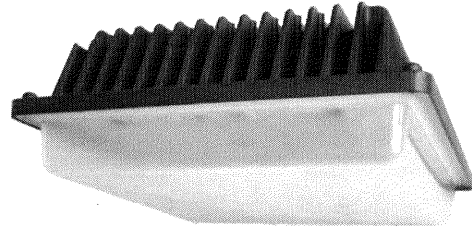
Tel: (908) 996-7710
Fax: (908) 996-7042

CATALOG NO. _____

TYPE NO. **TYPE L** _____

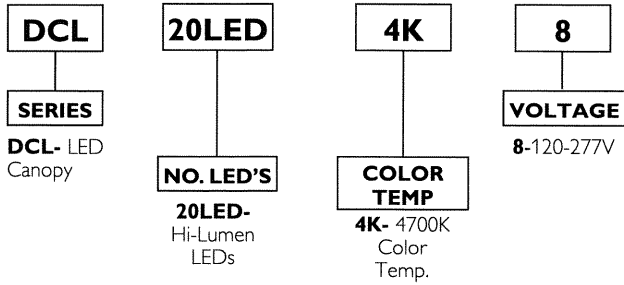
JOB NAME _____

Designer Canopy LED

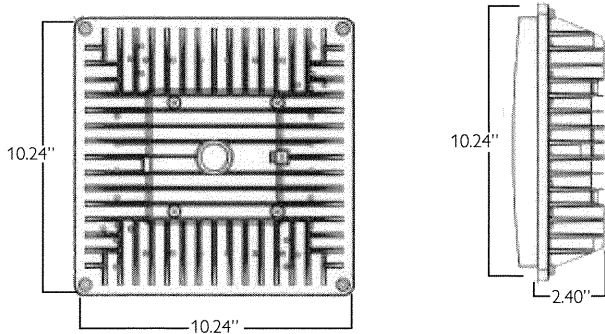


ORDERING INFORMATION

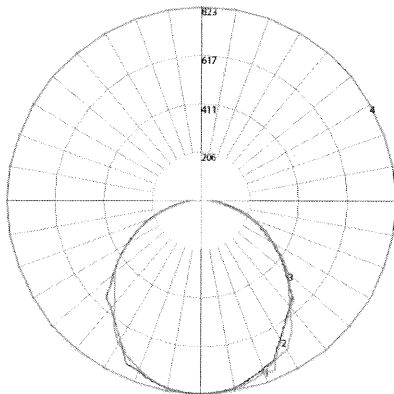
Catalog Number: Example: DCL20LED4K-8



TECHNICAL INFORMATION



PHOTOMETRICS



CHARACTERISTICS

IES Classification
 Longitudinal Classification
 Cutoff Classification (deprecated)
 Total Rated Lamp Lumens
 Maximum Candela
 Maximum Candela Angle
 Maximum Candela @ 90° Vertical
 Maximum Candela from 80 to <90° Vertical
 Downward Total Efficiency
 Total Luminaire Watts
 Ballast Factor

PRODUCT SPECIFICATIONS

- Perfect for hard to service locations
- Ideal for strip-malls, entry ways, garages and plazas.
- Designed to replace up to an existing 100W M.H. system
- Rugged die cast design insures LEDs operate at optimum temperature for long life.
- Continuous silicone rubber gasket between housing and lens/cover
- Architectural bronze UV resistant outdoor powder paint
- Quality long life CREE XPE LEDs
- Low Tj for long life, low lumen depreciation
- Input power - approx. 35 watts
- Delivered lumens output - 2,200
- Lumens per watt (Efficacy): 63
- Operating temperature: -25°C (-13°F) to 35°C (95°F)
- Color temperature 4700K
- Voltage: 120-277V 50/60H
- UL/CUL listed for wet locations
- 5 Year System Warranty

Type II
 Very Short
 Cutoff
 2639
 822.79
 330H 2.5V
 40.28 (1.5% Lamp Lms)
 130.15 (4.9% Lamp Lms)
 90.1%
 36
 0.98

Maximum Candela = 822.79 Located at Horizontal Angle = 330, Vertical = 2.5
 #1 - Vertical Plan Through Horizontal Angles (0-180)
 #2 - Vertical Plane Through Horizontal Angles (90-270)
 #3 - Vertical Plane Through Horizontal Angles (45-255)
 #4 - Horizontal Cone Through Vertical Angle (2.5) (Through Max. Cd.)

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 Specifications are subject to change without notice.
www.philips.com/luminaires



PHILIPS Stonco

Job:
Type:
Notes:

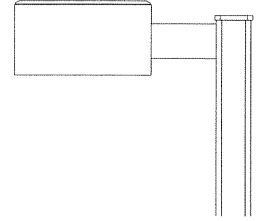
TYPE W5, W5E

Form 10 Square LED

Page 1 of 3

EH / H / Arm Mount

The Philips Gardco arm mounted Square Form 10 LED products are cutoff luminaires featuring LED arrays. Square Form 10 LED luminaires provide performance excellence and advanced Philips Gardco LED thermal management technology. High performance Class 1 LED systems offer the potential for energy savings up to 50 % when compared to HID systems. The EH units are manufactured from mitered extruded aluminum and finished in an Architectural Class 1 anodizing. The H style luminaires are die formed aluminum with a thermoset polyester finish. Form 10 Square LED luminaires provide full cutoff performance and feature a flat glass lens.



PREFIX	MOUNTING	DISTRIBUTION	LED WATTAGE	LED SELECTION	VOLTAGE	FINISH	OPTIONS

Enter the order code into the appropriate box above. Note: Philips Gardco reserves the right to refuse a configuration. Not all combinations and configurations are valid. Refer to notes below for exclusions and limitations. For questions or concerns, please consult the factory.

PREFIX

Available in 70LA and 85LA LED Wattages Only	
EH14L	14" Square Extruded Luminaire LED - Constant Wattage
EH14L-DIM	14" Square Extruded Luminaire LED - 0-10V Dimming
H14L	14" Square Fabricated Luminaire LED - Constant Wattage
H14L-DIM	14" Square Fabricated Luminaire LED - 0-10V Dimming
Available in 110LA and 160LA LED Wattages Only	
EH19L	19" Square Extruded Luminaire LED - Constant Wattage
EH19L-DIM	19" Square Extruded Luminaire LED - 0-10V Dimming
H19L	19" Square Fabricated Luminaire LED - Constant Wattage
H19L-DIM	19" Square Fabricated Luminaire LED - 0-10V Dimming

MOUNTING

1	Single Pole Mount
2	Twin Pole Mount at 180°
2@90	Twin Pole Mount at 90°
3	3-way Pole Mount at 90°
3@120°	3-way Pole Mount at 120°
4	4-way Pole Mount

DISTRIBUTION

2	Type II
3	Type III
4	Type IV
5	Type V

Type II, Type III and Type IV optics are field rotatable. Type V optics feature unitized lens.

Retrofit Kits for existing Form 10 Square 14" and 19" HID luminaires are available. See Legacy LED Retrofit Kits Submittal Data Sheet (G200-21) for Retrofit Kit information.

LED WATTAGE AND LUMEN VALUES

Ordering Code	Average System Watts ¹	LED Current (mA)	LED Selection	Luminaire Initial Absolute Lumens ^{2,3}				Basis of Lumen Data: Photometric tests performed in compliance with IESNA LM-79, except where otherwise indicated. Notes: 1. Wattage may vary by +/- 8% due to LED manufacturer forward volt specification and ambient temperature. Wattage shown is average for 120V through 277V input. Actual wattage may vary by an additional +/- 10% due to actual input voltage. 2. Values shown are for luminaires without the HS external shield option. Tests are in process for luminaires with the HS option and WW luminaires. Contact Gardco.applications@philips.com if approximate estimates are required for design purposes. 3. LED arrays feature LEDs that provide from 100 to 130 lumens per watt when operated at 350 mA. Lumen values based on tests performed in compliance with IESNA LM-79. (s) Marked values are scaled from NW tests on the same luminaire.
				TYPE 2	TYPE 3	TYPE 4	TYPE 5	
70LA	70	350	CW	6,517	6,735	6,568	6,438	
			NW	5,938	6,124	5,989	5,874	
85LA	85	350	CW	7,860	8,114	8,342	8,245	
			NW	7,468	7,697	7,491	7,323	
110LA	110	350	CW	9,535(s)	9,908(s)	9,641(s)	9,526(s)	
			NW	8,911	9,260	9,010	8,903	
160LA	160	530	CW	13,170(s)	13,698(s)	13,244(s)	13,180(s)	
			NW	12,308	12,802	12,378	12,311	

LED SELECTION

CW	Cool White - 5700°K - 75 CRI
NW	Neutral White - 4000°K - 70 CRI
WW	Warm White - 3000°K - 80 CRI

VOLTAGE

UNIV	120V through 277V, 50hz or 60hz
HVU	347V through 480V, 50hz or 60hz (High Voltage Universal)



PHILIPS





Form 10 Square LED

NISH

EH Style

- BRA** Bronze Anodized
- BLA** Black Anodized
- NA** Natural Anodized
- OC** Optional Color Paint
*Specify Optional Color or
RAL ex: OC-LGP or OC-RAL7024.*
- SC** Special Paint
Specify. Must supply color chip.

H Style

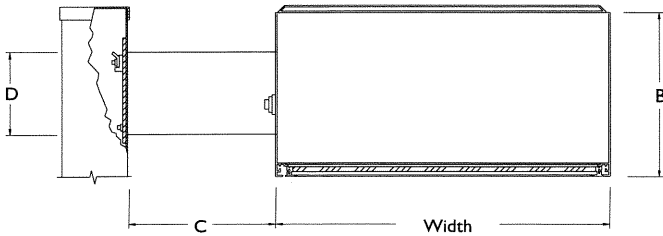
- BRP** Bronze Paint
- BLP** Black Paint
- OC** Optional Color Paint
*Specify Optional Color or
RAL ex: OC-LGP or OC-RAL7024.*
- SC** Special Paint
Specify. Must supply color chip.

OPTIONS

- F⁴** Fusing In Head
- LF** In-Line/In-Pole Fusing
- PC⁴** Photocontrol and Receptacle
- PCR** Photocontrol Receptacle only
- MF** Mast Arm Fitter *Requires 2 3/8" OD mast arm.*
- MU** 10° Uptilt Bracket
- AP⁵** Adjustable Knuckle - Square Pole Mount
- PTF2** Pole Top Fitter - 2 3/8" - 3" Dia. Tenon
- PTF3** Pole Top Fitter - 3" - 3 1/2" Dia. Tenon
- PTF4** Pole Top Fitter - 3 1/2" - 4" Dia. Tenon

4. Not available in 480V. Provide specific input voltage.
5. Only available with 1 way and 2 @ 180° mounting. Square pole mount only.

DIMENSIONS AND EPA



Size	Width	B	C	D
EH14	14"	7"	6"	5"
	35.56 cm	17.78 cm	15.24 cm	12.70 cm
H14	14"	7"	6"	5"
	35.56 cm	17.78 cm	5.08 cm	12.70 cm
EH19	19"	10"	9"	5"
	48.26 cm	25.40 cm	22.86 cm	12.70 cm
H19	19"	10"	9"	5"
	48.26 cm	25.40 cm	5.08 cm	12.70 cm

Size	Effective Projected Area (EPA)			Approximate Weight
	Single	Twin	3/4	Single
14"	1.1 ft ²	2.3 ft ²	2.9 ft ²	30 lbs
	.10 m ²	.21 m ²	.27 m ²	13.61 kg
19"	2.1 ft ²	4.0 ft ²	5.5 ft ²	55 lbs
	.20 m ²	.37 m ²	.51 m ²	24.95 kg

Form 10 Square LED

LUMINAIRE CONFIGURATION INFORMATION

CONSTANT WATTAGE CONFIGURATIONS: Standard LED luminaires provide constant wattage and constant light output when power to the luminaire is energized.

DIMMING "-DIM" CONFIGURATIONS: Dimmable LED luminaires are provided with 0 - 10V dimming for connection to a control system provided by others.

SPECIFICATIONS

GENERAL: The Philips Gardco arm mounted Square Form 10 LED products are cutoff luminaires featuring LED arrays. Square Form 10 LED luminaires provide performance excellence and advanced Philips Gardco LED thermal management technology. High performance Class 1 LED systems offer the potential for energy savings up to 50 % when compared to HID systems. The EH units are manufactured from mitered extruded aluminum and finished in an Architectural Class 1 anodizing. The H style luminaires are die formed aluminum with a thermoset polyester finish. Form 10 Square LED luminaires provide full cutoff performance and feature a flat glass lens.

HOUSING: Extruded housings (EH style) are composed of precisely mitered anodized aluminum extrusions. Fabricated (H style) units are one piece, multi-formed aluminum with an integral reinforcing spline and a single concealed joint. Pressure injected silicone provides a continuous weather tight seal at all miters and points of material transition.

ARM: Extruded aluminum arm is wired and secured to luminaire by contractor. Assembly is suitable for mounting to pole without requiring access to luminaire.

LENS: Mitered, extruded anodized aluminum door frame retains the optically clear, heat and impact resistant tempered flat glass in a sealed manner using hollow section, high compliance, memory retentive extruded silicone rubber. Concealed stainless steel latch and hinge permit easy toolless access to the luminaire.

THERMAL MANAGEMENT: The Philips Gardco Form 10 Square LED luminaires utilize extruded aluminum integral thermal radiation fins to provide the excellent thermal management so critical to long LED system life.

OPTICAL SYSTEMS: Philips Gardco Form 10 Square LED luminaires utilize lensed LED arrays set to achieve IES Type II, Type III, Type IV and Type V distributions. Individual LED arrays are replaceable. Optical systems are field rotatable. Luminaires feature high performance Class 1 LED systems.

ELECTRICAL: Luminaires include a complete prewired LED driver assembly, provided as part of the optical assembly. Luminaires include an LED driver that accepts 120V through 277V, or 347V through 480V, 50hz to 60hz, input. Driver output is based on the LED wattage selected. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600 VAC at 302°F / 150°C or higher. Plug disconnects are listed by UL for use at 600 VAC, 15A or higher. Power factor is not less than 90%. Luminaires consume 0.0 watts in the off state. Surge protector standard. 10KA per ANSI/IEEE C62.41.2.

FINISH: Extruded housings (EH style) are standard with natural, bronze, or black Aluminum Association Architectural Class I anodized finish. Special color polyester finishes are available. Formed housings (H style) are standard with a chromatic acid pretreatment. The finish coat is a thermosetting polyester baked at 450°F / 232°C to achieve an H-2H hardness measure. 2

LABELS: All luminaires bear UL or CUL (where applicable) Wet Location labels.

WARRANTY: Philips Gardco Form 10 Square LED luminaires feature a 3 year limited warranty, including a 5 year limited warranty covering LED arrays and LED drivers. See Warranty Information on www.sitelighting.com for complete details and exclusions.

LED RELIABILITY:

PREDICTED LUMEN DEPRECIATION DATA		
Ambient Temperature °C	Driver mA	L ₇₀ Hours ⁷
25 °C	350 mA	150,000
	530 mA	100,000
40 °C	350 mA	100,000
	530 mA	70,000

7. Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions. L₇₀ is the predicted time when LED performance depreciates to 70% of initial lumen output.

FULL CUTOFF PERFORMANCE: Full cutoff performance means a luminaire distribution where zero candela intensity occurs at an angle at or above 90° above nadir. Additionally, the candela per 1000 lamp lumens does not numerically exceed 100 (10 percent) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.

CUTOFF PERFORMANCE: Cutoff performance means a luminaire distribution where the candela per 1000 lamp lumens does not numerically exceed 25 (2.5 percent) at an angle at or above 90° above nadir, and 100 (10 percent) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.



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Philips Lighting
North America Corporation
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Somerset, NJ 08873
Tel. 855-486-2216

Imported by: Philips Lighting,
A division of Philips Electronics Ltd.
281 Hillmount Rd,
Markham, ON, Canada L6C 2S3
Tel. 800-668-9008

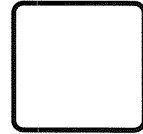
Job:
 Type:
 Notes:

TYPE W5, W5E

Poles

5" / 6" Straight Square Steel

The Philips Gardco SSS straight steel pole consists of a one-piece square fabricated steel lighting standard. The carbon steel base plate is secured to the shaft with a continuous circumferential weld providing excellent strength and integrity. The poles are finished with an electrostatically applied, thermally cured TGIC polyester powdercoat. All poles include anchor bolts, full base cover, hand hole, ground lug and top cap.



PREFIX	HEIGHT	SIZE	GAUGE	DRILLING	FINISH	OPTIONS

Enter the order code into the appropriate box above. Note: Philips Gardco reserves the right to refuse a configuration. Not all combinations and configurations are valid. Refer to notes below for exclusions and limitations. For questions or concerns, please consult the factory.

PREFIX	HEIGHT	SIZE	GAUGE	DRILLING
SSS5	20'	5"	7	D1 1 Way
SSS6	25'	6"	11	D2 2 Way
	30'			D2@90 2 Way at 90°
	35'			D3 3 Way
	40'			D4 4 Way
				T2 2 3/8" OD Tenon
				T4 4" OD Tenon

FINISH

PP	Prime Painted
BRP	Bronze Paint
BLP	Black Paint
WP	White Paint
NP	Natural Aluminum Paint
GV	Galvanized (No Paint)
FIGV	Finished Paint over Galvanized (specify color)
OC	Optional Color Paint Specify RAL designation ex: OC-RAL7024.
SC	Special Color Paint Specify. Must supply color chip.

OPTIONS

FES	Festoon Outlet	<i>For Festoon Outlets and Additional Hand Holes, indicate height above base and orientation to original hand hole. See Pole Orientation Information on Page 4.</i>
AHH	Additional Hand Hole	
Couplings		
<i>Indicate size (1/2", 3/4", 1", 1 1/4", 1 1/2".) Indicate height above base and orientation to hand hole. See Pole Orientation Information on Page 4.</i>		
CL	Coupling - Internal thread	
Single Mount Bullhorn Brackets		
<i>Indicate height above base and orientation to hand hole. See Pole Orientation Information on Page 4.</i>		
GM-080-19	Single - 1.9" OD	
GM-080-24	Single - 2.4" OD	
Motion Response Provisions		
GMR	Provision for Gardco HID Motion Response System	<i>Minimum Pole Height is 18'. Includes a 1/2" coupling placed 180° to the hand hole, 12' above the pole base.</i>
MSM	Motion Sensor Mounting Provision for LED Luminaires available with Motion Response	<i>Minimum Pole Height is 18'. Includes a special hand hole with 1/2" coupling placed in the cover plate, 180° to the hand hole, 15' above the pole base.</i>

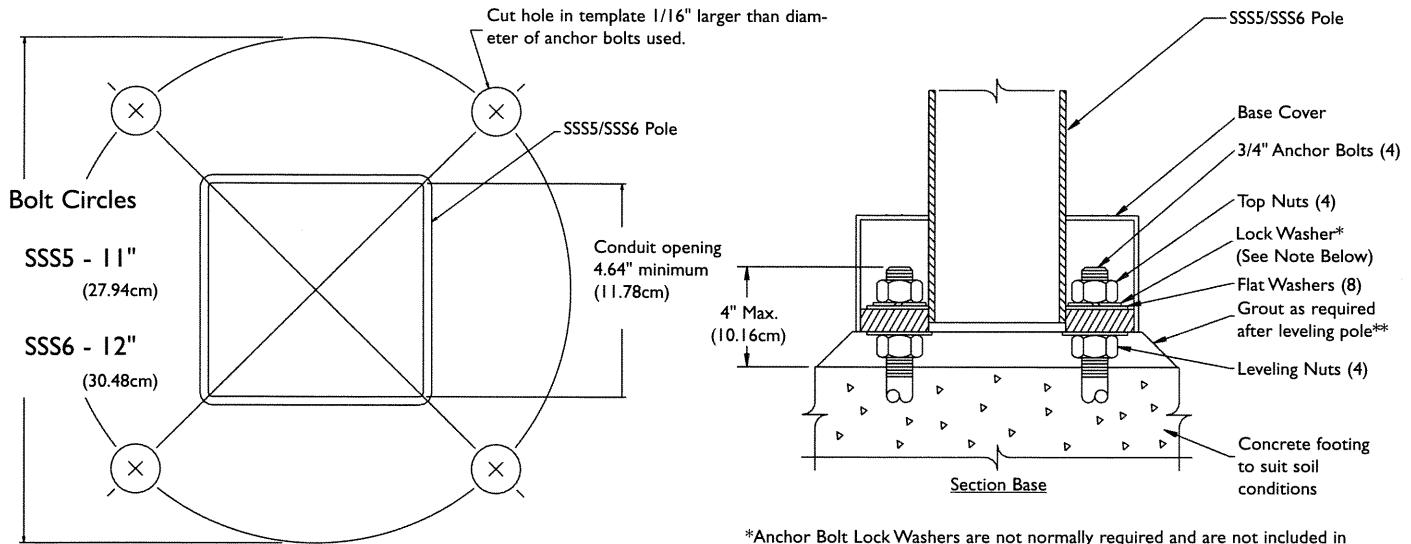
Refer to Steel Pole Accessories sheet 79415-26 for additional accessories.

POLE DATA

CATALOG NUMBER		POLE SIZE		MAXIMUM LUMINAIRE LOADING ¹									ANCHOR BOLT DATA ²		
				HIGH WIND CONDITIONS						NORMAL WIND CONDITIONS					
				130 MPH		120 MPH		110 MPH		100 MPH	90 MPH	80 MPH			
PREFIX	HEIGHT (FT.)	POLE SIZE (inches)	GAUGE	EPA FT ²	Max Weight (lbs)	EPA FT ²	Max Weight (lbs)	EPA FT ²	Max Weight (lbs)	EPA FT ²	EPA FT ²	EPA FT ²	BOLT CIRCLE (inches)	BOLT SIZE (inches)	MAX PROJ. (inches)
SSS	20	5	11	3.5	88	5.0	125	7.0	175	9.4	12.7	17.7	11.0"	3/4 x 17 x 3	4.0"
SSS	20	5	7	6.2	155	8.2	205	10.7	270	16.2	21.4	28.1	11.0"	3/4 x 17 x 3	4.0"
SSS	25	5	11	-	-	-	-	2.1	53	3.7	6.3	9.8	11.0"	3/4 x 17 x 3	4.0"
SSS	25	5	7	2.7	68	4.3	108	6.3	158	9.5	13.3	18.5	11.0"	3/4 x 17 x 3	4.0"
SSS	30	5	11	-	-	-	-	-	-	-	2.0	4.7	11.0"	3/4 x 17 x 3	4.0"
SSS	30	5	7	-	-	-	-	2.0	50	3.9	6.7	10.7	11.0"	3/4 x 17 x 3	4.0"
SSS	30	6	7	-	-	3.3	83	5.6	140	9.0	13.2	19.0	12.0"	1 x 36 x 4	4.0"
SSS	35	5	7	-	-	-	-	-	-	-	2.5	5.9	11.0"	3/4 x 17 x 3	4.0"
SSS	35	6	7	-	-	-	-	-	-	4.2	7.6	12.4	12.0"	1 x 36 x 4	4.0"
SSS	40	6	7	-	-	-	-	-	-	-	3.0	7.2	12.0"	1 x 36 x 4	4.0"

- Warning:** Additional wind loading, in terms of EPA, from banners, cameras, floodlights and other accessories attached to the pole, must be added to the luminaire(s) EPA before selecting the pole with the appropriate wind load capability.
- Factory supplied template must be used when setting anchor bolts. Philips Gardco will not honor any claim for incorrect anchorage placement resulting from failure to use factory supplied templates.

DIMENSIONS



NOTE: Factory supplied template must be used when setting anchor bolts. Philips Gardco will not honor any claim for incorrect anchorage placement from failure to use factory supplied templates.

*Anchor Bolt Lock Washers are not normally required and are not included in standard anchor bolt sets. They are available upon request at additional cost.
 ** Grouting should include a drainage slot or tube (by others) to permit water to drain from the base of the pole. Failure to provide drainage may weaken the pole base structure over time and may result in pole base failure, for which Philips Gardco is not responsible.

1611 Clovis Barker Road, San Marcos, TX 78666
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79415-18/0611

PHILIPS



SPECIFICATIONS

POLE SHAFT: The pole shaft is fabricated from a single-piece of 11 ga (.1196") or 7 ga (.1793") commercial carbon steel. The formed steel plate is longitudinally welded providing minimum yield strength of 46 KSI.

ANCHOR BASE: The pole anchor base is fabricated from A-36 structural quality carbon steel with a minimum yield strength of 36 KSI. The base plate telescopes the pole shaft and is circumferentially welded on both top and bottom.

ANCHOR BOLTS: Anchor bolts are fabricated from a commercial quality hot rolled carbon steel bar that meets or exceeds a minimum guaranteed yield strength of 50,000 psi. Bolts have an "L" bend on one end and threaded on the opposite end. Anchor bolts are galvanized a minimum of 12" on the threaded end. Four (4) properly sized bolts, each furnished with two (2) regular hex nuts and two (2) flat washers, are provided per pole, unless otherwise specified.

BASE COVER: A two-piece base cover completely conceals the entire base plate and anchorage.

HAND HOLE: The reinforced hand hole has a nominal rectangular 2" X 4" inside opening in the pole shaft. Included is a cover plate with attachment screws. The hand hole is located 18" above the base and 180° clockwise with respect to the luminaire arm when viewed from the top of the pole for one arm. For two arms the hand hole is located directly under one arm.

POLE TOP CAP: Each pole assembly is provided with a removable pole top cap.

FINISH: Poles are available with a bronze, natural, white or black electrostatically applied, thermally cured TGIC polyester powdercoat finish.

STOCK POLES: Poles provided from stock under the Quick Ship program are drilled for four (4) luminaires at 90° with three (3) hole sets plugged.

GENERAL POLE INFORMATION

DESIGN: The poles as charted are designed to withstand dead loads and predicted dynamic loads developed by variable wind speeds with an additional 30% gust factor under the following conditions:

The charted weights include luminaire(s) and/or mounting bracket(s).

The wind velocities are based on 10 mph increments from 80 mph through 100 mph. Poles to be located in areas of known abnormal conditions may require special consideration. For example: coastal areas, airports and areas of special winds.

Poles are designed for ground mounted applications. Poles mounted on structures (such as buildings and bridges) may also necessitate special consideration requiring Philips Gardco's recommendation.

Height correction factors and drag coefficients are applied to the entire structure. An appropriate safety factor is maintained based on the minimum yield strength of the material incorporated in the pole.

WARNING: This design information is intended as a general guideline only. The customer is solely responsible for proper selection of pole, luminaire, accessory and foundation under the given site conditions and intended usage. The addition of any items to the pole, in addition to the luminaire, will dramatically impact the EPA load on that pole. It is strongly recommended that a qualified professional be consulted to analyze the loads given the user's specific needs to ensure proper selection of the pole, luminaire, accessories, and foundation. Philips Gardco assumes no responsibility for such proper analysis or product selections. **Failure to insure proper site analysis, pole selection, loads and installation can result in pole failure, leading to serious injury or property damage.**

GENERAL INFORMATION: Mounting height is the vertical distance from the base of the lighting pole to the center of the luminaire arm at the point of luminaire attachment. Twin arms as charted are oriented at 180° with respect to each other. For applications of two (2) arms at 90° or other multiple arm applications, consult the factory.

WARRANTY: Philips Gardco poles feature a 1 year limited warranty. See Warranty Information on www.sitelighting.com for complete details and exclusions.

1611 Clovis Barker Road, San Marcos, TX 78666

(800) 227-0758 (512) 753-1000 FAX: (512) 753-7855 sitelighting.com

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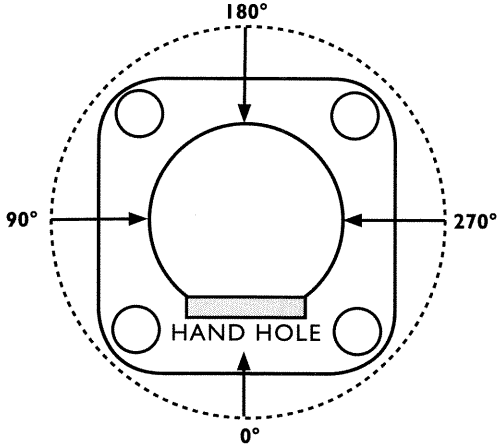
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PHILIPS



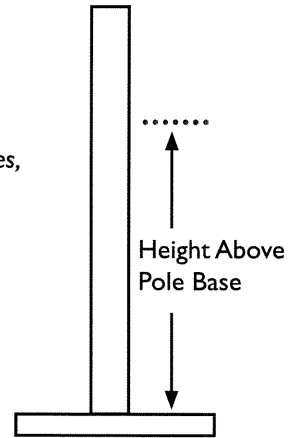
ORIENTATION INFORMATION

FACTORY INSTALLED OPTIONS AND ACCESSORIES



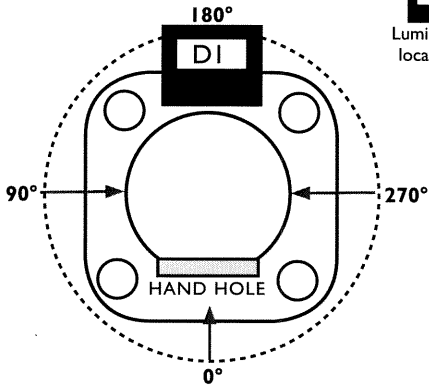
Orientation is measured clockwise from the Hand Hole Center.

For Factory Installed Options and Accessories,
Specify Orientation from Hand Hole and
Height Above Pole Base Where Required.

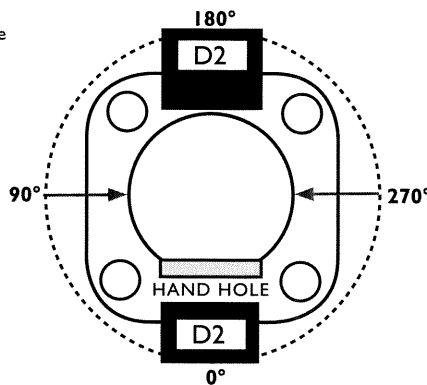


STANDARD ARM MOUNT LUMINAIRE ORIENTATION

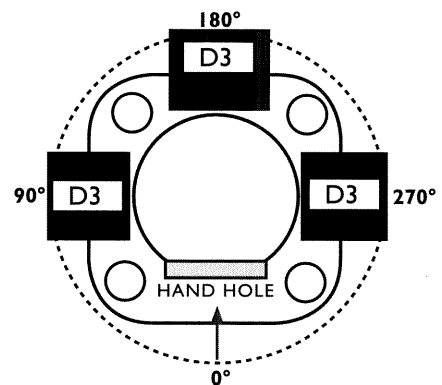
D1 Drilled for Single Luminaire



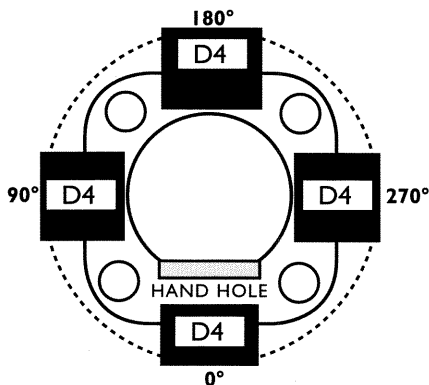
D2 Drilled for 2 Luminaires at 180°



D3 Drilled for 3 Luminaires @ 90°



D4 Drilled for 4 Luminaires at 90°



D2@90 Drilled for 2 Luminaires at 90°

