

DIVISION 10 - SPECIALTIES
SECTION 10440
EXTERIOR SIGNAGE

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. New signage and graphics elements throughout project as shown and located on the Construction Documents.
- B. The construction documents to bid, fabricate and install signage and graphic elements for this project consist of:

1. Part 1 Specifications, Location Plan and Design Drawings: Specifications, Location Plan and Design Drawings are included in a 24" x 28" bond print.

The Specifications state the technical description of minimum quality and performance required of signage and graphic elements.

Location Plan locates all signage and graphic elements.

The Design Drawings show design intent, visual details and typical mounting conditions for signage and graphic elements.

1.2 SUBMITTALS

Provide the following submittals:

A. Shop Drawings

1. Provide three (3) sets of shop drawings for each sign type in the Design Drawings for review and written approval prior to fabrication.
2. Shop Drawings shall include the following:
- a. Shop instruction drawing on vendor's title block showing exactly how the sign will be made: exact materials; techniques; processes; dimensions; internal structure; lighting fixtures; ballast and wiring; welds; connections; fasteners; mounting details; access panels and other pertinent information.
- b. Include message listing with all forms, symbols and text to be used Message listing to correspond to numbering system shown on Signage Location Plans, Signage Design Drawings and Signage Message Matrix.
- c. Include engineering calculations and data for all components of stress.
- d. Structural shop drawings shall be signed and stamped by a California licensed structural engineer from Sign Contractor. Electrical shop drawings shall be signed and stamped by a California licensed electrical engineer from Sign Contractor.

2.3 MATERIALS - PLASTICS

A. Acrylic (interior and exterior):

1. Made with methylmethacrylate polymers, as manufactured by:
- a. AutoHaas (Rohn & Haas)
- b. Or equal.
2. Provide tubing, solid sheet, laminated sheet, or cast acrylic in size, thickness, clarity, opacity, texture, and color required for work.
3. Provide ultra-violet resistant type, where exposed to sunlight.

B. Polycarbonate (interior and exterior):

1. Sheet: Provide with scratch and ultra-violet resistant coating.
- a. AutoHaas (Rohn & Haas)
- b. Lexan by General Electric.
- c. Or equal.
2. Film: 0.015 in. thick Lexan by General Electric or equal.
- a. Provide with 925 chemical and mar-resistant coating.
- b. Provide with matte (specular gloss value of 30 in accord with ASTM D523) finish.
- c. AutoHaas (Rohn & Haas)
- d. Lexan by General Electric.
- e. Or equal.
3. Acrylic/PVC: High impact acrylic polyvinylchloride thermoplastic sheet. Color shall be integral throughout the material and shall be of thickness and color(s) consistent with the type of item to be represented. Provide flame-retardant formulations for all use conditions and ultraviolet-resistant formulations where exposed to sunlight.
- a. Kydex as by Kleardex Co.
- b. Crylex as by Atlas Plastics Corp.
- c. Or equal

2.4 MATERIALS - ADHESIVE FILM (exterior)

- A. Vinyl die-cut: Precision-cut, pre-spaced, computer-generated, pressure-sensitive type by 3M or equal.
- B. Decalcomania (decal): Pressure sensitive adhesive type by 3M, or equal.
- C. Sheet reflective materials: Pressure-sensitive or heat-activated adhesive backed, reflective plastic sheet.
1. Roadway and retroreflective signs: Provide 3M Scotchlite Diamond Grade Long Distance Performance (LDP) reflective sheeting Series 3970 in accordance with Product Bulletin 3570, dated April 1999. (No known equal)

2.5 MATERIALS - CONCRETE (exterior)

- A. Formwork: Provide materials in accord with reference standard ACI 347.
- B. Reinforcement: Provide concrete reinforcement in accord with reference standard CRSI.
- C. Concrete: Provide concrete in accord with reference standard ASTM C94.
1. Mix proportions: As required to produce 28-day compressive strength of not less than 3,000 psi.
- D. Grout: Non-shrink, high-strength, non-metallic hydraulic anchoring cement.

B. Calculations

1. Prior to fabrication, provide engineer stamped calculations for all foundations, lifting eyes and other components that effect the structural design.

C. Patterns

1. Provide three (3) full size, paper pattern for all signs with painted, curved, stenciled, cutout, fabricated, routed or sandblasted letters, characters, forms or other as noted on drawings for review and approval. Identify each pattern with the sign number to which the pattern applies.
2. Pattern definition: Full size exact outline on white paper of each letter, word, character, or form. Include outline of sign panel. Make outlines dark enough for long distance viewing.
3. These patterns, once accepted, will become the patterns or templates for shop fabrication.
4. Retain all original annotated patterns reviewed during pattern submittal process. Retain final approved/stamped pattern for use and review at installation.

D. Colors and Material Samples

1. Submit samples for review and approval. Identify each sample with the sign type number to which the sample applies.
- a. Paint samples, 8 1/2" x 11", on actual specified materials to match color, texture and finish.
- b. Each type exposed metal used for major elements of work with respective finish.
- c. Each type plastic (acrylic, polycarbonate, PVC) used for major elements of work with respective finish.
- d. Each type adhesive plastic film, including die-cut designs.
- e. Decorative hardware, including bolt heads, nail heads, screw heads, rivets and similar exposed items.
- f. Sample Daktronics module as identified on drawings.
2. Compile and maintain a listing of all paint colors with the factory batch number and formulation code for all paints and coatings. For custom semi-opaque and/or "wash" type finishes, provide specific mix "reduced" formulations. Submit the list to the Owner for future maintenance reference.
- Three (3) copies of Manufacturer's Certificates of Material Standards to meet all Code and Ordinance Requirements.

E. Artwork:

1. Sign Contractor to provide all sign type artwork.

1.3 QUALITY ASSURANCE

- A. Comply with all laws, ordinances, rules, regulations and orders of any public authority having jurisdiction over this work.
- B. Preparation:
1. Protect exposed finish surfaces of hanging items from damage resulting from fabricated hanging/support assemblies.

- E. Waste molds: Wood, plastic, staff - as required to produce designs indicated on Design Drawings.
1. Pea gravel: Uniform sized (3/8 in.), washed, hard, durable gravel conforming to ASTM C33. Angular, flat, chip-like, thin, elongated, friable aggregate is not acceptable.

2.6 MATERIALS - MISCELLANEOUS

- A. Cement for acrylic plastic: Weld-On Part No. 4 cement by Industrial Polychemical Co., or equal.
- B. Adhesives:
1. Silicones: Single-component silicone rubber by:
- a. General Electric
- b. Dow Corning
- c. Or equal
2. Epoxy: Two-part, catalyzed; provide fast-setting, high-strength, flexible, high-viscosity or other specific types as necessary and approved by Owner.
3. Tape: Double-coated, high strength acrylic adhesive foam tape, 3M VHB+ tape or equal.
4. Thread-locking: Anaerobic, single-component adhesive, as manufactured by:
- a. Hernon.
- b. Loctite.
- c. Permabond.
- d. Or equivalent.
5. Other: Exterior grade, waterproof, structural types as necessary and compatible with materials in contact with adhesives.
- C. Locks: Tubular key or allen wrench actuated cam lock, brass and/or stainless steel construction.
- D. Magnets: Commercial quality.
- E. Neoprene: Synthetic rubber.
- F. Hook and loop tape (Velcro): High shear strength, dual-grip hook and loop with pressure-sensitive adhesive backing.
- G. Miscellaneous hardware: Provide continuous (piano) hinges, hooks and hook-eyes, hinges and bolts with acorn nuts, chain, invisible (Cos) hinges, and other non-corrosive, commercial type hardware items including fasteners as necessary, where not specifically indicated on the Design Drawings. Ferrous metal hardware is not acceptable.
1. Owner approval of type and finish is required for all items.
2. Mechanical fasteners must be flush (flat head), tamperproof and match finish and type of material being fastened, unless indicated otherwise.
- a. Aluminum, brass, and bronze bolts, screws and nuts: ASTM F467 and ASTM F468.
- b. Stainless steel studs (threaded pins), bolts, screws and nuts: ASTM F593 and ASTM F594.
- c. Fractional-turn, captive and similar specialty-type screw assemblies: As manufactured by: Southco, Inc., Tamperproof Screw Co., or equal.
- d. Provide aluminum or stainless steel threaded inserts for bolting and screwing into acrylic plastics and similar "soft" materials.
- e. Set screws: Headless, cup point, stainless steel socket set screws with self-locking, threaded stainless steel insert.

2. Prepare hanging items to receive proper attachments in accord with Contract Drawings and approved submittals.
3. Install work in accord with approved shop drawings, patterns and color/material submittals.

1.4 MAINTENANCE - MATERIALS AND DOCUMENTATION

- A. Upon completion of work, Contractor is to provide written documentation outlining proper care and maintenance for all graphic materials, colors, finishes and hardware.
- B. Touch-up paint: Provide Owner with one 1/2 pint can of touch-up paint (including clear coat finish) of each type and color used in work.
- C. Provide warranty as follows:
1. Warrant all work against failure because of faulty materials, workmanship, and design for a period of one year from date of acceptance by the Owner.
2. Fading, cracking, warping, peeling, delaminating, rusting, corroding and structural failure, including distortion by whatever cause, shall be construed to mean failure because of faulty materials and workmanship.
3. Failures during the warranty period shall be repaired or replaced to the satisfaction of, and without any cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

- A. The work as herein identified, requires the manufacture and/or purchase of; and delivery, installation and/or application of: Signage and Environmental Graphics as part of the Long Beach City College Sign Program.

2.2 MATERIALS - METALS

- A. Steel (interior and exterior):
1. Exposed, painted locations and bending/forming uses: Stretcher-leveled, electrolytic zinc-coated, sheet steel, with phosphate or other specialty treatment for maximum paint adherence, ASTM A591, commercial or drawing quality, Coating Class C.
2. Concealed, unpainted locations and flat/unformed uses: Galvanized sheet steel, ASTM A653, commercial quality, with G90 coating.
3. Steel shapes: ASTM A36, A53, A500, A501 hot-rolled or cold rolled shapes, plates and tubes in sizes indicated on Design Drawings.
- B. Aluminum (interior and exterior):
1. Sheet Aluminum ASTM B209: Provide alloy and temper consistent with specific fabrication and finishing processes.
2. Extruded aluminum: Provide alloy and temper consistent with specific fabrication and finishing processes.
3. Bars, rod, wire and shapes: ASTM B221
4. Pipe and tubing: Seamless, minimum Schedule 40 or equivalent wall thickness
- a. Non-structural: ASTM B210 and ASTM B241.
- b. Structural: ASTM B429.
- C. Metal thickness: Provide metal thickness indicated on Design Drawings. When metal thickness is not indicated on Design Drawings, provide thickness most appropriate for the fabrication condition.
1. For sheet steel not indicated, use not less than 20 gauge.
2. For non-ferrous metal not indicated, use not less than 0.032-in. thickness.
- f. Stainless steel lag bolts and screws: ANSI B18.2.1.
- g. Plain washers: ANSI B18.22.
3. Nylon washers: Friction-reducing, abrasion-resistant, high strength, virgin nylon (or Teflon); fiber, PVC, FRP, rubber, metals and similar materials are not acceptable.
4. Provide all brass hardware with a protective coating of clear metal lacquer, baked-on.
5. Cable: Fed. Spec. RR-W-410 or Mil. Spec. MIL-W-53420, minimum 1/16-in. diameter multi-stranded, stainless steel aircraft cable with stranded stainless steel wire core. Provide stainless steel sleeves, thimbles, clips, turnbuckles, and similar swaged fittings that develop full strength of cable; crimped fittings are not acceptable.
6. Machine bolt anchors: Stainless steel, chemical-adhesive type as manufactured by:
- a. Rawl.
- b. Ramset/Red Head.
- c. Hilti.
- d. Or equal.

2.7 MATERIALS - ELECTRICAL (interior and exterior)

- A. Code: Conform to California Electrical Code and National Electrical Code for materials.
- B. Approved listing: Materials must be approved and listed by Underwriters Laboratories, Inc.
- C. Lighting fixtures: Standard manufacture as indicated on Design Drawings. Modify as indicated on Design Drawings and as necessary to conform to governing electrical standards and regulations. Provide without (or remove) identifying trademarks, trade names, model numbers, and similar information on surfaces exposed to view.
- D. Disconnects: Heavy duty, non-keyed, flush mounted, fused or unfused, by:
1. General Electric
2. Square D
3. ITE.
4. Or equal
5. Provide NEMA 1 for dry locations and proper enclosure for others.
- E. Conduit:
1. Above-grade: Threaded, rigid steel or intermediate metal, conforming to ANSI C80.1, UL 6 or UL 1242, unless specifically approved otherwise by Owner. Provide with hot-dipped galvanized coating. Provide threaded fittings, conforming to NEMA F81, UL 514A, or UL 514B. Where specifically approved by Owner, flexible conduit must be liquid-tight type, conforming to UL 380.
2. Below-grade: Rigid PVC, conforming to UL 651, minimum Schedule 40. Provide cemented, socket-type fittings, conforming to NEMA TC3.
- F. Junction boxes: Single-piece, pressed steel type with hot-dipped galvanized coating.
- G. Dimmers: Continuously variable-type with extra (minimum 50%) load-capacity for future use.
- H. Conductors: THHN, No. 12.
- I. Accessories: Provide supports, hangers, and other accessories as required for the work.

2.8 MATERIALS - PRIMERS AND PAINTS (interior and exterior)

- A. Provide and use paint by:
1. Matthews Paint Co., Kenosha, WI
 2. PPG Paint Co., Pittsburg, PA
 3. Or equal.
- B. Paint Schedule:
1. Aluminum:
 - a. Interior of illuminated sign cans, including internal support/mounting system:
 - Pretreatment: Etching/wash type as recommended by paint manufacturer.
 - 1st coat: Epoxy primer.
 - 2nd and 3rd coats: Flat alkyl or 100% flat acrylic latex. Vinyl acrylics and similar acrylic blends are not acceptable.
 - b. Exterior surfaces of signs:
 - Pretreatment: Etching/wash type as recommended by paint manufacturer.
 - 1st coat: Epoxy primer.
 - 2nd coat: Two-component catalytic, linear, aliphatic polyurethane enamel with ultraviolet inhibitors. Automotive-type enamels are not acceptable.
 2. Zinc coated sheet and hot-dip galvanized steel:
 - a. Pretreatment: Etching/wash type as recommended by paint manufacturer.
 - b. 1st coat: Exterior alkyl or latex primer.
 - c. 2nd and 3rd coats: Exterior alkyl or 100% acrylic latex. Vinyl acrylics and similar acrylic blends are not acceptable.
 3. Acrylic plastic:
 - a. 1st coat: Plastic lacquer primer or as recommended by paint manufacturer.
 4. Aluminum and ferrous metals below grade:
 - a. 1st coat: Primer as recommended by paint manufacturer.
 - b. 2nd and 3rd coats: Epoxy or urethane mastic protective coating system.

2.9 MATERIALS - Daktronics

- A. Refer to Design Drawings for Daktronics specifications.

2. If a suspended item is free to rotate and its path is clear through a 45° swing, no seismic bracing is required.
3. If a suspended item is free to rotate and a collision is possible within a 45° envelope with the potential to threaten public safety, then lateral bracing which will prevent the collision is required.

3.2 ELECTRICAL DESIGN

- A. It shall be the responsibility of the Contractor to perform the complete electrical design for illuminated signs. Illuminated signs shall be designed by an electrical engineer and shall be UL approved.
1. Provide lighting medium indicated on drawings.
 2. Position illuminating elements within internally lighted signs or externally illuminated signs at such spacing as will assure uniform light distribution across the portion of the sign faces intended to be illuminated. Sign faces that exhibit "hot-spots" will be unacceptable unless such hot spots are intended to be integral design features of the signs.
 3. Access panels shall be flush for all internally illuminated cabinets. Access panel shall be flush with adjacent surface, light fitting, lightproof and waterproof. Show access panel location on shop drawing. Access panels to be in an accessible location, out of sight.
 4. Provide disconnect switches for all illuminated signs in accordance with electrical code requirements. Locate disconnect and on/off switches in an accessible location, out of sight.
 5. For housing remote electrical components: Provide waterproof box to hide all electrical components. Box to have flush access panel for servicing. Mount box in a minimally visible way. Color and/or finish to match existing adjacent mounting surface.

3.3 SIGN CABINETS AND SIMILAR ENCLOSURES:

- A. Fabricate of sheet aluminum and stainless steel (0.090-in. minimum thickness) as indicated. Brake-formed, heliarc electric welded construction, precision formed, with straight and even corners and edges. Visible distortions and other irregularities, due to heat of welding process, is not permitted on exposed surfaces. Test welds using dye-penetrant or vacuum-seam test; re-weld where necessary to obtain solid, complete weld joint. Welds shall be smooth and flush. Finish to match adjacent surfaces.
- B. Accurately rout portions of sign cabinets to required designs. Finish edges of routed portions to match adjacent surfaces. Coordinate with fabrication of "cut-out" letters and shapes to assure a tight, hairline-type joint appearance.
- C. Provisions for acrylic "cut-out" letters and shapes:
1. Provide sufficient quantity of clips to retain all sides and to preclude any looseness or movement of acrylic or separation of acrylic from interior face of cabinet.
 2. Provide continuous angle to support and retain perimeter of acrylic faces where necessary.
 3. Clips and retainers must not cast shadows or otherwise be visible on face of acrylic when signs are internally illuminated.
- D. Provide an internal system of ventilation (screened openings, passages, and electric fans) to assure a uniform dissipation of heat from electrical components of electrically-powered and illuminated signs, heat (solar) absorption by sign and other sources.

PART 3 EXECUTION

3.1 STRUCTURAL DESIGN

- A. It shall be the responsibility of the Contractor to perform the structural design of the signs and to incorporate all the safety features necessary to adequately support the sign for its intended use and purpose and to protect the Owner. Designs that meet or exceed industry and code standard engineering practices will be required. The sign fabricator shall submit engineer stamped calculations for foundations, lifting eyes and other sign components that affect the structural design.
1. Include foundations when part of the signage and graphics work.
 2. When required because of size or weight of sign, provide lifting eyes. Lifting eyes shall be removable or visually inconspicuous in the finished work.
 3. Include support backing and connection to existing support structure or mounting surface.
- B. Design loads:
- a. All forces resulting from dead loads, live loads, rated loads, wind loads, and seismic loads as applicable shall be applied in determining adequacy of all parts of a suspension system and the system as a whole.
 - b. Wind loads and seismic loads shall be in accord with governing loads.
- C. Allowable stresses:
1. Allowable stresses shall not exceed values which would cause permanent distortion of any structural or machinery component.
 2. All components of stress shall have the benefit of engineering calculations and data, and such calculations and data shall be used in the selection of materials.
 3. Stresses due to combined loads shall be in accord with governing codes.
- D. Support:
1. Consideration shall be given to the support structure to which overhead objects may be attached to assure sufficient structural strength and appropriate connection points.
 2. Every suspended object shall be connected by means of sufficient and appropriate attachments and hangers to the support structure designed for its application. The only exceptions are loads of 2 lb. or less which may be attached to architectural materials. These objects may be suspended from walls or ceilings made of tile, plaster, or gypsum board without connecting directly to the structure.
 3. Loads in excess of 2 lb. suspended from a vertical plane, such as a wall or column, shall be supported and installed in a positive manner that maximizes the structures provided. In addition, when visual design criteria permit, a ledge shall be provided to support the bottom edge of the object. Friction attachments are not acceptable.
 4. The primary support of a suspended object may be designed as a concentrated load that is suspended from a single point, or as a distributed load where the weight of a suspended object is suspended by means of more than one primary support sharing the load equally.
 5. Whenever possible, objects shall be designed to be supported as a distributed load.

Any openings in exterior surfaces must be internally baffled to prevent "light leaks" and prevent entry of rain, snow, wind-blown debris, and other foreign matter, and screened to prevent entry of insects.

- E. Provide drain holes to prevent accumulation of water within signs. Holes must be inconspicuous and be in inconspicuous locations; holes must also be located such that drainage does not occur onto signs, or other surfaces subject to staining. Provide internal system of baffles to prevent "light leaks" through drain holes of illuminated signs. Provide insect screening over drain holes.
- F. Fabricate door frames as specified for cabinets.
1. Weld or use concealed fasteners to continuously attach continuous hinge to door and case. Hinges must be concealed when door/frame is in the closed, locked position.
 2. Provide continuous, flexible weather seal gasket between door/frame and cabinet.
 3. Install locks at location(s) necessary and adjust to ensure a tight-fitting weather seal at perimeter of door/frame contacting cabinet.
 4. Set single-piece glass panel in accord with GANA Glazing Manual using neoprene setting blocks, spacers and glazing tape or vinyl glazing beads to preclude looseness and glass-metal contact. Glazing blocks and spacers must not be readily visible from exterior side of glass door.
- G. Fabricate removable external panels as specified for cabinets.
1. Use system of continuous angles and Z-clips and inconspicuous, tamper-proof fasteners to secure removable panels to cabinets, as indicated on Drawings.
 2. Provide continuous, flexible weather seal gasket between removable panels and cabinet.
 3. Provide aircraft cable safety strap and attachments of design and type to withstand the dynamic loads imposed by falling weight of the removable panels without failure of cable safety strap or attachments nor damage to signs, including removable panels; provide easily detachable attachment of cable safety strap to permit complete removal for servicing, maintenance, etc.
- H. Fabricate removable internal panels as specified for cabinets.
1. Provide magnetic-type attachment to sheet steel backing where indicated.
 2. Provide lift-out-type frame holder where indicated. Use concealed fasteners where possible.
 3. Provide one extra set of panels.

3.4 ACRYLIC LETTERS AND SHAPES:

- A. Precision-milled single-piece or routed letters and shapes. Polish exposed edges to match finish of face, free of polishing markings, unless indicated otherwise. "Punched thru" portions must fit accurately into routed portions of cabinet with tight, hairline joints and snugly into back of formed (channel) letters.
- B. Evidence of laminating process of letters and shapes to carrier or diffuser, including the carrier itself, must not be visible on face of signs when internally illuminated. Provide continuous opaque masking material at perimeter of routed opening.
- C. Maintain protective paper covering on exposed faces during fabrication wherever possible. Remove immediately prior to Owner's review of completed sign drawings.

6. When determining the load of an object or system, both the total weight of the object or system and the specific load at each suspension point shall be considered. Basic statics and known material properties and weight distributions shall be used in determination of support loading.
 7. Consideration shall be given to the design of the support structure and access to the structure to which overhead objects are intended to be attached. System design shall include adequate access for installation, inspection, and maintenance.
 8. Qualified, trained individuals shall perform all rigging installations with prior rigging experience. Individuals who hang items shall be familiar with these Specifications.
 9. Attaching to structure: Care shall be taken to minimize loading conditions that induce torque in structural members. Attachments to existing structure shall be as specified in approved shop drawings.
- E. Attachment points of suspended items:
1. Every suspended item shall be constructed to withstand the stresses imposed within its structure by the rigging design.
 2. Hardware used to form a rigging point on an item shall meet the intent and requirements of this Section.
- F. Additional structure, if required:
1. Additional structure shall be fully engineered by a licensed structural engineer.
 2. Visible additional structure shall match the original in material, size, and shape unless otherwise approved by the Owner.
 3. Do not cut into structural members, including beams, girders, and columns, without prior written approval from Owner.
 4. Patch around all cuts to match adjacent surfaces.
 5. Replace ceiling tiles affected by the installation with new matching tiles.
- G. Safety factors:
1. The systems used for supporting suspended objects shall be sufficiently secure so as to prevent failure.
 2. The safety ratio for a specific installation shall, as a minimum, meet a 5:1 safety ratio over the minimum allowable load for the installation condition.
 3. The required minimum safety ratio applies to the total system. Individual components of a system may be rated at higher values, depending upon the component. The lowest value shall determine the safety factor of the system. Certified "working load" factors that have the basis of laboratory testing are acceptable. As an example, chain manufacturers traditionally use a safety factor of 4:1 over breaking strength as ultimate working load. Wire rope shall use the 5:1 safety factor.
 4. Required fail-safe system: Every object suspended overhead shall be designed with a single-point fail-safe system.
 - a. Every malfunction or failure of a critical component, due to whatever cause, shall not create a life or limb threatening condition or progressive failure of the system.
- H. Seismic requirements:
1. All suspended items, connections, and systems shall be designed to resist a seismic load of a 1-g vertical force and a 1/2-g horizontal force.

- D. Coordinate fabrication of sheet plate and formed (channel) letters and shapes, and routing of sign cabinets to assure a tight, hairline type joint between materials.
- E. Fabricate laminated acrylic plastic and sheet plate letters and shapes to assure precise, matching shapes and forms with light, hairline joint.

3.5 PAINTING AND FINISHING

- A. Definitions:
1. The term "paint" as used herein includes enamels, polyurethanes, paints, primers, sealers, fillers, stains, and coatings systems whether used as prime, intermediate or finish coats.
 2. The term "system" implies that each finish is comprised of materials and quantities appropriate for the surface to be finished, and includes preparation priming/sealing, and intermediate and finish coats as applicable.
- B. Sample finishes: Refer to Section 1.3 - "SUBMITTALS".
- C. Paint color references: As indicated on Design Drawings.
- D. Paint formulation: All paint materials shall be especially formulated to meet all local and state environmental codes and specifications, with anti-mildew agents incorporated into the formulations. This requirement applies to all materials including those for interiors of sign cabinets and cans. In addition, include carefully balanced ultraviolet inhibitors for exterior materials.
- E. Application:
1. Properly prepare substrates and apply materials in an environment most favorable for producing best quality work. Where indicated or necessary, etch surfaces prior to applying finish paint materials.
 - a. Finish surfaces shall be free of streaks, laps, runs, or pile-up of paints, with all surfaces uniformly covered.
 - b. Surfaces with over spray are not acceptable.
 2. Unless specified or directed otherwise, provide semi-gloss (specular gloss value of 50 in accord with ASTM D523) finish for all surfaces.
 3. Unless specified or directed otherwise, provide "clear coat" finish over all exposed, finish painted surfaces consisting of a two-component catalytic, clear, acrylic polyurethane enamel with ultraviolet inhibitors. Unless otherwise directed by Owner, provide semi-gloss for metal and plastic surfaces and flat/matte gloss for wood surfaces.
 4. Seal all edges of plywood and end grain of solid stock wood even though it may be concealed by other work.

3.6 FABRICATION - GENERAL

- A. It is intended that the workmanship be of the highest quality obtainable by the respective trades and crafts experienced in the fabrication of signs.
- B. Finished work shall be of highest quality to pass eye-level examination and scrutiny. Scratches, paint drips or sags and other visual defects are not acceptable.
- C. Copy application: Sign copy shall be crisp, sharp, clean, and free from "ticks," discontinuous curves, line waver, and similar type imperfections.

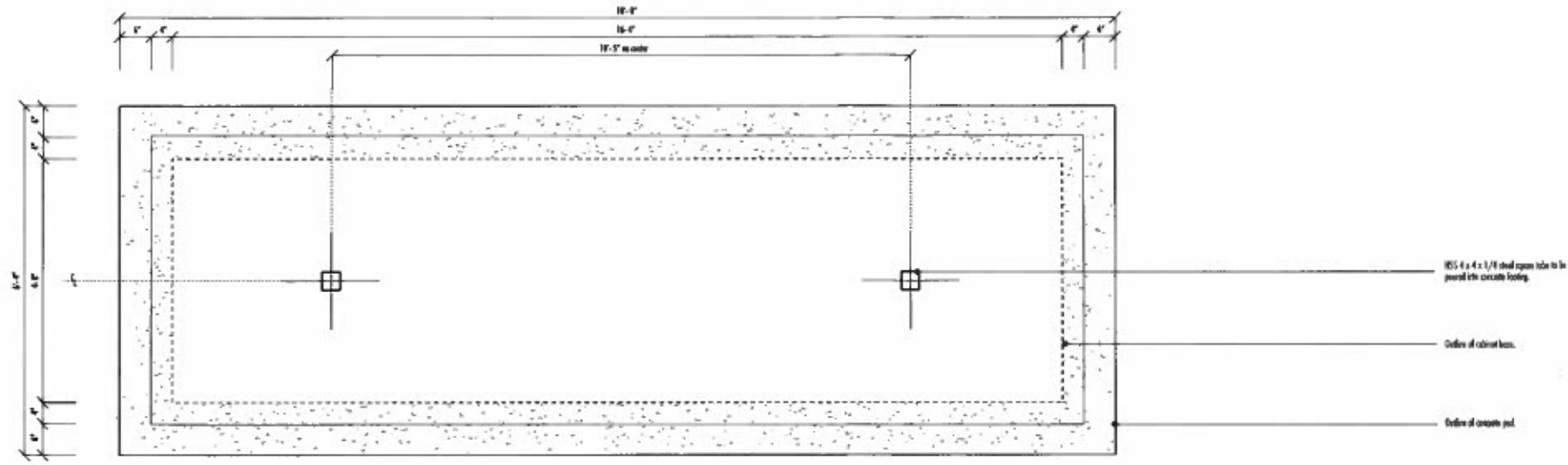
1. Letterforms shall conform to prescribed proportions.
 2. Whenever possible, messages shall be set full-size.
 3. Letterforms shall be aligned so as to maintain a baseline parallel to sign format, with margins and layout as indicated on Design Drawings and approved shop drawings.
- D. Sign construction:
1. Construct work to eliminate burrs, cutting edges, and sharp corners.
 2. Finish welds on exposed surfaces to be imperceptible in the finished work.
 3. Except as indicated or directed otherwise, finish surfaces smooth.
 4. Surfaces that are intended to be flat shall be without bulges, depressions, oil canning, or other physical deformities; use thicker materials or other means of stiffening or reinforcement to achieve intended results.
 5. Surfaces that are intended to be curved shall be smoothly free-flowing to required shapes.
 6. Parts indicated to be turned must be accurately machined/worked from solid stock to dimensions indicated or on approved shop drawings. Finished surfaces to be polished smooth unless otherwise indicated, free of any visible pits, voids, or similar defects.
 7. Fabricate continuous, internal support/mounting systems required to adequately secure/support signs. Where necessary, make provisions to allow for easy, quick removal for maintenance, etc. Where internal illumination is indicated, internal system must not cast shadows nor obstruct illumination as to be visibly apparent when fully illuminated sign is viewed from front.
 8. Except where approved otherwise by Owner, conceal fasteners.
 9. Make signs tight fitting, between parts and sections, and with adjacent surfaces. Unless indicated otherwise, non-welded joints between various portions of signs must be weatherproof (for exterior signs) and have tight, hairline-type appearance, without gaps (varying or otherwise). Provide sufficient fastenings to preclude looseness, racking, or similar movement.
 10. Make access panels and similar removable, external portions tight-fitting, tightproof, and weatherproof with adjacent surfaces. Provide access panels and removable portions occurring in overhead (i.e., greater than 8 feet above adjacent grade) locations with aircraft cable safety strap and attachments of design and type to withstand the dynamic loads imposed by falling weight of the access panels or removable portions without failure of cable safety strap or attachments nor damage to signs, including access panels and removable portions; provide easily detachable attachment of cable safety strap to permit complete removal for servicing, maintenance, etc.
 11. Locate UL labels and similar identification required by the local building authorities on exterior of sign, at specific locations as indicated on approved shop drawings. Do not apply other labels of any type that cannot be concealed.
 12. Conform with manufacturer's recommended fabricating procedures regarding fastening, restraining, expansion, and contraction of FRP, polyurethane foam, acrylic plastic and other dissimilar materials.

13. Exercise care to assure that finished surfaces are unblemished in completed work.
14. Isolate dissimilar materials. Exercise particular care to isolate non-ferrous metals from ferrous metals, including fasteners.
15. Position illuminating elements within internally lighted signs at such spacing as will assure uniform light distribution across portion of sign faces intended to be illuminated. Sign faces that exhibit "hot-spots" will be unacceptable unless such hot spots are intended to be integral design features of signs.
16. Provide flush-mounted, non-keyed, weatherproof disconnect switches for electrically powered or illuminated signs in accord with electrical code and UL requirements. Locate disconnects on top or back of signs in a manner so as to not be visible to public guests unless indicated otherwise on Design Drawings.
17. Locate items requiring maintenance, such as lamps, ballasts, transformers, wiring connections, etc., in easily accessible areas.
18. Assembly of electrical components must conform to requirements of Underwriters Laboratories, Inc. "Standards for Sign Safety US UL 48" and quality sign to receive and bear UL label.
19. Fabricating copy: Unless specifically indicated on Design Drawings otherwise, fabricate sign copy as follows.
 - a. Cut-out copy: All letter and number cut-outs shall be made from material and gauge as indicated on Design Drawings. Cutting shall be done in such manner that edges and corners of finished letterforms will be sharp and true. Letterforms with nicked, cut, ragged, rounded (positive or negative) corners, and similar disfigurements will not be acceptable.
 - b. Silk-screened and hand-painted copy: Finish sheen of copy to match sheen of copy panel background (gloss, semi-gloss, or sheens between). Edges of letters shall be straight and corners sharp. Surface of letters shall be uniform in color, finish, and free from pinholes and other imperfections.
 - c. Routed copy: Cutting and routing shall be done in such manner that edges and corners of finished letterforms shall be sharp and true. Letterforms with nicked, cut, ragged, rounded (positive or negative) corners, and similar disfigurements will not be acceptable. Letterforms shall be aligned so as to maintain a base line parallel to the sign format, with margins and layout as indicated on Design Drawings and approved shop drawings. Vertical strokes shall be plumb. Mechanically fasten center of letters to acrylic plastic as required.
 - d. Vinyl letters: Vinyl letters and numbers shall be computer cut unless an alternate process is approved by Owner prior to fabrication. Copy shall be pre-spaced with 3-M series 2-application tape, prior to installation on sign. No exceptions.

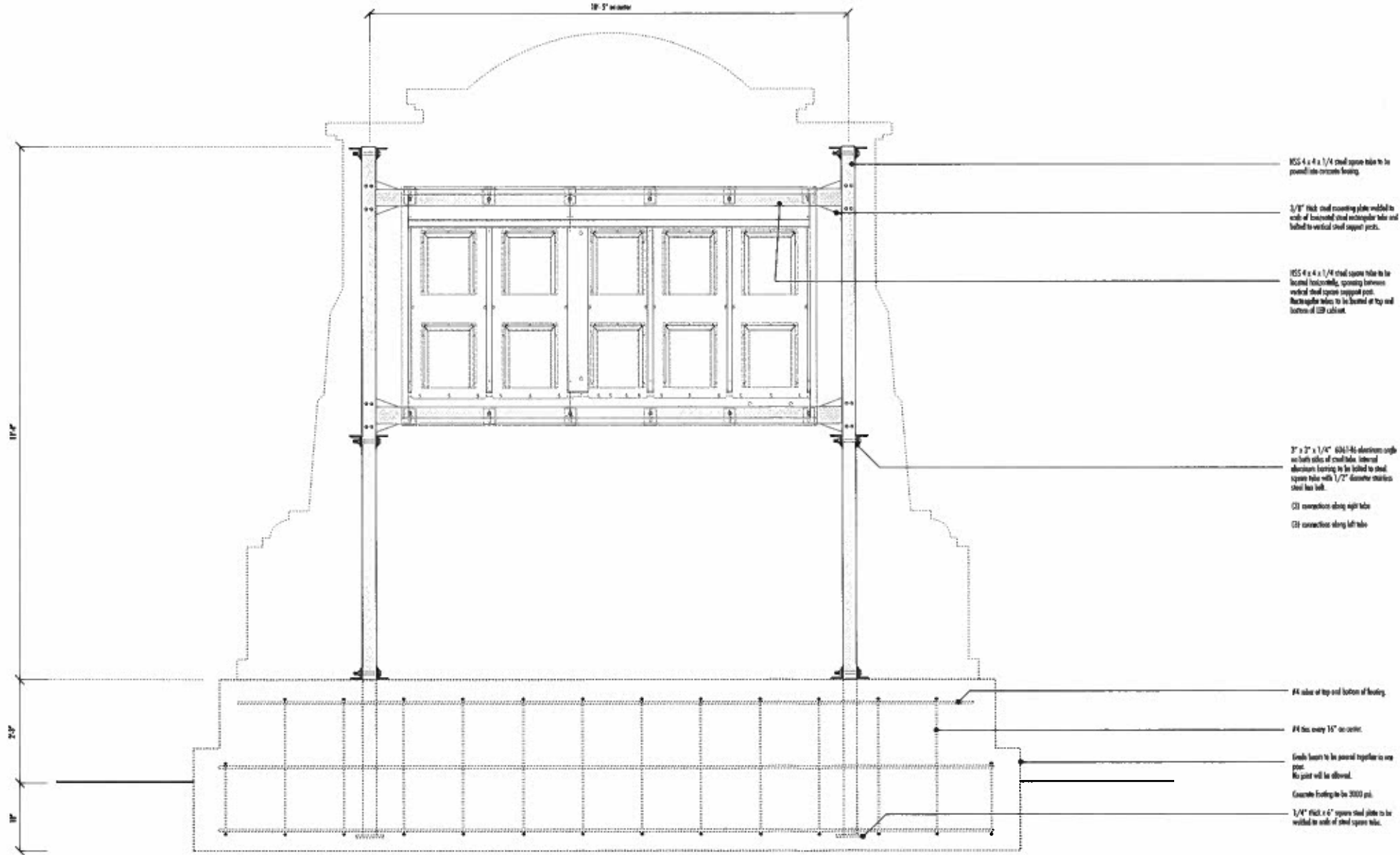
3.7 INSTALLATION - GENERAL

- A. Verify and stake the exact sign locations at on site walk-through with Owner at the job site for all sign locations which are not exactly dimensioned on the drawings. Notify Owner of any conditions that may adversely affect satisfactory installation of graphic elements.
- B. Except as indicated otherwise on the drawings, install prefabricated work plumb, level, square and true to line.

- C. Securely anchor work in proper location using anchors, anchorages, fasteners, or other methods approved on shop drawings. All anchors and fasteners shall be appropriate to the anchorage condition.
 - D. Provide final electrical power hook-up. After final electrical connections have been made, test all electrical systems to assure that all are in proper working order.
 - E. Coordinate work and access to site with the Owner.
 - F. Final adjustment and cleaning:
 1. Touch-up all scratched, marred, abraded, or otherwise damaged surfaces to match original surfaces.
 2. Clean-up work area after installation has been completed.
- 3.8 MATERIAL HANDLING
- A. Pack, wrap, crate, bundle, box, bag, or otherwise package, handle, transport, and store all fabricated work as necessary to provide protection from damage by every cause.
 - B. Provide clear and legible identifying information on all product packaging to ensure proper on-site review and installation.
- 3.9 PROJECT CONDITIONS
- A. Protection:
 1. Warning signs and other methods of protection must be sufficiently substantial to withstand normal, anticipated construction activities and are subject to Owner's approval.
 - B. Sequencing/Scheduling: Coordinate fabrication, delivery, installation, field finishing and field-application, where applicable, of the work of this section, with progress of construction and Owner's schedule.
- 3.10 RESTORATION
- A. Damage due to negligence of the Contractor to surfaces or building components, shall be repaired and restored to its original condition by the Contractor at no extra cost to the Owner. Patch and paint around all cuts to match adjacent surfaces.
 - B. Patch and paint around all cuts to match adjacent surfaces. Replace with ceiling, wall or floor tiles affected by the installation with new tiles.
- 3.11 INSPECTION
- A. Owner reserves the right to inspect work in the fabrication shop in progress and before it is shipped to the job site for installation.
 - C. Fabricator shall inspect installation locations for conditions that will adversely affect execution, performance and quality of work, and shall not proceed with installation until unsatisfactory conditions have been corrected.
- END OF SECTION 10440



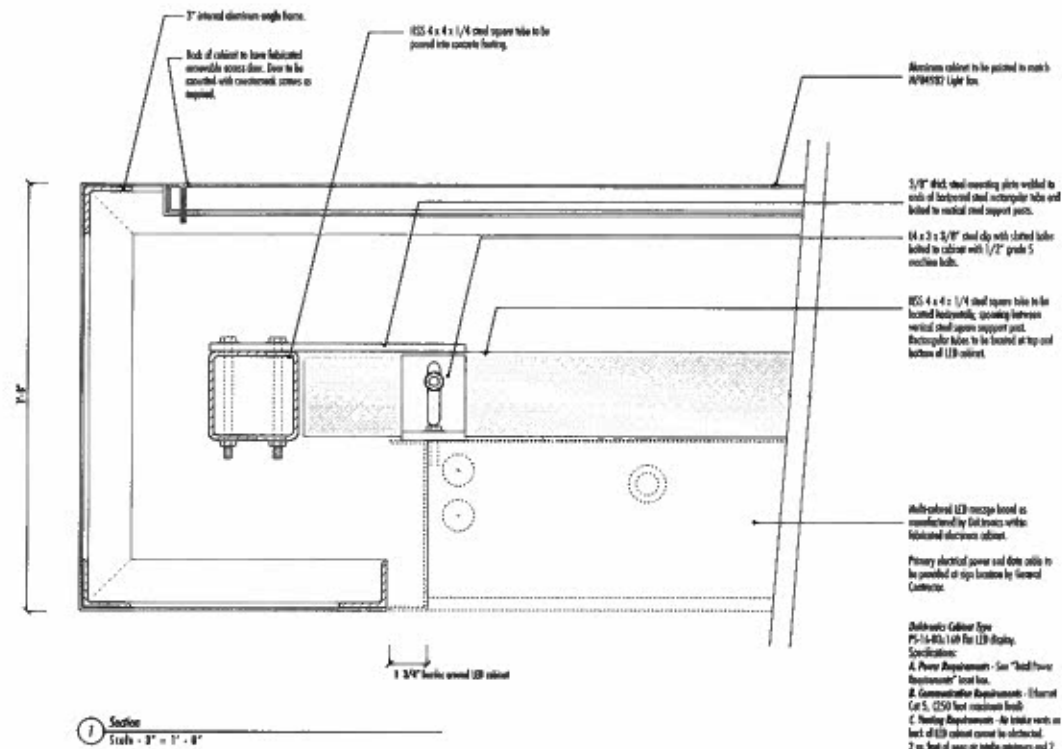
1 Concrete Pool Profile
Scale - 3/4" = 1' - 0"



2 Steel Tube Elevation
Scale - 3/4" = 1' - 0"

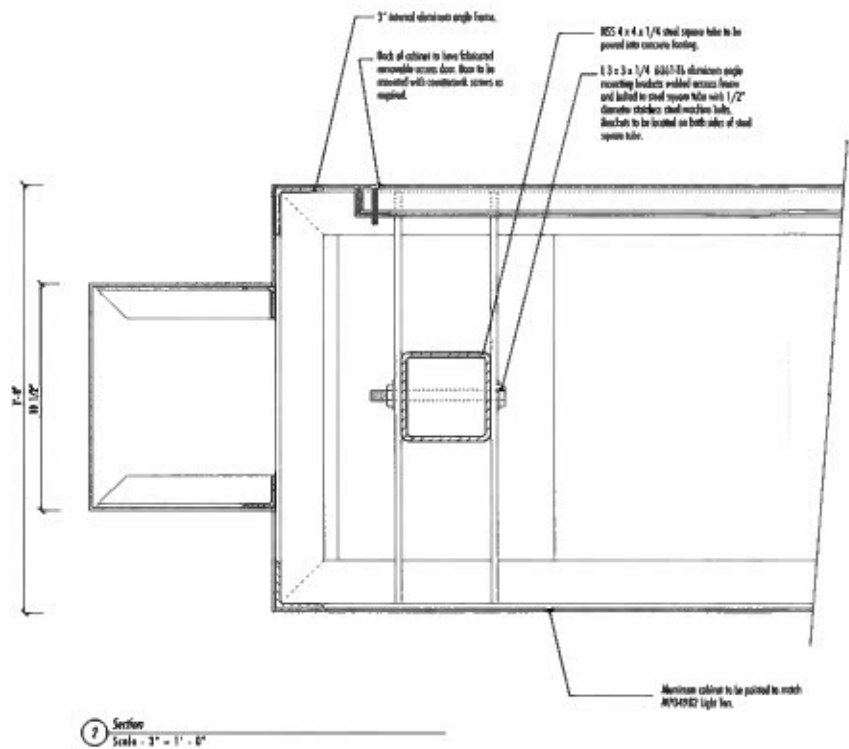
HUNT DESIGN
37 North Martin Avenue
Pasadena, California 91106-1709
T 626 793-7847 F 626 793-3369
H HUNTPASADENA.COM

DATE: 06/12/09
PROJECT: 2564
CLIENT: Long Beach City College
PROJECT: Long Beach City College
Wayfinding & Signage
SHEET TITLE: Electronic Message Board
Liberal Arts Campus

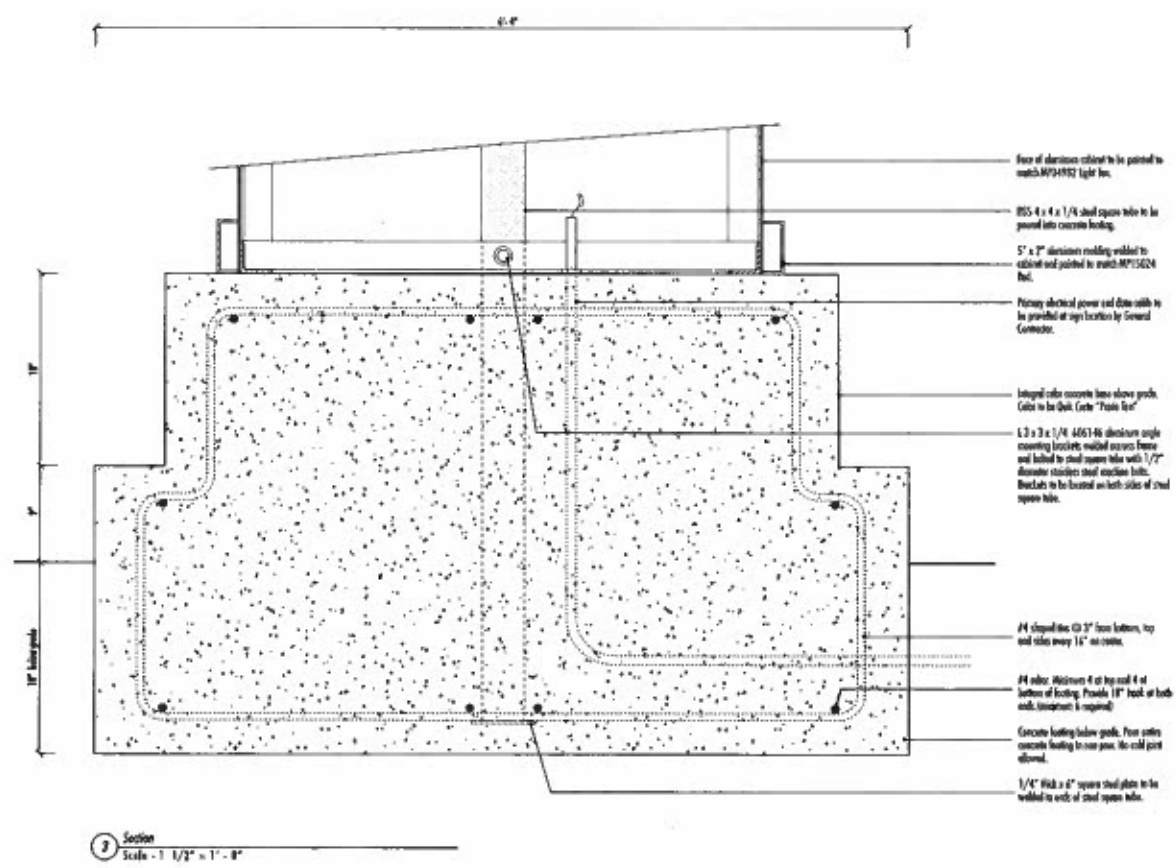


1 Section
Scale - 3" = 1' - 0"

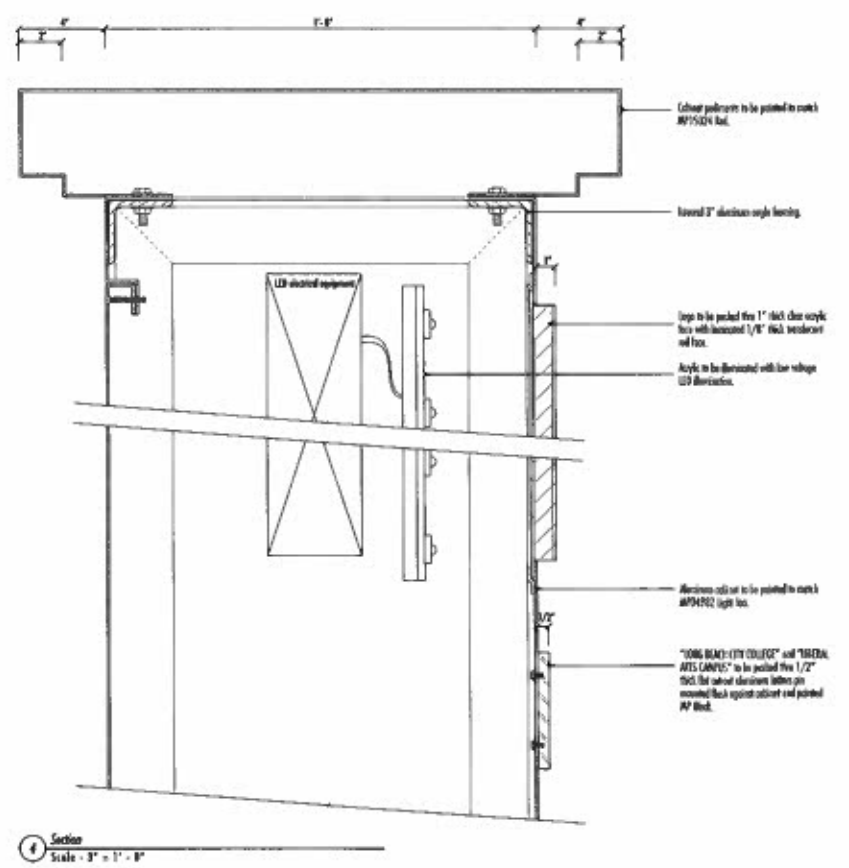
Dedicated Cabinet Type
PS-16-RS-140 for LED Display
Specifications:
A. Power Requirement - See "Load Power Requirement" load list.
B. Communication Requirement - Ethernet Cat 5, 10/100/1000 base-T network switch.
C. Mounting Requirement - All cabinet units on back of LED cabinet cannot be obstructed. 2 sq. feet of open air intake minimum and 7 sq. feet of open air space for cabinet exhaust.
D. Weight - 550 lbs.
E. Panel Finish - R1 x 140
F. General Type - Floor Cycle



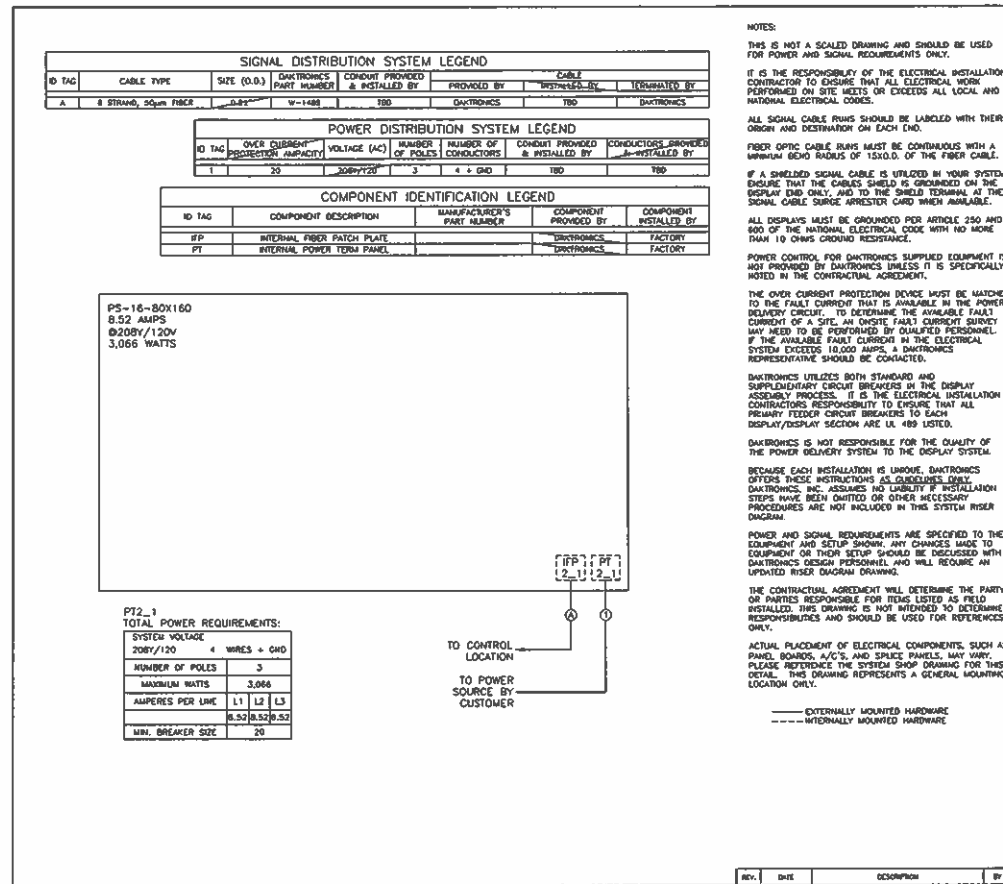
2 Section
Scale - 3" = 1' - 0"



3 Section
Scale - 1 1/2" = 1' - 0"



4 Section
Scale - 3" = 1' - 0"



LONG BEACH CITY COLLEGE

4901 E. CARSON ST
LONG BEACH, CA 90808

SUBMITTAL APPROVAL

APPROVED
 APPROVED AS NOTED
 APPROVED AS NOTED & RESUBMIT

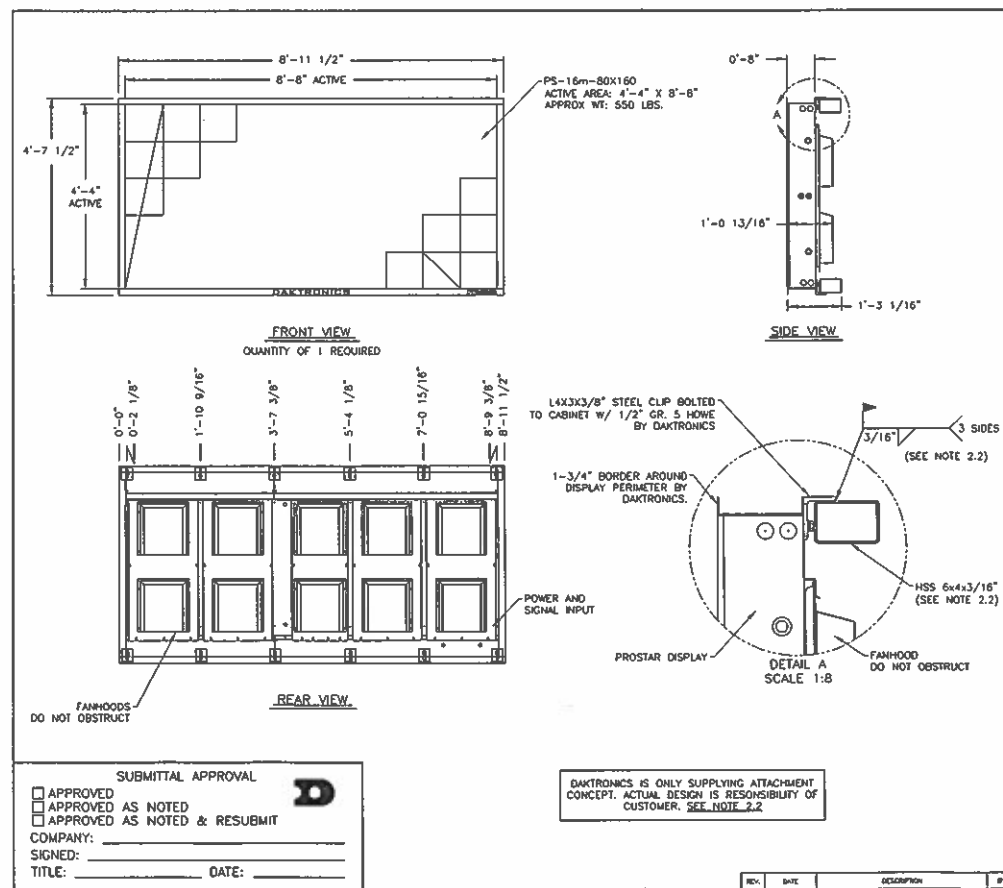
COMPANY: _____
SIGNED: _____ DATE: _____

SHEET 202

THE CONCEPTS EXPRESSED AND DETAILS SHOWN ON THIS DRAWING ARE CONFIDENTIAL AND PROPRIETARY. DO NOT REPRODUCE BY ANY MEANS, INCLUDING ELECTRONICALLY WITHOUT THE EXPRESS WRITTEN CONSENT OF DAKTRONICS, INC.

DAKTRONICS, INC. BROOKINGS, SD 57006

FROM: LONG BEACH CITY COLLEGE / LONG BEACH, CA
FILE: SYSTEM RISER DIAGRAM, PS-16-BOX160
DES. BY: SHOOKSIA DRAWN BY: JORDAN DATE: 22 JAN 09
REVISION: NONE BY: JPH



LONG BEACH CITY COLLEGE

4901 E. CARSON ST
LONG BEACH, CA 90808

SHEET 302

THE CONCEPTS EXPRESSED AND DETAILS SHOWN ON THIS DRAWING ARE CONFIDENTIAL AND PROPRIETARY. DO NOT REPRODUCE BY ANY MEANS, INCLUDING ELECTRONICALLY WITHOUT THE EXPRESS WRITTEN CONSENT OF DAKTRONICS, INC.

DAKTRONICS, INC. BROOKINGS, SD 57006

FROM: LONG BEACH CITY COLLEGE / LONG BEACH, CA
FILE: SHOP DWG, PS-16-BOX160
DES. BY: BHALBER DRAWN BY: BHALBER DATE: 15 JAN 08
REVISION: NONE BY: JPH

HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

PROJECT: LONG BEACH CITY COLLEGE
SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE

Pylon and Monument Signs for Long Beach City College, CA
(Rev.#1, dated 1-27-09, adjusted spacing between the columns for the pylon sign and only 16" of
concrete above the grade for the monument sign.)
(Rev.#2, dated 4-13-09, the monument sign was redesigned to match the revised sign architecture.)

LOADING:

DEAD LOAD: SEE CALCULATIONS

WIND LOAD: SEE CALCULATIONS

MATERIAL:

STRUCTURAL FRAMING ARE ALUMINUM ALLOY 6061-T6 ALUMINUM SHEET ALLOY 3003-H14.
ALLOWABLE STRESSES ARE COMPUTED ACCORDING TO THE SPECIFICATIONS OF
THE ALUMINUM ASSOCIATION
OR
STRUCTURAL STEEL IS ACCORDING TO AISC.

SECTION PROPERTIES:
SECTION PROPERTIES OF THE EXTENSORS USED ARE ATTACHED.

FASTENERS:

FOR ALUMINUM MEMBERS STAINLESS STEEL OR ALUMINUM.

FOR STEEL MEMBERS A315 BOLTS, U.B.T.

CRITERIA:

CRC-307, ASCE 7-05, AISC 13th edition, and ALUMINUM DESIGN MANUAL (ADM 1-05)

DISSIMILAR MATERIALS:

WHERE ALUMINUM ALLOY PARTS ARE IN CONTACT WITH ABSORBENT BUILDING MATERIALS
LIKELY TO BE CONTAMINATED OR IN CONTACT WITH WET, OR DISSIMILAR METALS OTHER THAN
STAINLESS ALUMINIZED OR GALVANIZED STEEL, THE CONTACT SURFACES SHALL BE
PAINTED OR OTHERWISE SEPARATED IN ACCORDANCE WITH ADM 1-05.

NOTE:

THESE CALCULATIONS ARE ONLY FOR THE NEW SIGN FOUNDATIONS AND THE STEEL PULS.
ATTACHMENT OF THE PRE-MANUFACTURED ALUMINUM CARBONETS TO THE STEEL PULS IS NOT
PART OF THIS CALCULATION PACKAGE.

3/08 NO. HUNT-1889-06 (REVISED)



HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

PROJECT: LONG BEACH CITY COLLEGE
SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE

WIND LOADING PER CRC-307 (ASCE 7-05) FOR PYLON SIGN:

45 MPH, EXP "C"

USE METHOD 2

$q_s = (0.00256) K_z K_d K_e K_g K_h K_{zt} K_{sfc} K_{top}$

$q_s = (0.00256)(0.85)(1.0)(0.85)(0.85)^2(1.15) = 15.4 \text{ PSF}$ (20-150)
 $q_s = (0.00256)(0.90)(1.0)(0.85)(0.85)^2(1.15) = 16.3 \text{ PSF}$ (20-200)
 $q_s = (0.00256)(0.94)(1.0)(0.85)(0.85)^2(1.15) = 17.0 \text{ PSF}$ (20-250)

$K_z = 0.83$ (Table 6-3; Exp "C" @ 0-150)
 $K_z = 0.90$ (Table 6-3; Exp "C" @ 200)
 $K_z = 0.94$ (Table 6-3; Exp "C" @ 250)

$K_d = 1.0$

$K_e = 0.85$ (Table 6-4; Solid Signs)

$I = 1.15$ (Table 6-1; occupancy category III)

F = (0.18) S D / (C D A)

$F = (15.4 \text{ PSF}) / (0.85) (1.60) (A_s) = 20.9 \text{ PSF (A)}$ (20-150)
 $F = (16.3 \text{ PSF}) / (0.85) (1.60) (A_s) = 22.1 \text{ PSF (A)}$ (20-200)
 $F = (17.0 \text{ PSF}) / (0.85) (1.60) (A_s) = 23.1 \text{ PSF (A)}$ (20-250)

$G = 0.85$ (Section 6.5.8)

$C_r = 1.60$ (Figure 6-20; $B_s = 6'23" = 6.38$; $h = 23'23" = 1.0$)

HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

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SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE

SEISMIC LOADING PER IRC-7006 (ASCE 7-05) FOR RIGID NON-BUILDING STRUCTURES (MONUMENT SIGN):

$V = 0.30 (S_d) (W) (I)$ (ASCE 7-5; Section 15.4-2)

$I = 1.25$ (Section 11.5.1; occupancy category III)

$S_d = 1.590$ (See next page)

$S_1 = 0.592$ (See next page)

$S_d = 1.590$ (See next page)

$S_1 = 0.592$ (See next page)

$S_D = 1.060$ (See next page)

$S_1 = 0.592$ (See next page)

$V = (0.30) (1.060) (W) (1.25) = 0.382$

For LRFD use: $V = 0.378 (W)$

For ASD use: $V = 0.298 (W) (0.7) = 0.209 (W)$

HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

PROJECT: LONG BEACH CITY COLLEGE
SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE

Project Name = LONG BEACH CITY COLLEGE

Continents 48 States

2003 NEHRP Seismic Design Provisions

Latitude = 33.83238

Longitude = -118.13502

Spectral Response Accelerations S_s and S_1

S_s and S_1 = Mapped Spectral Acceleration Values

Site Class B - $F_a = 1.0$, $F_v = 1.0$

Data are based on a 0.01 deg grid spacing

Period S_a

(sec) (g)

0.2 1.590 (S_0 , Site Class B)

1.0 0.592 (S_1 , Site Class B)

Continents 48 States

2003 NEHRP Seismic Design Provisions

Latitude = 33.83238

Longitude = -118.13502

Spectral Response Accelerations S_M s and S_{M1}

S_M s = $F_a \times S_s$ and $S_{M1} = F_v \times S_1$

Site Class D - $F_a = 1.0$, $F_v = 1.5$

Period S_a

(sec) (g)

0.2 1.590 (S_M s, Site Class D)

1.0 0.607 (S_{M1} , Site Class D)

Continents 48 States

2003 NEHRP Seismic Design Provisions

Latitude = 33.83238

Longitude = -118.13502

Design Spectral Response Accelerations S_D s and S_{D1}

S_D s = $2/3 \times S_M$ s and $S_{D1} = 2/3 \times S_{M1}$

Site Class D - $F_a = 1.0$, $F_v = 1.5$

Period S_a

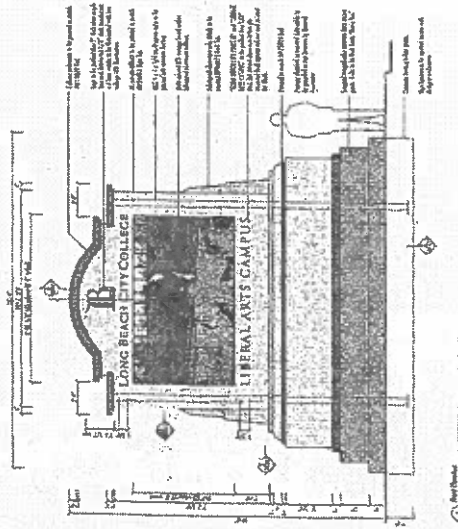
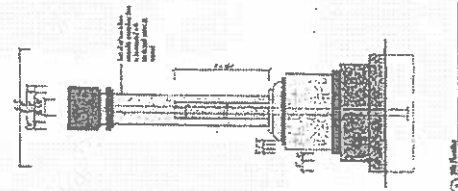
(sec) (g)

0.2 1.060 (S_D s, Site Class D)

1.0 0.592 (S_{D1} , Site Class D)

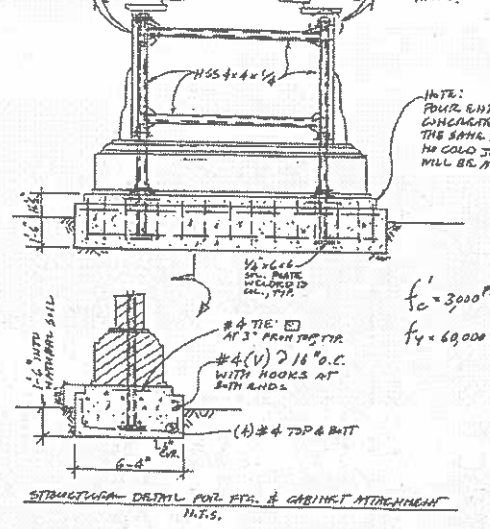
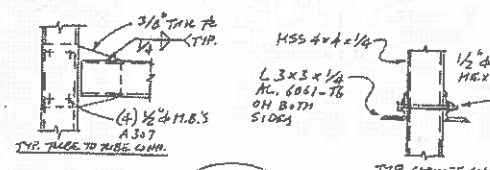
HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

PROJECT: LONG BEACH CITY COLLEGE
SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE



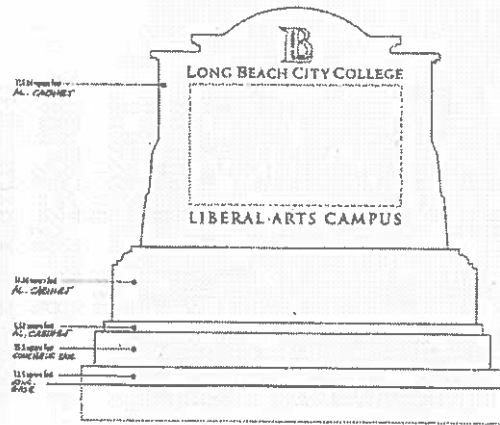
HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CA 91106

PROJECT: LONG BEACH CITY COLLEGE
SUBJECT: LONG BEACH, CA CAMPUS
SIGN STRUCTURAL CALCS.
BY: DVM DATE: 4-20-09
P.O.# DWGS. FROM DENNIS LEE



HUNT DESIGN
25 NORTH MENTOR AVENUE
PASADENA, CALIFORNIA 91106-7709
P.O.# 646 793-7847 • 646 793-3549
• HUNTDENIGN.COM

DATE: 06/12/09
PROJECT: Long Beach City College Wayfinding & Signage
SHEET TITLE: Electronic Message Board Liberal Arts Campus



1 Signage Footing of Sign Face Section Area
Scale - 1/4" = 1'-0"

DESIGN MONUMENT SIGN

L.C. #1 (DL + WIND)

$$P_1 = 20.9 \text{ PSF} \times 116.04 \text{ FT}^2 = 2425 \text{ LB}$$

$$P_2 = 20.9 \text{ PSF} \times (51.66 \text{ FT}^2 + 6.62 \text{ FT}^2) = 1218 \text{ LB}$$

$$P_3 = 20.9 \text{ PSF} \times (25.5 \text{ FT}^2 + 13.5 \text{ FT}^2) = 815 \text{ LB}$$

$$P_{\text{TOTAL}} = 4458 \text{ LB}$$

$$M_o = 2425 \text{ LB} \times (1.125 + 1.5 \text{ FT}) + 1218 \text{ LB} \times (1.125 + 1.5 \text{ FT}) + 815 \text{ LB} \times (1.125 + 1.5 \text{ FT}) = 30919 \text{ LB-FT} = 6851 \text{ FT-LB} = 2139 \text{ FT-LB} = 39909 \text{ FT-LB} \rightarrow \text{WIND GOVERNS}$$

L.C. #2 (DL + SEISMIC)

$$P_1 = (0.278)(15 \text{ PSF})(16.04 \text{ FT}^2) = 484 \text{ LB}$$

$$P_2 = (0.278)(15 \text{ PSF})(51.66 \text{ FT}^2 + 6.62 \text{ FT}^2) = 243 \text{ LB}$$

$$P_3 = (0.278)(150 \text{ PSF})(25.5 \text{ FT}^2 + 13.5 \text{ FT}^2 + 6.33 \text{ FT}^2) = 9231 \text{ LB}$$

$$P_{\text{TOTAL}} = 10158 \text{ LB}$$

$$M_o = 484 \text{ LB} \times (1.125 + 1.5 \text{ FT}) + 243 \text{ LB} \times (1.125 + 1.5 \text{ FT}) + 9231 \text{ LB} \times (1.125 + 1.5 \text{ FT}) = 6171 \text{ FT-LB} = 1367 \text{ FT-LB} + 24231 \text{ FT-LB} = 31769 \text{ FT-LB}$$

$$P_{DL} = 15 \text{ PSF} \times 116.04 \text{ FT}^2 = 1741 \text{ LB}$$

$$P_{DL} = 15 \text{ PSF} \times (51.66 \text{ FT}^2 + 6.62 \text{ FT}^2) = 874 \text{ LB}$$

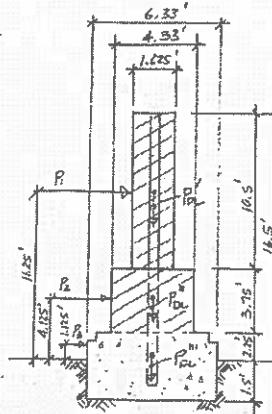
$$P_{DL} = 150 \text{ PSF} \times (25.5 \text{ FT}^2 + 5.33 \text{ FT}^2 + 13.5 \text{ FT}^2 + 18 \text{ FT} \times 1.5 \text{ FT} \times 2.33 \text{ FT}) = 58842 \text{ LB}$$

$$P_{\text{TOTAL}} = 61457 \text{ LB}$$

$$M_R = 61457 \text{ LB} \times \frac{6.33 \text{ FT}}{2} = 194511 \text{ LB-FT}$$

$$S.F. = M_R / M_o = 194511 \text{ FT-LB} / 31769 \text{ FT-LB} = 6.13 > 1.5 \text{ O.K.}$$

∴ OVERTURNING S.F. IS ADEQUATE.



DESIGN MONUMENT SIGN

FOOTING:

$$P_{DL} = 61457 \text{ LB}$$

$$M_o = 39909 \text{ LB-FT}$$

$$e = \frac{39909 \text{ LB-FT}}{61457 \text{ LB}} = 0.649 < \frac{6.33 \text{ FT}}{2} = 1.06 \text{ FT} \rightarrow \text{PAUL BERGMAN'S}$$

$$Q = \frac{61457 \text{ LB}}{18 \text{ FT} \times 6.33 \text{ FT}} \left(1 \pm \frac{0.649 \text{ FT}}{1.33 \text{ FT}} \right)$$

$$Q_{\text{MIN}} = 539 \text{ PSF} - 332 \text{ PSF} = 207 \text{ PSF} < 1000 \text{ PSF}$$

$$Q_{\text{MAX}} = 539 \text{ PSF} + 332 \text{ PSF} = 871 \text{ PSF} < 1000 \text{ PSF}$$

∴ USE 6'-4" WIDE X 18'-0" LONG X 1/4" DEEP GRANITE FOOTING.

DESIGN STEEL COLUMNS:

FIND MAX. COL. FORCES

$$P_{\text{COL}} = 2425 \text{ LB} \times \frac{7.62 \text{ FT}}{11.6 \text{ FT}} = 1743 \text{ LB}$$

$$M_{\text{COL}} = (2425 \text{ LB} \times 5.5 \text{ FT}) \times \frac{7.62 \text{ FT}}{10.6 \text{ FT}} = 9152 \text{ LB-FT}$$

∴ WIND GOVERNS FOR COLUMN DESIGN.

DESIGN MONUMENT SIGN

STEEL COLUMN DESIGN:

$$M_{\text{COL}} = 9152 \text{ LB-FT}$$

TRY HSS 4 x 4 x 1/4 (Z = 14.2; I = 7.80 IN⁴; S = 4.09 IN³)

$$\frac{M_n}{S_x} = 10.8 \text{ K} > 9.15 \text{ K} \rightarrow \text{O.K.}$$

$$\frac{L}{r} = 14.2 < 1.12 \sqrt{\frac{E}{F_y}} = 1.12 \sqrt{\frac{29000 \text{ KSI}}{46 \text{ KSI}}} = 28.1 \text{ O.K.}$$

CHECK DEFLECTION:

$$\bar{P} = 9152 \text{ LB-FT} / 10 \text{ FT} = 915 \text{ LB}$$

$$\Delta = \frac{P L^3}{3 E I} = \frac{0.915 \text{ K} \times (10 \text{ FT} \times 12)^3}{3 \times 29000 \text{ KSI} \times 7.80 \text{ IN}^4} = 2.33 \text{ IN} < 10.5 \text{ IN} \times 0.04 = 5.04 \text{ IN} \text{ O.K.}$$

∴ USE (2) HSS 4x4x1/4 TO SUPPORT PRE-MANUFACTURED ALUM. CABINET.

DESIGN MONUMENT SIGN

HORIZONTAL TUBE SUPPORTING LED:

$$W = \frac{(5.4 \text{ FT} + 5.25 \text{ FT})}{2} \times 20.9 \text{ PSF} = 111 \text{ PLF}$$

$$M = (111 \text{ PLF} \times 10.5 \text{ FT}) / 2 = 1530 \text{ LB-FT}$$

TRY HSS 4 x 4 x 1/4 (Z = 14.2; I = 7.80 IN⁴; S = 4.09 IN³)

$$\frac{M_n}{S_x} = 10.8 \text{ K} > 1.53 \text{ K} \rightarrow \text{O.K.}$$

∴ USE HSS 4x4x1/4 FOR TWO HORIZONTAL SUPPORTS OF LED.

CHECK CONNECTION FOR HORIZ. TUBE:

$$V_w = 111 \text{ PLF} \times \frac{10.5 \text{ FT}}{2} = 583 \text{ LB}$$

$$V_{\text{COL}} = \frac{(583 \text{ LB})}{2} = 138 \text{ LB}$$

$$T_{\text{BOLT}} = 583 \text{ LB} / 4 = 146 \text{ LB}$$

$$V_{\text{BOLT}} = 138 \text{ LB} / 2 = 35 \text{ LB}$$

TRY 1/2" φ H.B. A307

$$T_{\text{BOLT}} = 0.191 \text{ IN}^2 \times 22.5 \text{ KSI} = 4.4 \text{ K} > 0.15 \text{ K} \text{ O.K.}$$

$$V_{\text{BOLT}} = 0.191 \text{ IN}^2 \times 12.0 \text{ KSI} = 2.4 \text{ K} > 0.04 \text{ K} \text{ O.K.}$$

∴ (4) 1/2" φ H.B.'S A307 AT EACH END ARE ADEQUATE.

DESIGN MONUMENT SIGN

ATTACHMENT OF PRE-MANUFACTURED ALUMINUM CABINET WITH STEEL PURLIN:

MAX. $P_{\text{COL}} = 1743 \text{ LB}$

TRY (3) 1/2" φ S.S. BOLTS FROM THE COLUMN, DBL SHEAR

$$V_{\text{BOLT}} = (1743 \text{ LB} / 3) / 2 = 291 \text{ LB}$$

$$V_{\text{ALLOW}} = 1.5 \text{ K} > 0.291 \text{ K} \text{ O.K.}$$

$$V_{\text{ALLOW}} = 1/2 \times 1/4 \times 12 \times 1.5 \text{ K} = 1.5 \text{ K} > 0.291 \text{ K} \text{ O.K.}$$

∴ USE 1/2" φ S.S. HEX BOLT WITH L 3x3x1/4 AL. ANGLE 6061-T6 ON BOTH SIDES OF HSS 4x4x1/4 USE (3) POINTS OF ATTACHMENT PER COLUMN.