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**SECTION 02980**  
**90-DAY MAINTENANCE**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 SCOPE OF WORK**

- A. These specifications establish the standard for the maintenance of the landscaping for the (90) ninety days following completion of landscape installation.
- B. The Contractor shall furnish all labor, equipment, materials, tools, services and special skills required to perform the landscape maintenance as set forth in these specifications and in keeping with the highest standard of quality and performance.
- C. Maintenance of these areas shall include maintenance of plant materials and irrigation system. Maintenance of plant materials shall include, but is not limited to, mowing, trimming and edging, pruning, fertilization, aeration, weed control, cultivation, pest control, tree surgery, thatching, plant replacement and clean-up of drainage system. It is the intent of these specifications to provide plant material maintenance methods to keep the site in a state of growth and repair. Irrigation maintenance shall include operation of system adjustment and all necessary repairs.
- D. Emergency Numbers: The Contractor shall provide, at all times throughout the duration of this contract, emergency telephone numbers which can be called for emergency conditions at any time that the Contractor's representatives are not immediately available at the job site. An alternative number shall be provided in case no answer is received at the first number. The emergency number shall be used to contact a responsible representative of the Contractor who can take the necessary action required to alleviate an emergency condition that threatens to cause damage to any property.
- E. Method of Payment: The Contractor shall present monthly invoices of one-third of the total amount of the 90-day contract. Payments will be made monthly and shall equal one-third of the total amount for a 90-day period, due within (30) thirty days from which service was performed.

**1.03 INSURANCE, LICENSES, PERMITS**

- A. The Landscape Maintenance Contractor shall possess all insurance, licenses and permits required to perform the landscape maintenance.
- B. Licensing Requirements: In accordance with Division II, Chapter 9 of the Business and Professions Code of the State of California, providing for the licensing of contractors, the Contractor shall possess a valid C-27 landscape maintenance license or Class A Contractor's license. In addition, the Contractor shall possess a valid chemical applicator's license to include pest control or must subcontract to a licensed contractor.
- C. Contract Termination: The Owner reserves the right to terminate the contract, without penalty, for cause immediately or without cause after (30) thirty days written notice thereof is delivered to Contractor, either personally or by mail addressed as shown on the contract documents. In the event of such termination, the bond shall remain in effect for six (6) months after the date of termination to provide surety that any remedial work required at the time of termination will be completed.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

## 1.05 SUBMITTALS

In accordance with Article 5 of the General Conditions.

## PART 2 -- MATERIALS

As required.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and condition under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 TURF GRASS AREAS

- A. Mowing:
  - 1. Mowing of lawn areas shall be done once a week, except when weather precludes mowing. Bermuda grass shall be mowed at a cutting height of 3/4" - 1". Rye grass shall be mowed at a cutting height of 1-1/2" - 2".
  - 2. A power driven rotary mower with a grass catcher attached to remove clippings shall be used to mow turf. Blades shall be kept sharp at all times.
- B. Edging and Trimming:
  - 1. Edging shall be accomplished with a power edger each time the turf is mowed. Clippings shall either be vacuumed or blown off walks. The turf around tree wells, sprinkler heads and other objects shall be trimmed by hand clippers or a power weed-eater. (Contractor to provide weed-eater guard on all trees when weed-eaters are used.) Chemicals may be used for this purpose only with the approval of the Landscape Architect.
- C. Aerification:
  - 1. Turf grass shall be aerified once a year during the first week of August, one week prior to fertilization. Aerate all turf areas, removing 1/2"x2" cores of sod with an aerator machine at a maximum of 6" spacing. Any areas that show excessive compaction shall receive additional treatment as required to alleviate this condition and allow for proper water penetration and minimal runoff. At the discretion of the Contractor, the cores may either be dragged to break them up or removed.
- D. Fertilization:
  - 1. Apply fertilizers as indicated in Fertilization, Section 02960.
- E. Watering:
  - 1. A regular deep watering program shall be accomplished to give the best results. The established turf should not be kept wet but should dry out somewhat between waterings. Allow lawns to dry before mowing. Also see Section 02950 of Additional Work in All Areas.
- F. Thatching (only if not over seeding): Thatch all Bermuda lawns once a year in early September in accordance with the following methods:

1. Verticut entire area using a thatching machine set to soil line conduct. Verticut twice in parallel directions. Pick up debris at the completion of this operation.
  2. Mow with rotary mower at regular cutting height.
- G. Overseeding of Perennial Rye: In mid-October (or when the evenings are consistently cool), the following overseeding services should be performed:
1. Perennial rye to be applied at a rate of 20 pounds per 1,000 square feet.
  2. 15-15-15 commercial fertilizer to be applied at a rate of 6 pounds per 1,000 square feet.
- H. Refurbishment of Turf Areas:
1. Lawn areas that thin out due to dryness or any other reason will be reseeded with an approved grass seed or sod, as determined by the landscape architect.
- I. Weed Control:
1. Contractor shall maintain a weed-free lawn at all times by either chemical, mechanical means or by the water management program. The Contractor shall be especially careful if applying chemicals to control weeds because of possible damage to the lawn. Before such applications are made, the turf should be well established and in a vigorous condition.
- J. Disease, Harmful Insects and Rodent Control:
1. Maintain areas free of pest and diseases including rodents, snails, insects, etc.

### 3.03 ANNUAL COLOR/GROUNDCOVER AREAS

#### A Fertilization

1. Apply fertilizers as indicated in Section 02950.  
  
Shrub and groundcover areas shall be tilled only prior to pre-emergent application but raked and edged weekly or bi-monthly, and all debris removed from the areas that day. Groundcover shall be kept neat in appearance and within the intended area of planting by edging and trimming.  
  
Keep shrubs and groundcover neatly trimmed away from sprinkler heads to allow for their proper operation and normal spray pattern. Groundcovers and vines shall be trimmed back from shrubs, trees and private property fences, as necessary. Trim and edge to maintain sidewalks and curbs free of plant growth.

#### B Weed Control:

1. Weeds shall be controlled so as not to reach an objectionable height. Remove weeds by chemical or mechanical means on a monthly schedule. Weed infestations of the shrub and groundcover areas, if severe, may be controlled by a commercial herbicide by obtaining written permission from the Landscape Architect. Such permission shall depend on the Contractor submitting to the Landscape Architect the following information:
2. The exact location(s) where the herbicide is to be used.
3. Verification that the herbicide has no harmful effect on desirable plant materials.
4. The herbicide will be applied at the manufacturer's instructions for application.
5. Bermuda grass infestations of the shrubs, groundcover and slope areas, if severe, should be sprayed out and "weedeaten".

#### C Watering:

1. A regular deep watering program shall be implemented to give the best results.

The established groundcover shall not be kept wet but should dry out somewhat between waterings.

D Surface Drains:

1. The Contractor shall be responsible for periodic inspection and maintenance of surface drains located within the landscaped areas. These drains shall be checked to assure proper functioning. On a regular schedule, remove all debris and vegetation that may accumulate in these drains, including the portion under the sidewalk, to maintain the proper flow of water.

E Annual Color:

1. The Contractor shall be responsible for replacing annual color two (2) times during the year. Annual color will be replaced at the following times: 1st week in November and the 1st week in June (as weather permits).

3.04 ADDITIONAL WORK IN ALL AREAS

A. Tree Maintenance:

1. Trees shall be pruned to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, which have vertical spacing from 18" to 48" and radial orientation so as not to overlay one another, to eliminate diseased or damaged growth, to eliminate narrow V-shaped branch forks that lack strength, to reduce toppling and wind damage by thinning out crowns, to maintain a natural appearance, to balance with roots.
2. Tree maintenance should be done on a yearly or twice yearly basis, as needed, to maintain the trees in a healthy and vigorous growing condition. A qualified tree care professional should be contracted by the Owner to perform this service on all trees 15' or greater in height. Trees under 15' in height may be maintained by the general maintenance contractor following the methods outlined below. Trees are not to be pruned to maintain an artificial height of 15' or under when the natural growth characteristics would exceed a 15' height.
3. Under no circumstances will stripping of lower branches (raising up) of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched 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.
4. Evergreen trees shall be thinned out and shaped when necessary to prevent wind and storm damage. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute a safety hazard shall be pruned at any time of the year, as required.
5. All major pruning operations will not begin until reviewed with the Landscape Architect.
6. Pruning shall be done by those experienced and skilled in pruning techniques. All cuts shall be done using proper horticultural practices. Cuts made over 1-1/2" in diameter shall be treated with a sealer.
7. Prune trees to allow for necessary clearances for pedestrian and vehicle circulation.
8. Ailing or stunted trees that fail to meet expected growth will receive additional treatments to correct any deficiencies.
9. Surface roots that become maintenance or appearance problems will be removed as required to prevent damage to adjacent areas, sidewalks and curbs.

10. Apply all required insecticides and fungicides to prevent or control plant diseases and pests.
11. Perform minor tree surgery, as required.
12. Tree stakes, ties and guys shall be checked at least monthly and corrected, as needed. Ties will be adjusted to prevent girdling. Remove stakes, ties and guys as soon as they are no longer needed. Replace broken stakes, as required.
13. To prevent the setting and eventual dropping of fruit, olive trees shall be sterilized every spring, just before flowers are at full bloom, then again 7 to 14 days later to get any late blooms. The product for this shall be "Olive Stop" or approved equal.
14. The Contractor shall be responsible for the spraying of all pine trees for spider mites four times a year. The product for this shall be Malathion followed up with a petroleum oil for overwintering adults and eggs.

B. Shrub Maintenance:

1. The objective of shrub pruning is the same as for trees.
2. Shrubs shall be pruned, as required, for safety, removal of broken or diseased branches and general containment or appearance.
3. Prune shrubs to retain as much of the natural informal appearance as possible, consistent with intended use. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design.
4. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. "Stubbing" will not be permitted.
5. Apply all insecticides or fungicides to control pests.

C. Loss or Damage to Plant Material by Contractor:

1. Shrubs, trees and plants damaged or killed due to the Contractor's operations, negligence or chemicals shall be replaced at no cost to the Owner.

D. Disease and Harmful Insect Control:

1. Monthly inspections shall be made for evidence of disease and/or harmful insects. If evidence of such is found, a report shall immediately be submitted to the Landscape Architect. The report shall include:
2. Exact location(s) where disease and/or harmful insects are prevalent.
3. Contractor's opinion of the type of disease and/or insect.
4. Contractor's recommendations for control and elimination of disease and/or harmful insects.

E. Pest Prevention and Control:

1. The Contractor shall be responsible for detection, prevention, elimination and control of diseases, harmful insects and weeds in the turf, shrubs, trees and groundcover areas. The Contractor shall select and supply proper materials and licensed personnel and obtain necessary permits to comply with all city, county, state and federal regulations or laws.
2. Contractor will assume responsibility and liability for the use of all chemical controls. Pests and diseases to include, but not limited to, all insects, mites and other harmful organisms.
3. Chemical controls to include necessary use of herbicides and plant growth regulators. Pests may be controlled by mechanical means, as well as chemicals.

F. Rodent Control:

1. The Contractor shall be required to hire, as subcontractor, a professional who is in business strictly for the purpose of controlling rodents. The Contractor shall be responsible for overseeing the subcontractor to assure the control of all rodents, as required in all landscaped areas.

G. Clean Up:

1. The Contractor shall be responsible for keeping the entire area, including hardscape areas, free of debris such as papers, bottles, cans, glass, dirt, etc. Debris shall be removed Monday, Wednesday and Friday each week. Contractor shall be responsible for trash removal from the sites.
2. Contractor shall remove all debris resulting from the maintenance operations and dispose of it off-site. All grass clippings deposited on roadways or walks shall be picked up after each mowing or trimming operation.
3. All debris resulting from any of the Contractor's operations shall be removed and disposed of legally at the Contractor's expense. No debris will be allowed to remain at the end of the workday.
4. All walkways will be kept clean and care shall be taken not to create unnecessary hazards to the walking surface.
5. Unless otherwise indicated or directed, the Contractor shall provide a general clean-up operation at least once a week for the purpose of picking up debris which may accumulate from use of the area, windblown debris, dropped twigs or branches, leaves or paper in the landscape area.

H. Irrigation System:

1. Operation:

- a. The water schedule will be established and programmed by the Contractor's landscape maintenance supervisor. Application rates will be based on the amount the planting areas are capable of receiving without excessive runoff. The irrigation system's schedule shall be monitored and adjusted accordingly to maintain efficient use of water being applied.
- b. In determining rates of application, soil type, topography and weather conditions will be taken into consideration. The project is equipped with an automatic system that provides for repeat cycles. Applying water over short periods of time will allow for proper infiltration and thereby minimize runoff.
- c. Contractor shall turn off all controllers when it is unnecessary to irrigate due to adequate rainfall.
- d. Sprinkler heads shall be kept clear of overgrowth that may obstruct maximum operation.
- e. Contractor will avoid manual activation of automatic valves.
- f. Contractor will keep system in operation by valve or head adjustment to keep all systems operating at manufacturer's recommended operating pressures. This shall be accomplished by valve throttling and pressure gauge.
- g. Contractor will be responsible for hand watering any areas not provided with an irrigation system, or any area resulting from the physical breakdown of the irrigation system.

2. Maintenance:

- a. The Contractor shall be responsible for the cost of cleaning, repair, adjustment and replacement of sprinkler system components, with the exception of irrigation controllers and backflow protection devices.
- b. The Contractor shall be responsible for the cost of cleaning, repair, adjustment and replacement of all items listed in the foregoing paragraphs in addition to the following:
  - 1. Plastic Pipe
  - 2. Plastic Pipe Fittings
  - 3. Galvanized Steel Pipe
  - 4. Galvanized Steel Fittings
  - 5. Remote Control Valve Wiring
  - 6. Remote Control Valves
  - 7. Manual Control Valves
  - 8. Quick Coupler Valves
  - 9. Sprinkler Heads
  - 10. Valve Boxes
- c. Replacement of any item shall be with an item of identical design, unless otherwise specified in writing by the Landscape Architect.
  - 1. The following specifications are provided for replacement of plastic pipe, plastic pipe fittings, galvanized steel pipe and galvanized pipe fittings:
    - a. Plastic pipe shall be polyvinyl chloride (PVC) Schedule 40, Type 1, Grade 2 (PVC 1220).
    - b. Plastic pipe fittings and connections shall be PVC Schedule 40.
    - c. Galvanized steel pipe and galvanized steel pipe fittings shall be Schedule 40.
  - 2. The Contractor shall inspect and examine the sprinkler system while water is on twice per month.
  - 3. Any part of the system not functioning normally shall immediately be cleaned, adjusted, repaired or replaced.
  - 4. Contractor shall be responsible for adjusting height of sprinkler risers necessary to compensate for plant material growth.
  - 5. Automatic controllers will be kept locked at all times.

### 3.05 MISCELLANEOUS

- A. The Contractor shall furnish and pay all costs for the following material:
  - 1. Herbicides, pesticides and fungicides
  - 2. Sprinkler system parts
  - 3. Fertilizers
  - 4. Tree stakes and ties
  - 5. All tools and equipment to complete the work specified



6. Plant materials damaged by the Contractor
  7. Annual color
  8. Overseeding
- B. Daily Inspection:
1. The Contractor shall be responsible for notifying Owner upon discovery of damage to facilities (i.e. drinking fountains, lighting poles and fixtures, etc.), which could be a potential health and safety hazard or could be an inconvenience to the general public.
- C. Inspections will be made by Owner and the Contractor on a weekly basis and/or at the request of the Contractor. Once a month Owner, Landscape Architect and Contractor will meet. The purpose of the meeting will be to discuss specific project problems.

### 3.06 FERTILIZATION

- A. General
1. Fertilizers shall be inorganic, dry, pelletized formation, as specified. Application shall be in accordance with indicated rates and times.
- B. Method of Application
1. In making application of fertilizer granules, caution shall be taken to contain these materials in the planting areas. Avoid use of cyclone spreaders, which tend to throw material into paved areas, etc. Use gravity flow spreaders when possible to keep material contained in planting areas.
- C. Timing of Application
1. When climatic factors may cause problems of general containment of fertilizer materials, adjustment of the fertilizer schedule may be necessary. Avoid application of fertilizers prior to forecasted rainy weather, etc., which might affect stability. After fertilizer application, monitor watering schedule to eliminate runoff of fertilizer materials in solution.
- D. Trees and Shrubs
1. Agriform 21 grams plant tablets shall be applied to trees and shrubs that require supplemental feeding. Annual fall feeding shall be done in accordance with the rates indicated. Place tablets 6 to 8 inches deep.

PRODUCT ANALYSIS	TIME	RATE PER 1,000 S.F.
20-10-5	As required	1 gal plant - 1 tablet 5 gal plant - 2-3 tabs Mature trees - 1 tab per 1/2" of caliper

### 3.07 CLEAN UP

- A. Contractors shall remove all debris associated with his work from the project site on a daily basis. Contractor is responsible for providing proper debris receptacles, or disposing of debris off site.
- B. All receptacles or off site disposal must conform to state and local codes. Contractor is responsible for identifying any waste associated with his work which may be deemed as being "hazardous" as defined by the EPA, and disposing of it per EPA regulations.

\*\*\*END OF SECTION\*\*\*

**SECTION 03100**  
**CONCRETE FORMWORK**

**PART 1 -- GENERAL**

**1.01 DESCRIPTION**

- A. Work included: Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.

**1.02 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Design of formwork is the Contractor's responsibility.
- C. Standards: In addition to complying with pertinent regulations of governmental agencies having jurisdiction, comply with pertinent provisions of ACI 347.

**1.03 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.04 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit manufacturers' data and installation instructions for propriety materials including form coatings, ties, and accessories and manufactured systems if used.

**PART 2 -- PRODUCTS**

**2.01 FORM MATERIALS**

- A. Except for metal forms, use new materials, Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, re-coated for each use, and capable of producing formwork of the required quality.
- B. For footings and foundations, use Douglas Fir boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.
- C. For studs, walls, and supports, use Standard graded or better Douglas Fir, dimensions as required to support the loads but not less than 2" x 4".
- D. Wall forms:
  - 1. Exposed concrete surfaces:
    - a) Use 3/4" minimum thickness Douglas Fir plywood, grade B/B, Class I or II, exterior, sanded both sides, complying with PS-1.
    - b) Seal edges and coat both faces with colorless coating which will not affect application of applied finishes.
  - 2. Unexposed concrete surfaces:

- a) Use 1" x 6" shiplap Douglas Fir boards, surfaced one side and two edges, or 3/4" minimum thickness Douglas Fir plywood, grade B/B plyform, Class I or II, sanded both sides, mill-oiled.

## 2.02 FORM TIES

Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders accepted by the Architect.

1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.
2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.
3. For exposed concrete surfaces, provide form ties of removable type with she-bolts equipped with permanent plugs and a system accepted by the Architect for fixing the plugs in place.

## 2.03 DESIGN OF FORMWORK

General:

1. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
3. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
4. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerance.
5. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.

## 2.04 EARTH FORMS

- A. Foundation concrete may be placed directly into meat excavations provided the foundation trench walls are stable as determined by the Architect and Structural Engineer (subject to the approval of the Office of the State Architect). In such case the minimum formwork shown on the drawings is mandatory to insure clean excavations immediately prior to and during the placing of concrete.
- B. Provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the Drawings.

# PART 3 -- EXECUTION

## 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

## 3.02 FORM CONSTRUCTION

A General:

1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features as required.

B Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
3. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
4. Provide top forms for inclined surfaces where so directed by the Architect.

C Forms for exposed concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.
3. Use extra studs, walls, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.

D Corner treatment:

1. Unless shown otherwise, form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.

E Locate control joints as indicated on the Drawings and where required but not shown on the Drawings, as accepted by the Architect.

F Provisions for other trades:

1. Provide openings in concrete formwork to accommodate work of other trades.
2. Verify size and location of openings, recesses, and chases with the trade requiring such items.
3. Accurately place and securely support items to be built into the concrete.

### 3.03 FORM COATINGS

Coat form contact surfaces with form coating compound before reinforcement is placed.

1. Do not allow excess form coating material to accumulate in the forms or the come in contact with surfaces which will bond to fresh concrete.
2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

### 3.04 REMOVAL OF FORMS

A. General:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
3. Do not strip horizontal concrete in less than three days.
4. Do not strip vertical concrete in less than three days.]

B. Finished surfaces:

1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.
2. Release sleeve nuts or clamps, and pull the form ties neatly.
3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified in Section 03300 of these Specifications, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.

**\*\*\*END OF SECTION\*\*\***

**SECTION 03200**  
**REINFORCING STEEL**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Requirements of Division 1 apply to all work of this Section.

**1.2 SCOPE**

- A. Unless noted otherwise, furnish and install reinforcing for all concrete, including dowels, chairs, spacers, bolsters, etc., necessary for supporting and fastening reinforcement in place as shown on the Drawings and specified herein.

**1.4 QUALITY ASSURANCE**

A. General:

1. Acceptable Manufacturers: Regularly engaged in the manufacture of steel bar and welded wire fabric reinforcing.
2. Installer Qualifications: Installation shall be done only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics working under an experienced supervisor.
3. Welding Qualifications: Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4 - "Structural Welding Code Reinforcing Steel".
  - a. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
4. Reinforcement Work shall conform to ACI 301 and CBC Section 1907, as minimum standards.
5. Allowable Tolerances:
  - a. Fabrication:
    - 1) Sheared length: 1 inch.
    - 2) Depth of truss bars: Plus 0 minus ½-inch.
    - 3) Ties: Plus or minus ½-inch.
    - 4) All other bends: Plus or minus 1 inch.
  - b. Placement:
    - 1) Concrete cover to form surfaces: Plus or minus ¼-inch.
    - 2) Minimum spacing between bars: Plus or minus ¼-inch.
    - 3) Crosswise of members: Spaced evenly within 2 inches of stated separation.
    - 4) Lengthwise of members: Plus or minus 2 inches.
  - c. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.

B. Standards and References: (Latest Edition unless otherwise noted):

1. American Concrete Institute (ACI).
  - a. ACI 301 - "Specifications for Structural Concrete for Buildings".
  - b. ACI 315 - "Details and Detailing of Concrete Reinforcing".
  - c. ACI 318 - "Building Code Requirements for Reinforced Concrete"
2. American Society for Testing and Materials (ASTM).
  - a. ASTM A82 - "Cold Drawn Wire for Concrete Reinforcement".
  - b. ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".
  - c. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
  - d. ASTM A706 - "Low Alloy Steel Deformed Bars for Concrete Reinforcement".
3. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".

4. 2007 California Building Code (CBC),.

C. Submittals:

1. Shop Drawings: Prepare in accordance ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars and shapes, dimensions and details of bar reinforcing and assemblies. Correctness of all reinforcing requirements and work is the responsibility of Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Contract Drawings.
  - a. Do not use scaled dimensions from Contract Drawings in determining the lengths of reinforcing bars.
  - b. No reinforcing steel shall be fabricated without approved shop drawings.
  - c. Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
  - d. Areas of high congestion, including member joints and embed locations shall be fully detailed to verify clearances and assembly parameters and coordination with other trades.
2. Certified mill test reports of supplied reinforcing indicating chemical and physical analysis. Tensile and bend tests shall be performed by the mill in accordance with ASTM A615.
3. Product Data:
  - a. Manufacturer's specifications and installation instructions for splice devices.
  - b. Bar Supports.
4. Certificates of Compliance with specified standards:
  - a. Reinforcing bars.
  - b. Welded wire fabric.
  - c. Welding electrodes.
5. Samples: Only as requested by Architect.

D. Tests and Inspections:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A615. One Series of tests for each missing report to be borne by the Contractor.
3. When inspections are indicated for reinforcement placement on the Structural drawings, a special inspector shall be employed to inspect reinforcing placement per CBC Section 1704.
4. When tests are indicated for reinforcing steel on the structural drawings, the reinforcing steel used shall be tested in accordance with ASTM A615. One tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.
5. Inspect shop and field welding in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualification as well as the welds. Inspector will use non-destructive testing or any other aid to visual inspection that he deems necessary to assure himself of the adequacy of the weld.
6. Tests and inspection shall be performed by Owners testing agency except when needed to justify rejected work, in which case the cost of retests and reinspection shall be borne by the Contractor.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

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

- B. Handle and store materials to prevent contamination.
  - 1. Store reinforcement in a manner that will prevent excessive rusting or coating with grease, oil, dirt, and other objectionable materials. Storage shall be in separate piles or racks so as to avoid confusion or loss of identification after bundles are broken.
- C. Deliver and store welding electrodes in accordance with AWS D12.1.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Reinforcement Bars: ASTM A615, Grade 40 for No. 3 and smaller bars; ASTM A615, Grade 60 for No. 4 and larger bars.
  - 1. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.
- B. Stirrups and Ties: ASTM A615, Grade 60 for No.4 and larger bars, ASTM A615, Grade 40 for No. 3 and smaller bars.
- C. Steel Dowels: Same grade as bars to which dowels are connected.
- D. Welded wire Fabric: ASTM A185.
- E. Tie Wires: FS-QQ-W-461, annealed steel, black, 16 gauge minimum.
- F. Welding Electrodes: AWS D1.4, low hydrogen, E70XX series.
- G. Bar Supports:
  - 1. Typical, unless noted otherwise; CRSI Class 2 wire supports.
    - a. Do not use wood, brick or other objectionable materials.
    - b. Do not use galvanized supports.
  - 2. Supports placed against ground: Pre-cast concrete blocks not less than 4 inches square with embedded wire.
- H. Mechanical Couplers: Comply with ACI 318 section 12.14.3.

## PART 3 - EXECUTION

### 3.1 FABRICATION

- A. Shop fabricate reinforcement to meet requirements of Drawings.
- B. Fabricate reinforcement in accordance with the requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.
- C. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of bars for bending will not be permitted.
- D. Reinforcing shall not be field bent or straightened without structural engineer's review.
- E. Provide offsets in rebar (1:6 maximum) where required to maintain clearances.

### 3.2 CONDITION OF SURFACES

- A. Examine surfaces and conditions receiving or affecting the work. Do not proceed until unsuitable conditions have been corrected.



### 3.3 GENERAL

- A. Concrete shown without reinforcing shall be reinforced as similar parts shown with reinforcing except where concrete is specifically noted to be unreinforced.

### 3.4 PLACEMENT

- A. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with specified wire at all splices and crossing points. All wire tie ends shall point away from the form. Carefully locate all dowel steel to align with wall and column steel.
  - 1. Bars shall be in long lengths with laps and splices as shown. Offset laps in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the Drawings. Tie all laps and intersections with the specified wire.
  - 2. Maintain clear space between parallel bars not less than 1-1/2 times nominal diameter, but in no case shall clear space be less than 1-1/2 times maximum size concrete aggregate.
  - 3. Reinforcing dowels for slabs shall be placed as detailed. Sleeves may be used if reviewed by the Structural Engineer before installation. Install dowel through all construction and expansion joints for all slabs on grade.
- B. Bar Supports: Support and securely fasten bars with chairs, spacers and ties to prevent displacement by construction loads or placement of concrete beyond the tolerances specified. Conform to CRSI as a minimum standard.
- C. Steel Adjustment:
  - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
  - 2. Do not move bars beyond allowable without concurrence of Structural Engineer.
  - 3. Do not heat, bend, or cut bars without concurrence of Structural Engineer.
  - 4. Reinforcement shall not be bent after being embedded in hardened concrete.
- D. Splices:
  - 1. Splice reinforcing as shown.
  - 2. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
  - 3. Splice Devices: Install in accordance with manufacturer's written instructions. Obtain Structural Engineer's review before using.
  - 4. Do not splice bars except at locations shown without concurrence of Structural Engineer.
    - a. Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for Engineer's approval".
- E. Welding:
  - 1. Welding is not permitted unless specifically detailed on Drawings or approved by Engineer.
  - 2. Employ shielding metal-arc method and meet requirements of AWS D1.4.
  - 3. Welding is not permitted on bars where the carbon equivalent is unknown or is determined to exceed 0.55.
  - 4. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
  - 5. Welding of crossing bars is not permitted.
- F. Welded Wire Fabric: Install in long lengths, lapping 24 inches at end splices and one mesh at side splices. Offset laps in adjacent widths. Place fabric in approximately the middle of the slab thickness unless shown otherwise on the Drawings by dimension. Wire tie lap joints at

12-inch centers. Use concrete blocks to support mesh in proper position.

- G. Reinforcement shall be free of mud, oil or other materials that may reduce bond at the time concrete is placed. Reinforcement with tightly adhered rust or mill scale will be accepted without cleaning provided that rusting has not reduced dimensions and weights below applicable standards. Remove loose rust.
- H. Protection against rust:
  - 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
  - 2. Remove protective materials and clean reinforcement as required before proceeding with concrete placement.
- I. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.
- J. Mechanical and Electrical Drawings: Refer to Mechanical and Electrical Drawings for formed concrete requiring reinforcing steel. All such steel shall be included under the work of this Section.

**\*\*\*END OF SECTION\*\*\***

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## SECTION 03220

### UNDERSLAB VAPOR BARRIER

#### PART 1 -- GENERAL

##### 1.01 DESCRIPTION

- A. Division 0, Contract requirements and Division 1, General Conditions apply to this section.
- B. This Section describes the requirements for furnishing and installing moisture barrier and sand under concrete slabs-on-grade.

##### 1.02 SUBMITTALS

- A. In accordance with Article 5 of the General Conditions.
- B. Product Data: Include independent laboratory test results showing compliance with ASTM and ACI Standards. Include manufacturer's installation instructions for placement, seaming, and pipe boot installation.

##### 1.03 SUBSTITUTIONS

Substitutions will be considered per Article 5 of the General Conditions.

##### 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

Protect products against damage during field handling and installation.

#### PART 2 -- PRODUCTS

##### 2.01 MANUFACTURERS

- A. Stego Wrap Vapor Retarder by Stego Industries
- B. Vapor-Block by Raven Industries
- C. Architect approved equal

##### 2.02 MATERIALS

- A. Vapor Retarder must have the following qualities:
  - 1. 10 mil thickness minimum.
  - 2. Permeance of 0.01 UP perms as tested by ASTM E154.
  - 3. Puncture resistance of 2,600 grams per ASTM D1709, Method B.
  - 4. ASTM E 1745 Class A (Plastics) after conditioning testing.
- B. Vapor Retarder Tape:
  - 1. Water Vapor Transmission Rate :ASTM E 96, 0.3 perms or lower
  - 2. Minimum 8-mils thick
  - 3. Minimum 4 inches wide
  - 4. Manufactured from High Density Polyethylene
  - 5. Pressure Sensitive Adhesive
- C. Pipe Boots: Construct from vapor barrier sheeting material and pressure sensitive tape in accordance with manufacturer's instructions.
- D. Sand: Clean yard sand, free from excessive dirt, debris, organic matter, and fines smaller than No. 200 sieve size.

#### PART 3 -- EXECUTION

3.01 INSPECTION

- A. Below grade and grading work and items penetrating moisture barrier shall be completed prior to start of installation.
- B. Examine the areas and conditions under which work of this Section will be performed.
- C. Correct conditions detrimental to timely and proper completion of the Work.
- D. Do not proceed until unsatisfactory conditions are corrected.
- E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION REQUIREMENTS

A. Vapor Barrier Sheeting:

- 1. Install in accordance with manufacturer's instructions and ASTM E1643.
- 2. Unroll with the longest dimension parallel with the direction of the pour.
- 3. Lap vapor barrier over footings and seal to foundation walls.
- 4. Overlap joints 6-inches and seal with pressure sensitive tape.
- 5. Seal penetrations, including pipes, with pipe boot.
- 6. Penetrations through vapor barrier sheeting except for reinforcing steel and permanent utilities are not permitted.
- 7. Repair damaged areas by cutting patches of vapor barrier sheeting, overlapping damaged area 6-inches and taping all four sides with pressure sensitive tape.

B. Sand Cushion:

- 1. Provide 2-inch layer over moisture barrier, unless otherwise indicated.
- 2. Spread over surfaces required and work to fill voids; leave in stable condition with finished surfaces reasonably uniform at established grade.

\*\*\*END OF SECTION\*\*\*

**SECTION 03300**  
**CAST-IN-PLACE CONCRETE**

**PART 1 – GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

- A. Furnish, place and finish cast in place concrete and related work as indicated on the Drawings and specified here.
1. Install miscellaneous metal and other items furnished by other trades to be installed in concrete work.
  2. Provide facilities for job curing of test cylinders and transporting to Testing Laboratory.
- B. Provide grouting of steel base plates as indicated on the Drawings and specified here.

**1.3 QUALITY ASSURANCE**

- A. Standards and References: (Latest Edition unless otherwise noted)
1. 2007 California Building Code (CBC),
  2. AMERICAN CONCRETE INSTITUTE (ACI)
    - ACI 117 Standard Tolerances for Concrete Construction and Materials
    - b. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
    - c. ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete
    - d. ACI 301 Structural Concrete for Buildings
    - e. ACI 305R Hot Weather Concreting
    - f. ACI 318 Building Code Requirements for Reinforced Concrete
  3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM C 31 Making and Curing Concrete Test Specimens in the Field
    - b. ASTM C 33 Concrete Aggregates
    - c. ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
    - d. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
    - e. ASTM C 94 Ready-Mixed Concrete
    - f. ASTM C 109 Test of Hydraulic Cement Concrete
    - g. ASTM C 143 Slump of Hydraulic Cement Concrete
    - h. ASTM C 150 Portland Cement
    - i. ASTM C 172 Sampling Freshly Mixed Concrete by the Volumetric Method
    - j. ASTM C 192 Making and Curing Concrete Test Specimens in the Laboratory
    - k. ASTM C 260 Air-Entraining Admixtures for Concrete
    - l. ASTM C 330 Lightweight Aggregates for Structural Concrete
    - m. ASTM C 494 Chemical Admixtures for Concrete
    - n. ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
    - o. ASTM C685 Volumetric Batching and continuous mixing
    - p. ASTM C1157 Hydraulic-Cement

- B. Submittals: (Submit under provisions of Soils Report)
1. Concrete mix designs. See "Mix Design" below. Include results of test data used to establish proportions.
  2. Certificates of Compliance from Manufacturer
    - a. Cement certificates
    - b. Aggregates
    - c. Admixtures.
  3. Data regarding hardeners and sealers.
  4. Grout samples for sacked surface textures and colors upon Architects request only.
  5. Layout drawings for construction, control and expansion joints.
  6. Transit-mix delivery slips:
    - a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
    - b. Make the record available to the Architect for his inspection upon request.
    - c. Upon completion of this portion of the work, deliver the record and the delivery slips to the Architect.
  7. See Section 032100 for reinforcing steel submittals.
- C. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. The following tests shall be made by a recognized testing laboratory selected by the Owner and approved by the governing agency. All tests shall be in accordance with the previously mentioned standards and ACI 318 Section 5.6. A complete record of all tests and inspections shall be kept
    - a. Compressive Strength: Make and cure in accordance with ASTM C-31. Test in accordance with ASTM C-39 and ACI 318 section 5.6
      - 1) A record shall be made of time and of locations of concrete from which samples were taken.
      - 2) Four identical cylinders shall be taken from each pour of 150 cubic yards or 5000 square feet or part thereof, being placed each day per ACI 318 5.6.2.1. One cylinder shall be tested at age 7 days, and two at age 28 days unless otherwise specified. Preserve remaining cylinder for future use.
    - b. Drying Shrinkage: (applies to lightweight concrete only unless noted otherwise)
      - 1) A record shall be made of time cylinders and of locations of concrete from which samples were taken.
      - 2) Three identical 4" x 4" x 11" specimens shall be made from same concrete as used in structure. Percent of shrinkage shall be reported at 21 days after 7 day moist curing period. Average results of 3 specimens shall be used as the accepted value. The value for laboratory cast specimens shall not exceed .075%. If field test specimens are used in lieu of laboratory specimens, a tolerance of +33% may be used.
      - 3) Test specimens in accordance with ASTM C157.
    - c. Concrete consistency (slump) shall be tested in accordance with ASTM C143.
  3. Provide full time inspection during the taking of test specimens and during the placing of all concrete and embedded steel.
  4. See Section 03210 for reinforcing steel tests and inspections.
  5. Provide concrete batch plant inspections per ASTM C685.

## PART 2 - PRODUCTS

### 2.1 MATERIAL

- A. Portland Cement: ASTM C 150, Type I or Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.
- B. Concrete Aggregate: Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards and ACI 318.
  - 1. Concrete Aggregates for Standard Weight Concrete: ASTM C 33. Aggregate shall be crushed granite or Perkins type.
  - 2. Concrete Aggregates for Lightweight Concrete: ASTM C330 to produce concrete weighing no more than 110 pcf at 28 days. Aggregate shall be vacuum saturated expanded shale as produced through the rotary kiln method.
- C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption.
- D. Admixtures shall be subject to prior approval by the Architect, in accordance with ACI 318, Calcium Chloride is not permitted.
  - 1. Water Reducing
    - a. ASTM C494 Type A - for use in cool weather.
    - b. ASTM C494 Type D - for use in hot weather.
  - 2. Air Entraining
    - a. Conform to ASTM C 260
  - 3. Fly Ash
    - a. Conform to ASTM C 618
  - 4. Mid-Range Water-Reducers
    - a. Master Builders "Polyheed" or approved equal.
  - 5. Fly Ash Pozzolan
    - a. Conforming to ASTM A-618 Class F
- E. Slab on Grade Vapor Retarder
  - 1. Vapor Retarder must have the following qualities:
    - a. 10 mil thickness minimum
    - b. WVTR less than 0.008 as tested by ASTM E 96
    - c. ASTM E 1745 Class A (Plastics)
  - 2. Vapor Retarder Products
    - a. Stego Wrap Vapor Retarder by STEGO INDUSTRIES LLC.
    - b. W.R. Meadows Premoulded Membrane with Plasmatic Core.
    - c. Zero-Perm by Alumiseal.
  - 3. Vapor Retarder Tape
    - a. Water Vapor Transmission Rate :ASTM E 96, 0.3 perms or lower
    - b. Minimum 8-mils thick
    - c. Minimum 4 inches wide
    - d. Manufactured from High Density Polyethylene
    - e. Pressure Sensitive Adhesive
- F. Sand: Clean, dry, well graded.
- G. Abrasive aggregate for non-slip finish: Fused aluminum oxide grits, graded 12/30. Use factory-graded rustproof and non-glazing material that is unaffected by freezing, moisture and cleaning materials.
  - 1. Products offered by manufacturers to comply with the above requirements include: A-H Alox; Anti-Hydro Waterproofing Co., Toxgrip; Toch Div. - Carboline, or approved equal.



- H. Expansion Joint Filler:
1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.
- I. Bonding Agent: Sonneborn "Sonobond"; the Euclid Chemical Company "Euco-Weld"; Larsen Products Corp., "Weld-Crete" or approved equivalent.
- J. Concrete Sealer: Cure and Seal, as manufactured by the Euclid Chemical Company "Aqua-Cure VOX", Sonneborn "Kure-N-Seal WB", Burke "Spartan-Cote", W.R. Meadows "Intex" or approved equal conforming to ASTM C-309, Type I, Class B requirements, and conforming to State of California Air Resources Board VOC Regulations.
- K. Concrete Hardener/Sealer: Clear, water soluble, sprayable in-organic silicate based hardener/sealer or acrylic co-polymer resin. Products shall be equal to Euclid Chemical Company "Eucosil", Burke "Spartan-Cote", Sonneborn "Sonosil", W.R. Meadows "Pena-Lith", or approved equal and must conform to State of California Air Resources Board VOC Regulations.
- L. Concrete Cure: Water based curing compound conforming to ASTM C-309, Type 1, Class A and B, and AASHTO Specification M-148; Type 1, Class A and B requirements, and State of California Air Resources Board VOC Regulations. Product shall be equivalent to Euclid Chemical Company "Kurez VOX", Burke "No. 1127" or "Aqua-Resin Cure", W.R. Meadows "1100 Clear", or approved equal.
- M. Non-Shrink Grout: See Section 2.2.A.7

## 2.2 CONCRETE

- A. Concrete Mixes:
1. Type A Concrete:  
Strength: 3000 lbs. per square inch at 28 days.  
Maximum Aggregate Size: 1-1/2 inch.  
Cement Content: As determined by mix design (ACI 318 Section 5.2).  
5.0 sacks per yard minimum.  
Maximum Water to Cement Ratio: 0.58  
Admixture: Water Reducing.  
Weight: 145 lbs. per cubic foot  
Use for unexposed foundation concrete except as otherwise specified. At Contractor's option, Type B concrete may be substituted for this.
  2. Type B Concrete:  
Strength: 3500 lbs. per square inch at 28 days.  
Maximum Aggregate Size: 1 inch.  
Minimum Cement Content: As determined by mix design. (ACI 318 Section 5.2) 5.5 sacks per yard minimum.  
Maximum Water to Cement Ratio: 0.45  
Admixture: Water reducing.  
Weight: 145 lbs. per cubic foot  
Use for building slab on grade  
Maximum Fly Ash content as a percentage of total cementitious material: 15%
  3. Type C Concrete:  
Strength: 3500 lbs. per square inch at 28 days.  
Maximum Aggregate Size: 3/4 inch.  
Minimum Cement Content: As required by mix design (ACI 318 Section 5.2)

6.0 sack per cubic yard minimum.  
Maximum Water to Cement Ratio: 0.52  
Admixture: Water reducing.  
Weight: 145 lbs. per cubic foot  
Use for normal weight concrete over metal deck

4. Type D Concrete:  
Strength: 2500 lbs. per square inch at 28 days.  
Maximum Aggregate Size: 1 inch.  
Minimum Cement Content: 5 sacks per cubic yard.  
Maximum Water to Cement Ratio: 0.60  
Admixture: Water reducing.  
Weight: 145 lbs. per cubic foot.  
Use for concrete sidewalks, mechanical and electrical pads, miscellaneous non-structural slabs on grade.
  5. Grout shall be non-shrink, non-metallic, flowable Type "713" or "928" by Master Builders.
    - a. Metallic grout equivalent to Master Builders "Embeco" may be used only where covered by earth, concrete, or masonry.
    - b. Acceptance by Architect required before using.
- B. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143, shall fall within following limits.
1. For General concrete placement: 3 inch plus or minus 1 inch.
  2. Mixes employing the specified mid-range water reducer shall provide a measured slump not to exceed 7 inch  $\pm$  1 inch after dosing, 2 inch  $\pm$  1 inch before dosing.
  3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers. Water shall not be added at the jobsite without written review by the structural engineer.
- C. Mix Design:
1. Initial mix design shall be prepared for all concrete in accordance with ACI 318 section 5.2. Mix proportions shall be determined in accordance with ACI 318 Section 5.3 or ACI 318 section 5.4. In the event that additional mix designs are required due to depletion of aggregate sources, aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.
  2. Contractor shall notify the Testing Laboratory and Architect of intent to use concrete pumps to place concrete so that mix designs can be modified accordingly.
  3. Fly ash shall not exceed fifteen percent of the total cementitious material.
  4. Provide 3% air entrainment typical, 6% for mixes with f'c greater than 4,000 psi.
  5. Owner's testing laboratory shall review all mix design before submittal.
- D. Mixing:
1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
  2. Method of Mixing:
    - a. Transit Mixing: Comply with ASTM C 94. Ready mixed concrete shall be used throughout, except as specified below.
    - b. On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by Architect. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
    - c. Mixing shall be in accordance with ACI 318 5.8.
  3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.

4. Admixtures:
  - a. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 3%.
  - b. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
  - c. All admixtures are to be approved by Structural Engineer prior to commencing this work.
5. Retempering:
  - a. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
  - b. Indiscriminate addition of water to increase slump is prohibited.
  - c. When concrete arrives at project with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded. Water shall be incorporated by additional mixing equal to at least half of total mixing time required. Any addition of water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio. Such additions shall only be used if approved by Architect. In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in design mix, shall be added.
6. Cold Weather Batching: When temperature is below 40 degrees F or is likely to fall below 40 degrees F during 24 hour period after placing, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees F. When placed in forms concrete shall have a temperature between 50 degrees F and 85 degrees F.
7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

## 2.3 FLOOR LEVELING AND FILL MATERIALS

- A. Epoxy Concrete Mortar: Floor leveling, non-shrink trowel applied epoxy concrete mortar; TPM 115 General Polymers Corp., A-H Emery Epoxy Topping #170 Anti-Hydro Corp., or approved equal, where areas to fill are less than 1/4 inch thick.
- B. Concrete Mortar: Floor leveling, patching and repair, non-shrink trowel applied concrete mortar; Master Builders EMBECO 411-A, Euclid EUCO, or approved equal, where areas of fill are greater than 1/4 inch thick.
- C. Cementitious Floor Leveling Material: Shall be self-leveling or trowelable with a minimum 28 day compressive strength of 3000 psi in accordance with ASTM C-109. Material shall be equal to Quickrete No. 1249, Ardex V-800/K-55, Mapei "Ultra/Flex" or approved equal.

## PART 3 - EXECUTION

### 3.1 PLACEMENT

- A. Before any concrete is placed, the following items of work shall have been completed in the area of placing.

1. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.
  2. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.
  3. Reinforcing steel shall have been placed, tied and supported.
  4. Embedded work of all trades shall be in place in the forms and adequately tied and braced.
  5. The entire place of deposit shall have been cleaned of wood chips, sawdust, dirt, debris, hardened concrete and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other work.
  6. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale or other contaminants that will destroy or reduce bond.
  7. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the aggregate, and then coated with the bonding adhesive herein specified.
  8. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
  9. No concrete shall be placed until formwork and reinforcement has been approved by Architect. Clean forms of all debris and remove standing water. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete. Concrete shall not be placed against reinforcing steel that is hot to the touch. Notify Architect 48 hours in advance of concrete pour.
- B. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- C. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness around building, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the drawings or as approved by Structural Engineer. The rate of rise in walls shall not be less than 2 feet per hour.
1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by Structural Engineer. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
  2. Hot Weather Concreting: Unless otherwise directed by the Architect, perform all work in accordance with ACI 305 when air temperature rises above 75 degrees F and the following:
    - a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.  
Aggregate: Keep aggregate piles continuously moist by sprinkling with water.  
Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 85 degrees F. The method employed to provide

this temperature shall in no way alter or endanger the design mix or the design strength required.

Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.

Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.

3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F., as approved by Architect. Concrete placed in freezing temperatures shall have a temperature of not less than 50 degrees F. Maintain this temperature for at least 7 days. No chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from Architect.
- D. Construction Joints: Install only as indicated and noted on Drawings. Joints not indicated on Drawings shall be so located, when approved, as to least impair strength of structure, and shall conform to typical details. Construction joints shall have level tops, vertical sides. Horizontal construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean aggregate solidly embedded in mortar matrix. Joints between concrete and masonry shall be considered construction joints. Vertical construction joints need not be roughened. See Drawings for doweling and required keys.
  1. Roughen construction joints by any of following methods:
    - a. By sandblasting joint.
    - b. By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done not less than 2 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
    - c. By chipping and wire brushing.
  2. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall be reviewed with the Structural Engineer.
  3. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened (but not saturated).
  4. Before placing regular concrete mix, horizontal construction joint surfaces shall be covered with a layer of mortar composed of cement and fine aggregate of same proportions as that used in prescribed mix, but omitting coarse aggregate.
- E. Concrete Slabs on Grade:
  1. Exterior concrete slabs on grade shall be poured as required under this Section. Base shall be accurately leveled and compacted prior to placing of concrete.
  2. Typically, interior slabs on grade shall be poured over a vapor barrier and over a minimum of four (4 inch) inches, unless otherwise indicated, of compacted crushed rock.
  3. If sand is indicated on the structural drawings, place over the vapor barrier, otherwise, provide no sand layer.
  4. Vapor Retarder installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
    - a. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
    - b. Lap Vapor Retarder over footings and seal to foundation walls.
    - c. Overlap joints 6 inches and seal with specified tape.
    - d. Seal all penetrations (including pipes) per manufacturer's instructions.
    - e. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
    - f. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with tape.
- F. Control Jointing - Slabs on Grade:
  1. Joints shall be in locations indicated on Drawings, or as directed by Architect.

2. Joints in interior slabs shall be made by one of following methods:
    - a. By use of construction joints laid out in checkerboard pattern; pour and allow alternate slabs to set; fill out balance of checkerboard pattern with second pour.
    - b. By use of dummy groove joints at least 1/4 depth of slab, and at least 1/8 inch wide. These joints may be sawcut as soon as wet concrete can support the weight of the equipment and operator. Delaying sawcutting past this point will make jointing ineffective.
  3. Control jointing in exterior paving slabs shall be poured in a checkerboard pattern as described above, but with joint edges tooled to provide a uniform joint at least 3/8 inch in depth.
  4. Slab reinforcing need not be terminated at control joints.
  5. Construction and expansion joints shall be counted as control joints.
- G. Expansion Joints - Slabs on Grade:
1. Unless otherwise indicated, use 3/8 inch thick expansion joint filler. See Section 2.01 H
  2. Joints in interior slabs on grade shall be in locations indicated, or, where not indicated, locate joints at uniformly spaced intervals not exceeding 100 feet.
  3. Joints in exterior slabs on grade shall be installed at each side of structures, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk, and at uniformly spaced intervals not exceeding 20 feet.
  4. Edges of concrete at joints shall be edger finished to approximately 3/8 inch radius.
  5. Interrupt reinforcing at all expansion joints.
- H. Score markings on exterior slabs on grade shall be located as indicated. Where not indicated, mark slabs into rectangles of not less than 12 square feet nor more than 20 square feet using a scoring tool which will leave edges of score markings rounded.

### 3.2 CURING AND PROTECTION

- A. Curing: Exposed surfaces of all concrete used in structure shall be maintained in a moist condition for at least 7 days after placing. The following final curing processes shall normally be considered to accomplish this. Concrete shall be maintained at not less than 50 degrees F nor more than 100 degrees F for a period of 72 hours after being deposited.
1. Flatwork to be exposed, stained, or painted shall have curing process submitted and approved by the architect prior to construction.
  2. Initial Curing Process - Flat Work:
    - a. Mist Spraying: As soon as troweling of concrete surfaces is completed, exposed concrete shall be sprayed continuously with a special atomizer spray nozzle, capable of producing a fine mist. Spraying shall be done without any dripping of water from nozzle. Amount of spraying shall be such as to maintain surface of concrete moist without any water accumulating on surface. Maintain spraying for a minimum of 12 hours, or until such time as hereinafter described curing process is applied. Mist spraying will not normally be required when the ambient air temperature is below 90 degrees F.
  3. Final Curing Process - Flatwork: Except as noted, use any of following:
    - a. Water Curing: Concrete shall be kept wet by mechanical sprinklers or by any other approved method which will keep surfaces continuously wet.
    - b. Saturated Burlap Curing: Finished surfaces shall be covered with a minimum of two layers of heavy burlap which shall be kept saturated during the curing period.
    - c. Curing Compounds: Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by Architect. Use of membrane curing compound will not be permitted on surfaces to be painted, or to receive ceramic tile, membrane water-proofing or hardeners and sealers. Membrane curing compound may be used in areas to receive resilient floor tile, provided it is wax-free, compatible with adhesive used and approved by adhesive manufacturer. Agitate curing compounds thoroughly by mechanical means

continuously during use and spray or brush uniformly in accordance with manufacturer's recommendations. Apply immediately following final finishing operation. All curing compounds shall conform to State of California Air Resources Board VOC Regulations.

- d. Waterproof paper conforming to ASTM C 171, or opaque polyethylene film, may be used. Concrete shall be covered immediately following final finishing operation. Anchor paper or film securely and seal all edges in such a manner as to prevent moisture escaping from concrete.
- 4. Curing Process - Formed Surfaces: Forms heated by sun shall be kept moist during curing period. If forms are to be removed during curing period, curing as described for flatwork shall be commenced immediately.
- B. Refer to Drawings for areas of concrete slab not to receive curing compounds or hardening compounds. Where concrete floors are to receive heavy duty coatings, waterproof coatings and the like, verify with coating installer the type of finish required for specified coating.
- C. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.
- D. Provide additional curing agents or compounds, not necessarily listed herein, but as recommended and or required for use with shake type hardeners or other special coatings and coverings by their manufacturers for a complete and proper installation.

### 3.3 FINISHES

#### A. Formed Surfaces:

- 1. Rough Form Finish: Surfaces shall be reasonably true to line and plane with no specified requirements for selected facing materials. Tie holes and defects shall be patched and fins exceeding 1/4 inch in height shall be rubbed down with wooden blocks. Fins and other rough spots at surfaces to receive membrane waterproofing shall be completely removed and the surfaces rubbed smooth. Otherwise, surfaces shall be left with the texture imparted by forms.
  - a. Rough finish shall be used for the following areas:
    - 1) Below grade and unexposed surfaces.
- 2. Smooth Plywood Form Finish: Finish shall be true to line and plane. Tie holes and defects shall have been patched and ground with surface fins removed. Arrangement of plywood sheets shall be orderly, symmetrical, as large as practical and free of torn grain or worn edges. Surface concrete shall be treated with 1 part muriatic acid, in three parts water solution, followed immediately by a thorough rinsing with clear water. Surfaces which are glazed, have efflorescence, or traces of form oil, curing compounds or parting compounds shall be cleaned or treated to match other formed surfaces, except as otherwise indicated or specified.
  - a. Smooth Plywood Form Finish shall be used for the following areas:
    - 1) All surfaces above grade unless otherwise specified.
    - 2) At Contractor's option, may also be used in lieu of rough form finish.
- 3. Smooth Plastic Liner Finish: Surface shall be smooth, concrete free of honeycombing, air pockets larger than 1/8 inch in diameter, and fins.
  - a. This finish shall be used only where indicated on the Drawings.

#### B. Flatwork:

- 1. Unless otherwise indicated or specified, flatwork shall have an integral monolithic finish.
- 2. Integral Monolithic Finish: Apply as soon as freshly poured concrete slabs will bear weight of workers. Pour slabs full thickness to finish floor elevations indicated. At proper time, tamp surface repeatedly with a wire mesh or grid tamper in a manner to force aggregate down below surface and to bring sufficient mortar to surface to provide for a smooth

coating of cement mortar over entire surface. Allow surface mortar to partially set, then float with wooden floats and finish with one of following, as required.

- a. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces and other imperfections. After troweling, and before final set, give surface a broom finish, brushing in direction noted on Drawings, or as directed. Broom finish shall be used typically on exterior flatwork except as otherwise indicated or specified and shall be "medium" texture as approved by Architect.
  - b. Smooth Steel Trowel Finish: Apply 2 steel trowelings to obtain hard, smooth surface. All lips, irregularities, uneven levels, etc. shall be worked out before last troweling. All interior flatwork shall have a smooth steel trowel finish unless specified otherwise.
3. Tolerances:
- a. For tolerances not indicated, refer to ACI 117.
  - b. Finished surfaces of all interior integral finished flatwork shall be sufficiently even to contact a 10' long straightedge with a tolerance of 1/8 inch.
  - c. Finished surfaces of exterior integral finished flatwork shall not vary more than 1/4 inch from a 10' long straightedge, except at grade changes.
- C. Sacked Surfaces: Exposed surfaces that are unacceptable in appearance to the Architect shall be sacked.
1. Prepare concrete surfaces in accordance with the referenced standards. Remove any form release materials by stoning by hand, power grinding or other method approved by the Architect.
  2. Prepare concrete surfaces to receive sack finishing with a light sand blasting.
  3. For best results, grout application and rubbing should be performed when areas to be treated are shaded and during cool, damp weather. When work is to be performed in hot and dry weather, a fog spray should be available for continuous use.
  4. Prepare grout samples for matching of concrete surfaces for approval by the Architect. These shall be made in the following proportions of gray cement to white cement to sand: 1:1:2, 1:2:3, and 2:1:3, etc. until the correct matching color is obtained on the test areas. Sand should be fine enough to pass the Number 30 sieve. Mixes should be made to a good workable consistency in a clean container and the mix with the best color chosen, or modified if needed.
  5. Provide sufficient quantities of sand and cement from the same source for the complete work at the job site.
  6. Mixing and Application:
    - a. Mixing of grout on the job should be timed for it to be used up within 1 to 1-1/2 hours.
    - b. Let the grout stand 20 to 30 minutes after mixing, and then remixed before applying.
    - c. Soak the concrete surface thoroughly with water at least 15 minutes before applying grout and again just before application so that the surface is adequately wet during the operation.
    - d. Apply grout with plasterer's trowel or sponge rubber float in sweeping strokes from the bottom up. Brush or spray gun applications may be used when approved by the Architect.
    - e. Work in freshly applied grout vigorously with a sponge rubber float, then let sit until some of its plasticity is gone but not until it loses its damp appearance. At this point it shall be rubbed with clean, dry burlap to remove the excess grout, leaving no visible film on the surface but filling all air holes.
    - f. Keep the surface wet for a day after grouting and sack rubbing are completed.
  7. Alternate methods of application and materials shall be subject to the approval of the Architect.

### 3.4 PATCHING

#### A. Formed Surfaces:



1. Promptly upon removal of contact forms and after concrete surfaces have been inspected, form ties shall be removed and all necessary patching and pointing shall be expertly done.
  2. Honeycombed areas shall be removed down to sound concrete, coated with a bonding grout or approved compound and patched using a low shrinkage high bond mortar. Patched areas shall be cured by being kept damp for at least 5 days.
  3. Tie holes shall be cleaned, dampened and filled solid with patching mortar or cement plugs of an approved variety.
- B. Slabs on Grade: After entire slab is finished, shrinkage cracks that may appear shall be patched as follows:
1. Where slab is not exposed or where appearance is not important, cracks larger than 1/32 inch wide shall be filled with cement grout and struck off level with surface.
  2. Where slab is exposed and appearance is important, unsightly cracks shall be repaired in a manner satisfactory in appearance to Architect. If this cannot be accomplished, concrete shall be considered defective.

### 3.5 DEFECTIVE CONCRETE

- A. Defective concrete shall mean any of the following:
1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
  2. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
  3. Concrete significantly out of place, line, or level.
  4. Concrete not containing the required embedded items.
- B. Upon determination that concrete strength is defective:
1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of work shall be adjusted to produce required strength. Core samples shall be taken and tested from cast-in-place concrete where cylinders and samples indicate inferior concrete with less than minimum specified strength.
    - a. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 42 and C 39. Number and location of such cores shall be subject to the approval of Architect.
    - b. Cost of core sampling and testing will be paid for by the Contractor.
    - c. "500 psi" and "85 percent" reduction in ACI 318 5.6.5.4 will not justify low cylinder tests.
- C. Upon determining that concrete surface is defective, Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure. Permission to patch defective areas will not be considered a waiver of the right to require removal if patching does not, in the opinion of the Architect, satisfactorily restore quality and appearance.
- D. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Owner.
- E. No repair work shall begin until procedure has been reviewed by the Architect and Structural Engineer.

### 3.6 SURFACE HARDENER AND SEALER

- A. Seal all interior exposed flatwork with clear sealer, except surfaces receiving ceramic tile, quarry tile, poured flooring or other special finishes specified, or as scheduled on the Drawings.
  - 1. Apply sealer in 2 or 3 coats, in accordance with manufacturer's directions, using the maximum quantity recommended.
    - a. Concrete floors must be thoroughly cured for a minimum of 30 days and completely dry before treatment.
    - b. Surfaces to be treated must be clean, free of membrane curing compounds, dust, oil, grease and other foreign matter.
    - c. Upon completion, concrete surfaces shall be clean and without discoloration or traces of excess hardener left on the surface.
- B. Apply sprayable hardener/sealer at locations as scheduled or as indicated on the Drawings. Apply in accordance with the manufacturer's favorably reviewed application instructions and recommendations.

### 3.7 GROUTING

- A. Prepare and place grout materials at locations as indicated on the Drawings in accordance with the manufacturer's recommendations and installation instructions.
- B. Pack grout materials solidly between bearing surfaces and bases or plates as indicated and to ensure no voids.

### 3.8 ADJUSTING AND CLEANING

- A. Remove all debris, excess materials, tools and equipment resulting from or used in this operation at completion of this work.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 03320**  
**CONCRETE SEALERS**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 DESCRIPTION**

- A. Work included: Seal, harden or color concrete surfaces where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Concrete floor sealer/hardener/densifier shall react with concrete surfaces to produce a dense, hydrophobic, insoluble, moisture barrier to seal out contaminants, while hardening and densifying concrete surface.

**1.03 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use an applicator currently approved in writing by the manufacturer of the specified product.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Sufficient technical data to prove compliance with the specified requirements.
  - 2. Evidence satisfactory to the Architect that the proposed applicator is currently approved by the manufacturer of the specified product.

**1.06 JOB CONDITIONS**

- A. Ensure concrete has been cured a minimum of 3-days, is free of curing compounds and other sealers, and is free of laitance, grease, oil, and contaminants.
- B. Protect adjacent surfaces/areas from damage due to over-spray

**1.07 EXTENDED WARRANTY**

Warranty sealed concrete floors to be free of dusting from abrasion for a period of 10-years from date of Substantial Completion. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

**PART 2 -- PRODUCTS**

**2.01 SEALER**

- A. Wherever the Drawing indicates concrete with sealer, the surface shall be treated with ready-to-apply clear sealing compound. Where a sealer is used in conjunction with a

hardener with color, use only a product recommended by the manufacturer of the hardener as accepted by the Architect.

B. Comply with ASTM C 309, Type I, Class B.

C. Acceptable products:

1. Curcrete Chemical Company Inc. (Springville, Utah) "Ashford Formula".
2. "Industrial Concrete Sealer" by Burke Company, San Mateo, California, (213) 724-6690.
3. "Sealtight Intex" by W.R. Meadows, Inc., Benica, California, (714) 759-5006.
4. "Lithothane Concrete Sealer" by L.M. Scofield Company, Los Angeles, California, (213) 723-5285.

## 2.02 HARDENER

A. Wherever the Drawings indicate concrete with hardener, the surface shall be treated with a non-metallic dust-on floor hardener.

B. Acceptable products:

1. "Non-metallic Floor Hardener" by Burke Company.
2. "Mastercron" by Master Builders, Inc., Anaheim, California, (714) 978-6961.
3. "Lithochrome" by L.M. Scofield.

## 2.03 HARDENER WITH COLORS

A. Wherever the Drawings indicate colored concrete floor hardener, the surface shall be treated with a non-metallic dust-on hardener in colors selected by the Architect.

B. Acceptable products:

1. "Lithochrome Color Hardener" by L.M. Scofield Company.
2. "Colorcron" by Master Builders, Inc.

# PART 3 -- EXECUTION

## 3.01 EXAMINATION

- A. Examine the areas and conditions under which the work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

## 3.02 APPLICATION OF SEALER

A. Preparation:

1. On freshly finished concrete surfaces, no additional surface preparation is required.
2. On areas where forms are recently removed, remove all form oil and breaking compound residue to assure penetration of the product in to the pores of the material to be treated.
3. On existing concrete, vertical surfaces, and masonry surfaces:
  - a. Sweep all areas to be treated, using a fine bristle broom, or hose off with water and let dry to remove all surface dust and dirt.

- b. Free the surface from all contaminants which would inhibit penetration of the product into the pores of the material to be treated.
- c. Remove all curing, sealing, and coating agents by use of chemical or mechanical means as necessary.
- d. If acid is used to remove surface coatings, flush the surface with water sufficiently to remove all acid and acid residue.
- 4. When applying near windows, mask the glass.
- 5. Avoid contact with plant life, glass, aluminum, and other finished surfaces. Where contact occurs, immediately wipe a damp cloth or flush with water.
- 6. Avoid contact with asphaltic concrete.

**B. Application:**

- 1. On freshly finished surfaces, spray the product with a low pressure sprayer immediately following the finishing operation.
  - a. To assure proper curing, apply the product to the entire surface as soon as the surface is firm enough to walk on, and before checking and temperature cracking begins.
  - b. Keep the entire surface wet for 30 minutes by brooming excess product on to the dry spots, or by re-spraying the dry spots immediately.
  - c. As the product begins to dry into the surface and becomes slippery underfoot, lightly sprinkle the surface with water to aid penetration and to bring alkali to the surface.
  - d. As the product again begins to dry into the surface and become slippery underfoot, flush the surface with water and squeegee the surface totally dry, removing all excess product and alkali or other impurities brought to the surface.
- 2. On broom-finished surfaces, no flushing is required, but squeegee or broom the excess product from surface after 30 to 40 minutes.
- 3. On cured concrete surfaces, saturate the surface with the specified product.
  - a. If dry spots appear, broom excess material onto the dry spots or re-spray them immediately.
  - b. Keep the entire surface wet with the product for 30 minutes.
  - c. If, after 30 to 40 minutes, the majority of the product has not been absorbed into the surface, broom or squeegee the excess product from low spots and puddles so it will be absorbed into the surface, or remove such excess product from the surface.
  - d. If, after 30 to 40 minutes, the majority of the product is still on the surface, wait until the surface becomes slippery underfoot and then flush the entire surface with clear water and squeegee completely dry. If no water is available, squeegee the excess product from the surface after 30 minutes so that the surface is completely dry.

### 3.03 APPLICATION OF HARDENER

Apply the hardener after the surface of the concrete has reached the stage where no excess moisture shows, but while still plastic.

- 1. Hardener shall be applied at the rate of 40 pounds per 100 square feet of surface for the initial application.

2. Hardener shall be evenly distributed and thoroughly floated into the surface mortar with a wood float. 20 pounds of additional hardener shall be applied over each uniform color and texture.
3. All hardener and/or colored concrete floors shall be cured and protected with concrete curing paper or plastic until just prior to final cleaning.
4. Before applying curing paper or plastic, interior floors treated with colored hardener shall be given a heavy protective coat of colored wax left unpolished, and then immediately covered with the paper. If wax is not applied within two (2) hours after final troweling, the concrete shall be sprayed with a fine water mist and kept continuously moist until wax is applied, unless spraying is not recommended by the manufacturer of the hardener.
5. Cleaning and finishing: After all other work including plastering and painting has been completed, the curing paper shall be removed and waxed floors cleaned of protective wax coating. Clean all floors to remove dirt, stains or blemishes, and repair and restore damaged floors to their original condition. The hardener manufacturer's recommendations, directions, and recommended materials and methods shall be used for the protective wax coating, cleaning and finishing work.

**\*\*\*END OF SECTION\*\*\***

**SECTION 03345**  
**CONCRETE FINISHING**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 DESCRIPTION**

Work included: Provide finishes on cast-in-place concrete as called for on the Drawings, as specified herein, and as needed for a complete and proper installation.

**1.03 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Except as may be modified herein or otherwise directed by the Architect, comply with ACI 301, "Specifications for Structural Concrete for Buildings".

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.

Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

- 1. Materials list of items proposed to be provided under this Section;
- 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
- 3. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

**1.06 PRODUCT HANDLING**

Comply with pertinent provisions of Division 1.

**PART 2 -- PRODUCTS**

**2.01 MATERIALS**

- A. General:
  - 1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
  - 2. As required for the Work, provide the following materials, or equals accepted in advance by the Architect.
- B. Liquid bonding agent: "Weld-Crete," manufactured by the Larsen Products Corporation.
- C. Curing and protection paper:
  - 1. Comply with ASTM C171, Type 1, regular.



2. Accepted products:
  - a) "Sisalkraft, Seekure 896";
  - b) Equal non-staining products faced with polyethylene film.
- D. Slip-resistant abrasive aggregate:
  1. Provide aluminum oxide grains, uniformly graded, screen size 12-13, 14-36 or 16-30.
  2. Acceptable product:
    - a) Emerchrome Floor Hardener by L.M. Scofield Company.
    - b) Frictex H by Sonneborn.
    - c) or approved equal.

## 2.02 OTHER MATERIALS

Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 FINISHING OF FORMED SURFACES

- A. General:
  1. After removal of forms, give exposed concrete surfaces the finish specified below.
  2. Revise the finish as needed to secure the acceptance of the Architect.
- B. Rubbed finish:
  1. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.
  2. Do not permit cleaning as the work progresses.
  3. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
  4. Substitute white portland cement for part of the gray portland cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.
  5. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.
  6. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
  7. While the grout is still plastic, remove all excess grout by working the surfaces with a rubber float, sack, or other means.

8. After the surface whites from drying (above 30 minutes at normal temperatures), rub vigorously with clean burlap.
9. Keep the surface damp for at least 36 hours after final rubbing.

### 3.03 FINISHING SLABS

#### A. Definition of finishing tolerances:

1. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
2. "Class B": True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.

#### B. Scratched finish: For surfaces scheduled to receive bond-applied cementitious applications.

1. After the concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, roughen the surface with stiff brushes or rakes before the final set.

#### C. Floated finish: For surfaces intended to receive roofing.

1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
3. During or after the first floating, check the planeness of the surface with a ten foot straightedge applied at not less than two different angles.
4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
5. Refloat the slab immediately to a uniform sandy texture.

#### D. Troweled finish:

1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling which is relatively free from defects, but which still may show some trowel marks.
  - a. Monolithic Trowel Finish: For all floor surfaces not otherwise specified. Steel trowel and retrowel to smooth surface. After concrete has set enough to ring true, retrowel to a burnished impervious finish, free of trowel marks or other blemishes.
  - b. Steel Float Finish: for all slabs to receive resilient tile, waterproof membrane, or carpeting. Same as monolithic finish except omit burnish retroweling.
  - c. Fine Swirl Finish (when shown on the Drawings): Prepare same as steel float finish. When ready, perform such finishing operations as necessary to produce Architect-selected fine textured, non-slip finish. Construct sample panel for Architect's acceptance prior to placement. Sample panel shall consist of tooled edges and have a tooled joint within field of panel.
2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.

#### E. Broom finish: For slabs to receive thin set tiles, apply steel float finish followed by very fine broom finish. For surfaces to receive mortar setting beds and for exterior concrete driveway ramps, curbs and gutters, spandrels, etc.

1. Provide a finished surface uniform in texture and appearance, and in a plane of Class A tolerance. Roughen surface with coarse broom.
- F. Rock Salt finish: Exterior walkways and pavings except where non-slip finish is specified.
1. Provide a floated finish as described above.
  2. While the surface is still plastic, broadcast rock salt into the surface and embed uniformly into the surface by light tamping.
  3. Float the surface until it has been brought to a true plane with Class B tolerance.
  4. After the concrete has completely set, flood the surface with water to dissolve the rock salt, using a fine bristle brush as necessary to remove the salt.
  5. Provide a sample panel at the site of the proposed finish and receive the acceptance of the Architect of that finish prior to placing of the paving.
- G. Non-slip finish: For exterior platforms, steps, and landings; and Interior and exterior pedestrian ramps.
1. Provide a floated finish as described above.
  2. While the surface is still plastic, broadcast abrasive aggregate as specified in Paragraph 2.01.F above and work into the surface according to the manufacturer's recommendations.
  3. Complete finishing surface as described above for a troweled finish, and as recommended by the aggregate manufacturer.

#### 3.04 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Preservation of moisture:
1. Unless otherwise directed by the Architect, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.
    - a. Ponding or continuous sprinkling;
    - b. Application of absorptive mats or fabric kept continuously wet;
    - c. Application of sand kept continuously wet;
    - d. Continuous application of steam (not exceeding 150° F) or mist spray;
    - e. Application of waterproof sheet materials specified in Part 2 of this Section;
    - f. Application of other moisture-retaining covering as accepted by the Architect.
    - g. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
  2. Cure concrete by preserving moisture as specified above for at least ten days.
- C. Temperature, wind, and humidity:
1. Cold weather:
    - a) When the mean daily temperature outdoors is less than 40° F, maintain the temperature of the concrete between 50° F and 70° F for the required curing period.

- b) When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
  - c) Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
- 2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
  - 3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5° F in any one hour period, or 50° F in any 24 hour period.
- D. Protection from mechanical injury:
- During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
- 1. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.
  - 2. Do not load self-supporting structures in such a way as to over stress the concrete.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 04100**  
**MORTAR AND GROUT**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. The requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

- A. Provide all materials, labor and accessories as required and specified for complete mortar and grout installation in masonry walls.

**1.4 QUALITY ASSURANCE**

A. Standards and References: (Latest Edition unless otherwise noted)

1. ASTM C144, Aggregate for Masonry Mortar.
2. ASTM C150, Portland Cement.
3. ASTM C207, Hydrated Lime for Masonry Purposes
4. ASTM C270, Standard Specification for Mortar for Unit Masonry
5. ASTM C404, Aggregates for Grout
6. ASTM C476, Standard Specification for Grout for Masonry
7. ASTM C1019, Method of Sampling and Testing Grout
8. CBC Section 2103
9. 2007 California Building (CBC)
10. Masonry Standards Joint Committee (MSJC)

B. Tests and Inspections:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. All tests and inspections herein are to be performed by an independent testing laboratory approved by the building official.
3. Mortar and Grout Tests: If mortar and grout tests are indicated as required on the Structural drawings, at the beginning of Masonry Work, at least 1 test sample each of mortar and grout shall be taken on 3 successive working days, then once per week with at least one sample taken for each 5000 square feet of wall area, or fraction thereof.
  - a. Test specimens shall be made in accordance with ASTM C1019 for grout and ASTM C780 for mortar.
  - b. Test specimens shall be continuously stored in moist air until tested.
  - c. Mortar shall show a compressive strength of not less than 1800 psi at 28 days. Grout shall show a compressive strength of not less than 2000 psi at 28 days.
4. If masonry placement and grouting inspection is indicated as required on the Structural Drawings, a special inspector shall be employed per CBC Section 1704 during the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.

C. Submittals:

1. Mix design for mortar and grout shall be submitted for review.
2. Supplier's certificates indicating materials comply with the specifications below. They shall include but are not necessarily limited to:
  - a. Aggregates
  - b. Cement

c. Admixtures

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cement: ASTM C 150, Type I or II, low alkali; natural gray.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Quicklime: ASTM C 5.
- D. Lime Putty: Made from hydrated lime or quicklime.
  - 1. If made from quicklime, other than processed pulverized quicklime, slake lime and then screen through a No. 16 mesh sieve. Before using, store and protect slaked and screened lime putty for not less than 10 days.
  - 2. Processed pulverized quicklime shall be slaked for not less than 48 hours, and shall be cool when used.
  - 3. Lime putty prepared from hydrated lime may be used immediately after mixing.
  - 4. Lime putty prepared from quicklime or pulverized quicklime shall have a plasticity figure, after slaking and screening, of not less than 200, and shall weigh not less than 83 lbs. per cubic foot. Lime putty prepared from hydrated lime shall conform to ASTM C 207, Type S.
- E. Aggregate:
  - 1. For Mortar: ASTM C144.
  - 2. For Grout: ASTM C404.
- F. Admixture: "Sika Grout Aid"
- G. Water: Suitable for domestic consumption.

2.2 MORTAR

- A. Mortar shall be Type S having a 28 day compressive strength of not less than 1800 psi, and shall conform to CBC Section 2103.
- B. Mortar shall be made with admixtures that are proportioned, added and mixed in strict accordance with manufacturer's directions.
- C. Mortar mix shall be proportioned by volume; one part portland cement, not less than 1/4 part nor more than 1/2 part lime putty, and sand totaling not less than 2-1/4 nor more than 3 times sum of volumes of cement and lime used.
  - 1. Total clay content shall not exceed 2% of sand content or 6% of cement content.

2.3 GROUT

- A. Grout shall have a 28-day compressive strength of not less than 2000 psi. Proportion by volume, and with sufficient water to produce consistency for pouring without segregation so that grout will flow into masonry joints. Grout shall conform to CBC Section 2103.
- B. Fine Grout: 1 part portland cement, to which may be added not more than 1/10 part lime putty, and 3 parts sand.
  - 1. Fine grout shall be used for all grout spaces less than 3" wide.

- C. Coarse Grout: 1 part portland cement, to which may be added not more than 1/10 part lime putty, 3 parts sand and not less than 1 part nor more than 2 parts pea gravel (3/8" maximum aggregate size).
  - 1. Coarse grout shall be used in grout spaces 3" wide or more.
- D. Add "Sika Grout Aid" admixture to grout at the rate of 1 pound per 100 pounds cementitious material.

## PART 3 - EXECUTION

### 3.1 MIXING MORTAR AND GROUT

- A. Accurately measure materials in suitably calibrated devices; shovel measurements are not acceptable. Each 94lb. sack of portland cement will be considered as 1 cubic foot.
- B. Place sand, cement and water in mixer in that order and mix for at least 2 minutes; then add lime putty and continue mixing as long as necessary to secure a uniform mass, but in no case less than 10 minutes.
- C. Use mixers of at least 1 sack capacity; batches requiring fractional sacks will not be permitted unless cement is weighed for each batch.

### 3.2 GROUTING PROCEDURES

- A. Specified under Sections 04220.

### 3.3 RETEMPERING

- A. When necessary to retemper mortar, add water and remix; retempering by dashing water over mortar will not be permitted.
- B. Any mortar which is unused within 30 minutes after initial mixing and any mortar that has begun to set shall not be used.

### 3.4 DEFECTIVE MORTAR OR GROUT

- A. Should the strength of mortar or grout fall below that specified, remainder of Work shall be adjusted to reach required strength. Work in place representing inferior grout and mortar and indicating a strength less than the minimum specified shall be tested by taking and testing core samples. Number and location of cores shall be determined by Structural Engineer.
- B. Should compression tests of cores fail to meet required strength, masonry shall be deemed to be defective and shall be removed and replaced at no cost to Owner.
- C. Costs relative to taking and testing of core samples shall be paid by Owner and will be deducted from Contract Amount. Cost of patching core holes shall be borne by Contractor.

**\*\*\*END OF SECTION\*\*\***



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**SECTION 04200**  
**CONCRETE UNIT MASONRY**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A The requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

- A. Furnish and install all concrete unit masonry, reinforcement, and all required accessories and materials as shown on the Drawings and specified here.
1. Cooperate with other trades for embedded items, furnished under those sections and installed here.
  2. Supervise setting of dowels for masonry furnished and installed under Section 03210, Reinforcing Steel.

**1.3 QUALITY ASSURANCE**

- A. Allowable Tolerances: Maximum deviation from indicated line or plane of installed concrete masonry units shall not exceed 1/8 inch in 10 feet in any direction.
- B. Standards and References: (Latest Edition unless otherwise noted):
1. 2007 California Building Code (CBC)
  2. ASTM C90 - Hollow and Solid Load Bearing Concrete Masonry Units
  3. ASTM C140 - Sampling and Testing of Concrete Masonry Units
  4. ASTM C426 - Standard Test Method for Drying Shrinkage Concrete Block.
  5. CBC Section 2103.1.
  6. Concrete Masonry Design Manual published for the Concrete Masonry Association of California and Nevada, current Edition.
  7. Masonry Standards Joint Committee (MSJC)
- C. Submittals: In accordance with Article 5 of the General Conditions:
1. Suppliers certificate indicating units comply with material standards indicated below:
  2. See Section 03210 for reinforcing steel submittals.
- D. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. All tests and inspections herein are to be performed by an independent testing laboratory approved by the Building Official.
  3. If masonry tests are indicated as required on the structural drawings, three sample units will be tested during construction for each 5,000 square feet of wall area. Test also three sample units prior to construction.
    - a. Units will be tested for compressive strength on both the net and gross area per ASTM C140.
    - b. Units will be tested for linear drying shrinkage per ASTM C426.
  4. If masonry placement and grouting inspection is indicated as required on the structural drawings, a special inspector shall be employed per CBC Section 1704 to inspect the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.
  5. See Section 03210 for reinforcing steel tests and inspections.

#### 1.4 PRODUCT HANDLING

- A. Scaffolding, runways and ladders required for work under this Section shall be provided by masonry contractor, and shall be heavy trades type substantially built and in compliance with State labor laws, safety codes and other regulatory agencies as applicable to this project.
- B. Environmental Requirements: Install concrete unit masonry when temperature in area surrounding work is 40° F or above. Maintain temperature of work above 40° F for at least 48 hours after installation. Grout shall not be placed when air temperatures fall below 20° F.
- C. Store masonry units off the ground in a dry location, covered and protected from absorbing moisture.

### PART 2 - PRODUCTS

#### 2.1 MASONRY UNITS

- A. Masonry units shall be hollow load bearing masonry units conforming to ASTM C90 and CBC Section 2103.1.
  - 1. Weight: Light weight.
  - 2. Maximum lineal shrinkage from saturated to oven dry condition of not more than 0.065 percent.
  - 3. Twenty-eight day compressive strength of 1000 psi on gross area and 1900 psi on net area.
  - 4. Moisture controlled units.
- B. Unit Type
  - 1. 8" wide by 8" high x 16" long unless specified otherwise.
- C. Provide bond beam units, open end units and other special units as indicated. Use open end units at cells containing vertical reinforcement wherever possible.

#### 2.2 MORTAR AND GROUT

- A. Specified under Section 04100.

#### 2.3 ACCESSORY MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 40 or 60, as indicated in Section 03210, deformed bars.
  - 1. Tie Wire: Black annealed steel wire not lighter than 16 gage.
- B. Provide spacers to firmly hold reinforcement in place.
- C. Anchor Bolts: All anchor bolts cast in masonry shall be headed bolts with cut threads conforming to ASTM A307 or ASTM A36 or ASTM A572.50 as indicated on drawings.
- D. Expansion Anchors: All expansion bolts installed in masonry shall be Hilti Kwik Bolt 3 as manufactured by Hilti Inc. See Structural Drawings for installation requirements and tension testing requirements as applicable. See Drawings for special head requirements as needed. Substitution of other brands or anchors shall proceed only after written approval from the Structural Engineer and the Building Official as been obtained.

#### 2.4 JOINTS

- A. All joints shall be 3/8" thick joints for concrete block, Tool exposed interior and exterior joints and concealed exterior joints to produce a dense slightly concave surface that is well bonded

to unit at edges. Tool joints behind room base, switches, and outlet plates to produce a smooth dense joint flush with the face of adjacent masonry units, where occurring on the job. Cut joints flush on concealed interior surfaces and surfaces to be plastered.

## 2.5 SEALER

- A. Contractor shall provide and install minimum two coats, Thoroseal masonry sealer at all CMU walls. Thoroseal product shall meet all state vapor requirements. Sealer shall be clear and non-gloss product.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive masonry and verify following:
  - 1. That foundation surface is level to permit bed joint with range of 1/4 to 3/4 inch.
  - 2. That edge is true to line to permit projection of masonry to less than 1/4-inch.
  - 3. That projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.
- B. Do not begin work before unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean concrete surfaces to receive masonry. Remove latence or other foreign material lodged in surfaces by sandblasting or other means as required. Joints between concrete and masonry shall be considered construction joints. See Concrete specifications.
- B. Ensure masonry units are clean and free from dust, dirt, or other foreign materials before laying.
- C. Establish lines, levels, and coursing. Protect from disturbances.
- D. Provide temporary bracing during erection of masonry work. Maintain in place until masonry has set to provide permanent bracing.

### 3.3 COURSING

- A. Erect masonry in accordance with CBC Section 2104.1.2.
- B. Place masonry to lines and levels indicated to the following tolerances:
  - 1. Variation from Unit to Adjacent Unit: 1/32-inch max.
  - 2. Variation from Plane of Wall: 1/4-inch in 10 feet.
  - 3. Variation from Plumb: 1/4-inch.
  - 4. Variation from Level Coursing: 1/8-inch in 3 feet; 1/4-inch in 10 feet; 1/2-inch maximum.
  - 5. Variation of Joint Thickness: 1/8-inch in 3 feet.
- C. Bond: Unless noted otherwise in Drawings, lay concrete masonry units in running bond with vertical joints located over score of unit in course below (and vice versa).
- D. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- E. Preserve the vertical continuity of cells in concrete unit masonry. The minimum clear horizontal dimensions of vertical cores shall be 3 x 3 inches for 8-inch wide block.

### 3.4 PLACING AND BONDING

- A. Do not install cracked, broken or chipped masonry units.
- B. Lay only dry concrete masonry units.
- C. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
  - 1. Block Cap: Lay with full mortar coverage on horizontal and vertical joints.
  - 2. Install grout cap where and as indicated.
- D. Fully bond intersections and external and internal corners.
- E. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- F. Remove excess mortar.
- G. Perform job-site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- H. Step back unfinished work for joining with new work. Do not use toothing.

### 3.5 JOINTS

- A. Horizontal and vertical joints at masonry units shall be 3/8-inch wide and as follows:
  - 1. Point joint tight in unpurged masonry below ground.
  - 2. All end joints shall be fully filled with mortar and joints squeezed in bed joints shall be held back approximately 1/2-inch from cell to provide positive bond with grout.
  - 3. Joints shall be struck flush at all areas to receive plaster finish.

### 3.6 MASONRY REINFORCEMENT

- A. Place reinforcement in accordance with ACI 315, to a tolerance of +/- 1/2-inch from specified location.
- B. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars for bending will not be permitted.
  - 1. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on drawings and with hooks and beds made as detailed. Bars shall be placed as indicated on the drawings and centered on grout space.
  - 2. At the time grout is place around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.
  - 3. All vertical reinforcing steel shall be installed in one piece, full height of wall, and braced throughout its height in a manner that will retain the steel in proper position and provide the proper clearance.
- C. Reinforcing steel shall be secured to all foundation dowels and held in place at spacings not to exceed 192 bar diameters.

### 3.7 GROUTING

- A. General Requirements:
  - 1. All cells shall be grouted solid.
  - 2. Use low lift or high lift grouting at Contractor's option.

3. Use grout pump, hopper or bucket to place grout.
4. Place grout in final position within 1-1/2 hours after introduction of mixing water.
5. Place grout and rod with a 3/4-inch flexible cable vibrator sufficiently to case it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
6. Stop grout approximately 1½ inches below top of last course; except at top course bring grout to top of wall.

B. Low Lift Grouting:

1. Do not lay units higher than 48 inches before grouting.
2. If mortar has been allowed to set prior to grouting, remove all fins protruding more than ½-inch into grout space.
3. Conform to requirements of CBC Section 2104.6.1.1.2.
4. Consolidate each lift twice. Once while placing grout and once more after initial absorption of water but before set.

C. High Lift Grouting:

1. Conform to requirements of CBC Section 2104.6.1.1.3.
2. Lay up walls, subject to maximum height limitations of Masonry Standards Joint Committee, Building Code Requirements for Masonry Structures Table 1.16.1.
3. Provide clean out holes at the bottom of every pour in cells containing vertical reinforcement. Construct clean out courses with open-bottom bond beam units inverted to permit cleaning of all cells by flushing. Cleanouts shall be not less than 3x4inch openings cut from one face shell. Do not plug clean out holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected.
4. Clean mortar droppings from the bottom of the grout space and from reinforcing steel. Remove mortar fins protruding more than ½-inch into the grout space by dislodging the projections with a rod or stick as the work progresses or by washing the grout space at least twice a day during erection using a high pressure stream of water.
5. Do not place grout in hollow unit masonry until mortar joints have set for at least 72 hours and clean out plugs have cured 48 hours.
6. Place grout in lifts not to exceed 4 feet in height, with a waiting period between lifts, dependent on weather and absorption rate of the masonry, in order to place the succeeding lift after the preceding lift becomes plastic but prior to initial set. The first lift shall be consolidated using mechanical vibrators. After the required waiting period, place the second lift and consolidate with the vibrator, reconsolidating the lift below to a depth of 12 to 18 inches. Repeat the waiting, placing and consolidating process until the top of the grout pour is reached. Reconsolidate the top lift after the required waiting period. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top of a pour in one working day unless a new series of clean out holes is established and the resulting horizontal construction joint cleaned.

### 3.8 WEATHER PROVISIONS FOR CONSTRUCTION

- A. Cold Weather Construction to be in accordance with CBC section 2104.3.
- B. Hot Weather Construction to be in accordance with CBC section 2104.4

### 3.9 EXPANSION JOINTS

- A. See drawings for type and location of expansion joints.

### 3.10 BOND BEAMS

- A. Bond beams shall be located where shown and detailed on the drawings, and shall be reinforced as indicated and as herein after specified.

### 3.11 BUILT-IN WORK

- A. Miscellaneous Embedded Items: All items indicated to be embedded in masonry shall be carefully located and anchored to prevent movement during grouting operations. Avoid cutting and patching.
  - 1. Install all anchor bolts and anchors furnished under other sections for wood nailers, ledgers, etc.

### 3.12 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

### 3.13 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damage, or if units do not match adjoining units.
- B. Pointing: During the tooling of joints, enlarge any voids or holes and completely fill with mortar.
- C. Dry brush masonry surface after mortar has set, at each day's work and after final pointing.
- D. Leave work and surrounding surface clean and free of mortar spots and droppings.
- E. Cleaning: Upon completion of masonry installation, repair all holes. Defective joints shall be cut out and rejointed. Exposed masonry surfaces shall be cleaned free of mortar, green stain and efflorescence.

### 3.14 SEALER

- A. Contractor shall install sealer as directed by the manufacturer. Coverage and installation rates shall be as per manufacturer's recommendations. Install sealer in minimum two coats at the rates required.

### 3.15 DEFECTIVE MASONRY

- A. Materials or workmanship not conforming to appearance or strength specified, will be deemed defective and shall be removed and replaced at no cost to Owner.
- B. Defective mortar and grout, as defined under Section 04100; "Mortar and Grout" shall constitute defective masonry.

\*\*\*END OF SECTION\*\*\*

**SECTION 04270**  
**GLASS MASONRY UNIT SYSTEM**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

- A. Division 0, contract requirements and Division 1, General Conditions apply to this section.
- B. The work under this section includes furnishing all labor, materials and equipment, and performing all operations in connection with all masonry work, concrete block and glass block, indicated on the Drawings, specified herein, or reasonably required to complete all masonry work. Coordinate with other trades and install all embeds and inserts required.
- C. Pittsburgh Corning Blocks with (45, 60 or 90) minute listed U.L. fire rating, as indicated on the drawings
- D. Integral joint reinforcing.
- E. Mortars and sealants.

**1.02 REFERENCES**

- A. ASTM A153 - Class B-2, Spec. Zinc Coating (Hot dip) on iron and steel hardware (Canada same)
- B. ASTM C144, for Aggregate for Masonry (Canada - A179-94)
- C. ASTM C150, for Portland Cement (Canada - CAN/CSA - A5-93)
- D. ASTM E163, Fire Test of Window Assemblies (equivalent to UL® 9 and CAN 4-S106-M80)
- E. ASTM C207, for Hydrated Lime for Masonry Purposes (Canada same)
- F. ASTM C270, for Mortar for Unit Masonry (Canada - A179-94)

**1.03 SYSTEM DESCRIPTION**

Knowledge of the following basic information is essential for proper installation of Block units:

- 1. Glass block panels shall not be designed to support structural loads.
- 2. Maximum deflection of structural members supporting glass block panels shall not exceed L/600.
- 3. Sills of all panels must be painted with a heavy coat of asphalt emulsion and must dry for two hours before first mortar bed is placed.
- 4. Provision for expansion and movement must be made at jambs and heads of all panels. Mortar must not bridge expansion spaces.
- 5. Mortar should be mixed and applied in accordance with the recommendations of Pittsburgh Corning Corporation. See Materials

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product Data
  - 1. Submit two (2) copies of manufacturer's literature and two (2) copies of manufacturer's installation instructions.



C. Samples

1. Submit two (2) glass block units of each type specified showing size, color, design and pattern of faces.
2. Submit representative samples of (panel reinforcing), (panel anchors), (expansion strips), and (sealant).
3. Test Reports:
  - A. Fire Tests: Submit documents verifying glass block units are classified for a 3/4, 1 or 1-1/2-hour fire exposure according to ASTM E163, Underwriters Laboratories of Canada File CR1715 or UL® 9 Fire Tests of Window Assemblies. All such glass block unit cartons shall carry appropriate UL® labels.

1.06 STORAGE AND PROTECTION

- A. Store unopened cartons of glass block in a clean, cool, dry area.
- B. Protect opened cartons of glass block against windblown rain or water run-off with tarpaulins or plastic covering.

1.07 PROJECT/SITE CONDITIONS

Do not install glass block units when temperature is 40°F (4°C) and falling. Maintain the temperature of glass unit masonry above 40°F (4°C) for the first 48 hours after construction.

1.08 WARRANTY

Pittsburgh Corning Corporation offers a limited 5-year warranty on Pittsburgh Corning Glass Block units. See warranty statement.

**PART 2 -- PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

The drawings and specifications are based on catalog data, specifications and products of Pittsburgh Corning Corporation and designate the type and quality of work intended under this section.

1. Products of other manufacturers proposed as equivalent quality must be submitted through the bidding contractors for written approval of the architect ten days prior to the bid date.
2. Supporting technical data, samples, published specifications and the like must be submitted for comparison.
3. Contractor shall warrant that proposed substitutions, if accepted, will provide performance equivalent to the materials specified herein.
4. These specifications have been developed by Pittsburgh Corning Corporation based on extensive tests of panels composed of Pittsburgh Corning Glass Block masonry units manufactured by Pittsburgh Corning Corporation. These specifications do not apply to panels made from glass block masonry units produced by any other manufacturer.

2.02 GLASS BLOCK UNITS

- A. Size: As indicated on drawings.
- B. Color: As indicated on drawings.
- C. Pattern: As indicated on drawings.

- D. Edge Coating: polyvinyl butyral edge coating for better bonding and to provide for an expansion/contraction mechanism for each block.

## 2.03 ACCESSORIES

- A. Panel Reinforcing: two parallel 9-gauge wires either 1-5/8 inch or 2 inch on center with electrically butt-welded cross-wires spaced at regular intervals, galvanized after welding, by Pittsburgh Corning Corporation.
- B. Panel Anchors: 20-gauge perforated steel strips 24 inches long by 1-3/4 inches wide, hot-dipped galvanized after perforation, by Pittsburgh Corning Corporation.
- C. Expansion Strips: made of polyethylene foam with a thickness of 3/8 inch, by Pittsburgh Corning Corporation.
- D. Asphalt Emulsion: a water-based asphalt emulsion, by Karnak Chemical Corp. (Karnak 100, 1-800-526-4236), or equal.
- E. Sealant: non-staining, waterproof mastic, silicone.
- F. Backer Rods: polyethylene foam, neoprene, fibrous glass or equal as approved by sealant manufacturer.

## 2.04 MORTAR MATERIALS

Mortar: Type S in accordance with ASTM C270. Mortar shall be 1 part Portland cement, 1/2 part lime, and sand equal to 2-1/4 to 3 times the amount of cementitious material (cement plus lime), all measures by volume. (For exterior glass block panels, an integral type waterproofer should be added to the mortar mix.) No antifreeze compounds or accelerators allowed

- 1. Portland Cement: Type 1 in accordance with ASTM C150. If a waterproof Portland cement is used, the integral type waterproofer shall be omitted. (Masonry Cement is not recommended.) Architect shall select color.
- 2. Lime: Type S, in accordance with ASTM C207. Shall be a high-calcium lime, or a pressure-hydrated dolomitic lime, provided that not less than 92% of all the active ingredients are completely hydrated.
- 3. Sand: A clean, white quartzite or silica type, essentially free of iron compounds, for thin joints, in accordance with ASTM C144, not less than 100% passing a No. 8 sieve.
- 4. Integral Type Water repellent: Stearate type by Sonneborn Building Products (Hydrocide Powder, 800-243-6739), or equal. Note: Add hydrocide powder to dry mortar mix. Do not add powder to wet mortar mix.
- 5. External Type Waterproofer: Water based silane sealer type by Harris Specialty Chemicals, Inc. (ENVIROSEAL 20, 800-327-1570). Note: Remove excess sealer from glass surfaces soon after application.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 PREPARATION

- A. Verify that (channels) or (panel anchors) have been provided at head and jambs for the purpose of providing panel support within the opening.
- B. Mix all mortar components to a consistency that is drier than mortar for ordinary masonry. Retempering the mortar after it has taken its initial set shall not be permitted. Do not use antifreeze compounds or accelerators.
- C. Freshly mixed mortar may create skin irritation. Avoid direct contact where possible and wash exposed skin areas promptly with water. If any mortar gets into the eyes, rinse immediately with water and get prompt medical attention.

### 3.03 INSTALLATION

- A. Cover sill area with a heavy coat of asphalt emulsion. Allow emulsion to dry at least 2 hours before placing mortar.
- B. Adhere expansion strips to jambs and head. Make certain expansion strip extends to sill.
- C. Set a full mortar bed joint, applied to sill.
- D. Set lower course of block. Maintain a uniform joint width of 1/4 to 3/8 inch plus or minus 1/8 inch. All mortar joints must be full and not furrowed. Steel tools must not be used to tap block into position. (Place a rubber crutch tip on end of trowel to tap block into position.) Do not realign, tap, or otherwise move block after initial placement.
  - 1. For VISTABRIK® solid glass block, typical mortar joint is 3/8 inch. It may be necessary to use wedges in the mortar joints of the lower courses to prevent the mortar from being "squeezed" out.
- E. Install panel reinforcing every 16 inches o.c. maximum in the horizontal mortar joint, and in joints immediately above and below all openings within panels. Where panel anchors are used at jambs and heads, in lieu of channel or chase surrounds, install panel anchors in the same joints (16 inches o.c. maximum) as the panel reinforcing. EXCEPT THAT, at panel corners, anchors shall be placed in each mortar joint, both at the jamb and head, 24 inches on each side of the corner. Install panel anchors across head joint spaced 16 inches o.c. maximum. Run reinforcing continuously from end to end of panels. Lap reinforcing not less than 6 inches whenever it is necessary to use more than one length. For VISTABRIK® solid glass block, use 1-5/8" wide reinforcing (same as THINLINE Series block). Do not bridge expansion joints with reinforcing.
  - 1. Install reinforcing as follows:
  - 2. Place lower half of mortar in bed joint. Do not furrow.
  - 3. Press panel reinforcing into place.
  - 4. Cover panel reinforcing with upper half of mortar bed and trowel smooth. Do not furrow.
- F. Place full mortar bed for joints not requiring panel reinforcing - do not furrow. Maintain uniform joint width.
- G. Set succeeding courses of block. Space at head of panel and jambs must remain free of mortar for caulking with sealant.
- H. Use only wooden or rubber tipped tools when tapping glass blocks in place.
- I. Strike joints smooth while mortar is still plastic and before final set. Remove surplus mortar from faces of glass blocks and wipe dry. Tool joints smooth and concave before mortar takes final set. (Remove wedges from lower courses of VISTABRIK® solid glass blocks and point the voids with mortar.) At this time remove and clean out all excess mortar from jamb, head and other expansion joint locations.

- J. After final mortar set (approximately 24 hours), install packing tightly between glass block panel and jamb and head locations. Leave space for sealing.
- K. Apply sealant evenly to the full depth of recesses as indicated on the drawings and in accordance with the manufacturer's application manual and instructions.
- L. All exterior glass block panels shall be well sealed to prevent water entry.

#### 3.04 CLEANING

- A. Remove surplus mortar from the faces of the glass block at the time joints are struck or tooled. Mortar should be removed while it is still plastic using a clean, wet sponge or an ordinary household scrub brush having stiff bristles.
- B. Do not use harsh cleaners, acids (of any strengths), abrasives or alkaline materials while cleaning glass block. Never use steel wool or wire brush to remove mortar from glass block surfaces.
- C. Final mortar removal is accomplished with a clean, wet sponge or cloth. Rinse sponge or cloth frequently in clean water to remove abrasive particles that could scratch glass surfaces. Allow any remaining film on the block to dry to a powder.
- D. After all organic sealants, caulking, etc., have been applied, remove excess caulking materials with commercial solvents such as xylene, toluene, mineral spirits or naphtha and follow with normal wash and rinse. Be careful not to damage caulking by over-generous application of strong solvents. Comply with solvent manufacturer's directions on label for toxicity and flammability warnings.
- E. Final cleaning of glass block panels is accomplished after they are completely installed. Wait until panels are not exposed to direct sunlight. Start at the top of the panel and wash with generous amounts of clean water. Dry all water from the glass block surface. Change cloth frequently to eliminate dried mortar particles or aggregate that could scratch the glass surface. To remove the dry powder from the glass surfaces, use a clean, dry, soft cloth. For stubborn or hard to remove powder or stains, the use of an "extra fine" steel wool (grades 000 or 0000) is suggested. Try this first in an unobtrusive area.

**\*\*\* END OF SECTION \*\*\***

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**SECTION 05120**  
**STRUCTURAL STEEL**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 DESCRIPTION**

The work under this section includes furnishing all labor, materials and equipment, and performing all operations in connection with Structural and Miscellaneous Steel and related items indicated on the Drawings, specified herein or reasonably implied to complete the work.

1. Structural Steel framing members, support members, embed angles, and struts.
2. Base plates, anchor bolts and structural framing accessories for a complete and proper installation of the work.

**1.03 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures." Conform to AWS Code D1.1-85. Welding Inspection:
  1. It shall be the responsibility of the Contractor that the Architect be notified of the commencement of welding, shop or field, in ample time to provide inspection.
  2. A representative of the Owner will inspect installation of Automatic end and welded studs. At the beginning of each day's work, a minimum of two test stud welds shall be made with the equipment to be used to metal, which is the same as the actual work piece. The test studs shall be subjected to a 90-degree bend test by striking them with a hammer. After the above test, the weld section shall not exhibit any tearing out or cracking.
- C. The American Institute of Steel Construction (AISC) "Manual of Steel Construction" shall apply in the performance of this work, except for clauses contradicted by the General and special Conditions and this section of the Specifications.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  1. Producers' or manufacturers specifications and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with the specified requirements.
    - a. Structural steel, including certified copies of mill test reports covering chemical and physical properties;
    - b. Unfinished bolts and nuts;
    - c. Structural steel primer paint.

2. Shop Drawings including complete details and schedules for fabrication and shop assembly of members. Shop Drawings shall be generally in accordance with AISC "Structural Steel Detailing"
  - a. Include details of cuts, connections, camber, holes, and other pertinent data;
  - b. Indicate welds by AWS symbols, and show size, type, and length of weld;
  - c. Provide setting drawings, templates, and directions for installing anchor bolts and other required anchors;
  - d. Identify details by reference to sheet and detail number of the Drawings.

#### 1.06 PRODUCT HANDLING

- A. All material shall be handled, shipped, and stored in a manner that will prevent distortion or other damage. Material shall be stored off of the ground, in a clean location and kept properly drained. All damaged material shall be replaced or repaired as directed by the Architect.
- B. Delivery and storage:
  1. Delivery materials to the job site properly marked to identify the location for which they are intended.
  2. Use markings corresponding to markings shown on the approved Shop Drawings.
  3. Store in a manner to maintain identification and to prevent damage.

### PART 2 -- PRODUCTS

#### 2.01 MATERIALS

- A. Rolled steel plates and bars: Comply with ASTM A36.
  1. Girder and beam sections and beam cover plates.
  2. All other bars, plates and shapes.
- B. Steel Tube: Comply with ASTM A500, grade B. 46 ksi
- C. Anchor bolts: Comply with ASTM A307, non-headed type with double hexagonal nuts unless otherwise indicated.
- D. Unfinished threaded fasteners:
  1. Comply with ASTM A307, grade A, regular low carbon steel bolts and nuts.
  2. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.
  3. High strength bolts: ASTM A-325
- E. Primer: Use "10-99 Tnemec Primer," "Rustoleum No. 5769 Primer," or equal approved in advance by the Architect.
- F. Anchor bolt templates: Provide separate steel templates not less than 10 gage for each anchor bolt group or assembly.
- G. Electrodes for welding: Comply with AWS Code, using AWS A5.1 or A5.5 E70XX electrodes as required for intended use.
- H. Welding rod for mild steel: ASTM A-233

- I. Resistance welded studs shall be as manufactured by Nelson Stud Welding Division of Gregory Industries or by KSM Products, Inc.

## 2.02 FABRICATION

A. Shop fabrication and assembly:

1. Fabricate items of structural steel in accordance with AISC specifications: "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", latest edition, and as indicated on the approved Shop Drawings.
2. Properly mark and match-mark materials for field assembly and for identifications as to location for which intended.
3. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
4. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations.
5. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.

B. Connections:

1. Provide bolts and washers of types and sizes required for completion of field erection.
2. Welded construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welded work.
3. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

C. Experienced welding operators shall do welding. The operator, the welding equipment, the electrodes, the methods of making the welds, and all structural welds, as completed, shall be as approved by the representative of the approved Testing Laboratory.

D. Resistance welded studs shall be installed with special approved welding equipment, in accordance with stud manufacturer's recommendations.

E. Shop welds shall in general be made with the material to be welded positioned for down-hand welding. Root passes of all "U" or "V" joints for butt welds by manual process shall be made with #6010 rod; roots of butt welds shall be chipped or flame-gouged prior to deposition of seal weld or of initial pass of back-up weld.

F. Anchors. Welding rod for welded bar anchors shall be E 70 Series low hydrogen.

G. Exposed Welds. Welds that will be exposed to view, after building is completed, shall be neatly dressed off smooth, flush with the parent metal.

H. Holes for other work:

1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved Shop Drawings.
2. Provide threaded nuts welded to framing, and other specialty items as shown, to receive other work.
3. Cut, drill, or punch holes perpendicular to metal surfaces.
4. Do not flame cut holes or enlarge holes by burning.
5. Drill holes in bearing plates.

## 2.03 SHOP PAINTING



- A. General:
  - 1. Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar.
  - 2. Paint embedded steel that is partially exposed on the exposed portions, and the initial 2" of embedded areas only.
  - 3. Do not paint surfaces that are to be welded or high-strength bolted with friction type connections.
  - 4. Apply two coats of paint to surfaces that are inaccessible after assembly or erection. Change color of the second coat to distinguish it from the first.
- B. Surface preparation:
  - 1. After inspection and before shipping, clean steel work to be painted.
  - 2. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits.
  - 3. Clean steel in accordance with Steel Structures Painting Council SP-3k, "Power Tool Cleaning."
- C. Painting:
  - 1. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's recommendations and at a rate to provide a uniform dry film thickness.
  - 2. Use painting methods that will result in full coverage of joints, corners, edges, and exposed surfaces.

#### 2.04 GALVANIZING

- A. All steel and ferrous metal items located on the exterior of the building, or otherwise specifically shown or noted on drawings to be galvanized, shall be galvanized by the hot-dip process, conforming to ASTM A123-68a. All required hot-dip galvanizing shall be done after fabrication, in the largest sections possible. Items too large for available dip tanks shall be sprayed, by approved methods, with molten zinc to coating thickness of .003" to .004".
- B. Weight of the zinc coating per square foot of actual surface shall average not less than 2.0 ounces and no individual specimen shall show less than 1.8 ounces. The thickness of the zinc coating shall be the normal coating to be obtained by immersion in a bath of molten zinc at a temperature of not more than 865 degrees F., and allowed to remain until the temperature of the work being galvanized becomes the same as the bath.
- C. All shop galvanized metal work necessitating field soldering or welding which in any manner removes original galvanizing shall be restored by field cold galvanizing with "Galvaloy," "Galvicon," or "Drygalv."
- D. After fabrication, work indicated on the Drawings to be galvanized shall be thoroughly cleaned in a pressure spray of hot alkali solution to remove all oil, grease and dirt, and then rinsed in hot water. Work shall then be hot-dip galvanized. Finish work shall be free from twist, bow, warp and excess spelter.
- E. Spelter: The slab zinc (spelter) used shall conform to the standard specification for slab zinc of the American Society for Testing Materials.

### PART 3 -- EXECUTION

#### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.

- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 INSTALLATION

- A. All work shall be executed and finished in accordance with approved shop drawings, and to conform to the best practice required to produce the highest-grade construction. Workmanship shall be equal to the best practice in modern structural shops. Portions of work exposed to view shall be finished neatly. Welds shall be neat and uniform.
- B. Construction. Type I and Type II, in accordance with Section 1 of the AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
- C. Substitution of sections or modifications of details, or both, shall not be made without written approval of the Architect.
- D. Furnish and deliver anchor bolts, inserts, plates and other incidental items of structural steel required to be built into concrete with instructions or templates for their installation, to respective trades at the proper time to avoid delay in work.
- E. Report any errors in shop fabrication or deformation resulting from handling and transportation that prevent proper assembly and fitting of parts immediately to Architect and obtain approval of method of correction. Approved corrections shall be made at no additional cost to the Owner.

### 3.03 ERECTION

- A. Comply with AISC specifications and "Code of Standard Practice," except as may be modified herein.
- B. Anchor bolts:
  - 1. Provide anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
  - 2. Provide templates and other devices necessary for pre-setting bolts and anchors to accurate locations.
- C. Bases and bearing plates: Shop weld to columns and members attached to concrete.
- D. Splicing:
  - 1. Splice members only where indicated unless, with the Architect's approval, splices not indicated would result in lower costs due to reduced shipping expense.
  - 2. For splices not indicated, submit structural calculations prepared and signed by a structural engineer licensed to practice where the fabricator is located.
- E. Gas cutting:
  - 1. Do not use gas-cutting torches for correcting fabricating errors in the structural framing.
  - 2. Cutting will be permitted only in secondary members as acceptable to the Architect.
  - 3. When gas cutting is permitted, finish the gas cut section to a sheared appearance acceptable to the Architect.
- F. Surveys:
  - 1. Establish permanent benchmarks necessary for accurate erection of structural steel.

2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.
- G. Temporary shoring and bracing:
1. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.
  2. Provide temporary guy lines to achieve proper alignments of the structure as erection proceeds.
  3. Remove temporary connections and members when permanent members are in place and the final connections have been made.
- H. Setting bases and bearing plates:
1. Clean concrete bearing surfaces free from bond-reducing materials, and then roughen to improve bond to the surface by either sandblasting or waterblasting.
  2. Clean the bottom surface of base and bearing plates.
  3. Set loose and attached base plates and bearing plates for structural members in wedges or other adjusting devices.
  4. Tighten anchor bolts after the supported members have been positioned and plumbed.
  5. Do not remove wedges or shim but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
  6. Pack grout solidly between bearing surfaces and bases or plates to assure that no voids remain.
  7. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's recommendations as approved by the Architect.
- I. Field Assembly:
1. Set structural frames accurately to the lines and elevations indicated.
  2. Align and adjust members forming part of a complete frame or structure before fastening permanently.
  3. Clean the bearing surface, and other surfaces that will be in permanent contact, before assembly.
  4. Adjust as required to compensate for discrepancies in elevation and alignment.
  5. Level and plumb individual members of the structure within specified AISC tolerances.
  6. Establish required leveling and plumbing measurements on the mean operating temperature of the structure, making allowance for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
  7. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to welds.
  8. Bolted connections shown on the Drawings, except as specified otherwise, are for unfinished bolts. Holes for same shall be punched or drilled 1/16 inch larger than the diameter of the bolt, except as called for otherwise on the drawings.
  9. Bolting of end under connections and girder splices shall be with turned bolts in reamed holes or with torqued high-strength bolts.

3.04 TESTING AND INSPECTING (Conform to California Code Amendments, Current Edition)

A. Testing:

1. The Owner's selected testing laboratory will pick up specimens and make required tests.
2. Cost of procuring test specimens at locations more than 50 miles from the job site will be paid by the Owner and back-charged to the Contractor.
3. Costs of tests of identified stock will be paid by the Owner; except that if a test fails to comply with the specified requirements, the cost of testing will be paid by the Owner and back-charged to the Contractor.
4. Costs of tests of unidentified stock will be paid by the Owner and back-charged to the Contractor.

B. Test specimens:

1. Test specimens shall be furnished by the steel fabricator, and shall be taken under the direction of the Owner's selected testing laboratory.
2. Each specimen shall be machined by the Owner's selected testing laboratory to dimensions required by ASTM A370.
3. Cost of procuring, making, and machining test specimens shall be considered test costs as defined above.
4. Provide continuous field inspection for all in field welds and tightening of high strength bolts.

C. Identification and tests:

1. Structural steel identified by heat or melt numbers, and accompanied by mill analysis and test reports, does not require additional testing.
2. If structural steel cannot be identified, or if its source is questionable, not less than one tension test and one bend test will be made for each five tons or fractional part thereof.

D. Inspecting:

1. A complete four-sided inspection of steel will be made when required by the Architect.
2. Cost of inspecting will be paid by the Owner subject to the same provisions made above for tests.
3. If, after fabrication and inspection, the work of this Section is found to be defective and to require reinspection, cost of such reinspection will be paid by the Owner and back-charged to the Contractor.
4. Provide labor, equipment, and facilities needed to move and handle the materials to be inspected.

E. Welding inspection:

1. Unless otherwise specified, perform welding under observation of a qualified inspector from a testing laboratory approved by the Architect.
2. Inspect every layer of weld for quality, penetration, and conformity with design requirements.
3. Require the welding inspector to submit a signed report to the Architect, verifying that:

- a. The welding is adequate and was performed in conformity with the specified requirements; and
  - b. Adequate methods have been used to determine the quality of the welding.
- 4. The welding inspector may use gamma ray, magnaflux, trepanning, or any other aid to visual inspection considered necessary to assure adequacy of welding, or may use ultrasonic testing performed in accordance with pertinent requirements of governmental agencies having jurisdiction.
- 5. The Owner will pay cost of welding inspection. The Contractor shall pay any reinspections required due to improper installation.
- F. Access:
  - 1. Provide access for the testing agencies and inspectors to places where structural steel work is being fabricated or produced, so that required testing and inspecting may be accomplished.
- G. Erection inspecting:
  - 1. The Owner's testing and inspecting agency will visually inspect field welded connections, will perform such additional tests and inspections of field work as are required by the Architect, and will prepare test reports for the Architect's review.
  - 2. The testing agency will conduct and interpret the tests, and will state in each report whether the inspected work complies with the requirements, specifically stating all deviations therefrom.
- H. Corrections:
  - 1. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
  - 2. Perform additional tests required to reconfirm non-compliance of the original work and to show compliance of corrected work, all at no additional cost to the Owner.

### 3.05 FIELD PAINTING

- A. General:
  - 1. Prepare surfaces in a manner appropriate to the condition, and as approved by the Architect.
  - 2. Clean spots and surfaces where primer coats have been removed, damaged, or burned off, and clean field bolts and other field connections not concealed in the finished work.
  - 3. Remove dirt, oil, and grease.
  - 4. Apply a spot coat of the approved primer.
  - 5. Do not apply paint to wet, damp, oil, or improperly prepared surfaces.
- B. Notify the Architect when the work of this Section is ready to receive field painting.
  - 1. Secure inspection and approval by the Architect prior to field painting.
  - 2. Using spray or brush, as recommended by the manufacturer of the approved paint material, fill all joints and corners and cover the surfaces with a smooth unbroken film of at least 1.5 dry mils thickness.

\*\*\*END OF SECTION\*\*\*

**SECTION 05200**  
**STEEL JOISTS**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

- A. Design, furnish and install all steel floor joists, steel roof joists, joist girders and related bridging, blocking and connection necessary for a complete installation as indicated herein and on the Drawings.

**1.4 QUALITY ASSURANCE**

A. General:

1. Provide joists fabricated in compliance with Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders
2. Qualification of Field Welding:
  - a. Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Structural Welding Code", AWS D1.1.
  - b. Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of steel joists for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove and replace work found to be defective and provide new acceptable work.
3. Each joist unit shall have a current ICC-ES evaluation report listing allowable loads.

B. Standards and References: (Latest Edition unless otherwise noted)

1. Steel Joist Institute Specifications (SJI K-1.1, SJI LH/DLH-1.1, SJI JG-1.1).
2. American Society for Testing and Materials:
  - a. "High Strength Bolts" (ASTM A325 or A490).
3. American Welding Society "Structural Welding Code (AWS D1.1).
4. International Code Council (ICC-ES).
5. 2007 California Building Code (CBC).

C. Submittals: (In accordance with Article 5 of the General Conditions)

1. ICC-ES Evaluation report for each type of steel joist.
  - a. Certification that joints comply with SJI "specifications".
  - b. Manufacturers Specification and installation instruction for each type of joist and accessories.
  - c. ICC-ES in plant inspection (See Section 1.04.D.1)
2. Shop Drawings:
  - a. Submit detailed drawings showing layout of joists, special connections, jointing and accessories. Include mark, number, type, locations and spacing of joists and bridging.
  - b. In accordance with IBC 2206.3, submit structural calculations signed by a licensed California Civil Engineer. Calculations shall include a statement noting that the joist design complies with all criteria provided in the approved construction documents and has been based on configurations, details, spacing, etc. as shown in the steel joist manufacturer's steel joist placement plans.

D. Tests and Inspections:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in

charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.

2. Manufacturing facilities shall have been inspected by an independent ICC-ES approved inspection agency within the past year.
3. All field welding shall be special inspected per CBC Section 1704.

#### 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle joists in manner to prevent damage or deformation in accordance with SJI "Specification".

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Steel: Comply with SJI "Specifications" for Chord and Web Sections.
- B. Steel Prime Paint: SJI "Specifications".
- C. Bolts: ASTM A490 or A325 Heavy Hexagon Structural bolts with nuts and hardened washers.
- D. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low-carbon steel.
- E. Steel Bearing Plates: ASTM A36.

#### 2.2 FABRICATION

- A. General: Fabricate steel joists in accordance with SJI "Specification".
- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
- C. Extended Ends: Provide extended ends of joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.
- D. Ceiling Extensions: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suite manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 2 inch of finished wall surface unless otherwise indicated.
- E. Bridging: Provide horizontal or diagonal type bridging for "open web" joists, complying with SJI "Specifications".
  1. Provide diagonal type bridging for "longspan" joists, complying with SJI "Specifications".
  2. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- F. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise indicated.
- G. H Series Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.
- H. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

- I. Apply one shop coat of primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.
- J. In accordance with IBC 2206.5 and 1704.2.2, at the completion of fabrication, the steel joist manufacturer shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents and the SJI standard specifications.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Erector must examine areas and conditions under which steel joists are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Erector.

### 3.2 ERECTION

- A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.
- B. Anchors: Furnish anchor bolts and other devices to be built into concrete and masonry construction. Furnish templates for accurate location of anchors in other work.
  1. Furnish unfinished threaded fasteners for anchor bolts, unless otherwise indicated.
  2. Refer to Division 3 sections for installation of anchors set in concrete.
  3. Refer to Division 4 sections for installation of anchors set in masonry.
- C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
  1. Provide temporary bridging, connection, and anchors to ensure lateral stability during construction.
  2. Install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines where open web joist length exceeds erection stability limits, as determined by the manufacturer.
- D. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Bridging shall not attach to wood panelized roof framing.
- E. Fastening Joists:
  1. Field weld joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
  2. Secure joists resting on masonry or concrete bearing surfaces by bedding in mortar and anchoring to masonry or concrete construction as specified in SJI "Specifications" for type of steel joist used.
  3. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.
  4. Provide unfinished threaded fasteners for bolted connections, unless otherwise indicated.
  5. Provide unfinished threaded fasteners for bolted connections except where high-strength bolts or welded connections are shown.
  6. Provide high-strength threaded fasteners for bolted connections of steel joists to steel columns and at other locations where shown, installed in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts".



- F. Touch-Up Painting: After joist installation, paint field bolt heads and nuts, welded areas, and abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

**\*\*\*END OF SECTION\*\*\***

**SECTION 05300**  
**METAL DECKING**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. The requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

- A. Provide all steel decking, accessories and cutting and reinforcing of all holes as indicated on Drawings and specified here.

**1.3 QUALITY ASSURANCE**

- A. Standards and References: (Latest Edition unless otherwise noted)
1. 2007 California Building Code (CBC),
  2. American Iron and Steel Institute (AISI). "Specification for the Design of Cold-Formed Steel Structural Members."
  3. American Welding Society (AWS): AWS D-1.3 "Structural Welding Code - Sheet Steel".
- B. Submittals: (In accordance with Article 5 of the General Conditions)
1. Shop Drawings. Submittal required. Indicate deck sheet layout and all installation details. Contract documents may not be used as shop drawings.
  2. Manufacturer's specifications for each Deck Type. Submittal required.
  3. Certification: Provide affidavits from the manufacturer listing mill test certificates by number for each size and type of decking.
  4. Manufacturer shall provide affidavits of approval by the International Code Council Evaluation Service (ICC-ES) for the metal decking shapes proposed.
  5. Areas to receive concrete fill over metal deck: Provide a work plan detailing the means and methods to be used for placement of concrete, including screeding procedures and locations of any construction joints, which will achieve the performance criteria noted in Section 2.1.
- C. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. All materials, methods and equipment shall be subject to inspections by the Testing Laboratory at any time.
  3. Material Testing: Test reports establishing conformity to the specifications shall be furnished to the Owner for each heat prior to installation.
  4. Welding Inspection: Welding of metal deck shall be performed under the inspection of the Testing Laboratory. Inspection shall conform to CBC Section 1704.
  5. Powder Actuated Fasteners (shotpins): Where decking is attached with shotpins, the pins shall be inspected for proper installation by a special inspector. Twenty-five percent (25%) of all pins shall be verified using the inspection tool supplied by Hilti Inc.

**1.4 PRODUCT HANDLING**

- A. Protect metal decking before installation and protect the installed work and materials of other trades.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS - DECK SYSTEMS

- A. Acceptable Manufacturers:
  - 1. ASC Steel Deck.
  - 2. Verco Manufacturing Co.
  - 3. Manufacturers of materials are indicated to set a standard for design and product performances.
  - 4. Subject to the requirements of Division 1, products of manufacturers not indicated may be proposed for substitution, provided that they are equal in design, product performance and warranty to the products specified and have ICBO approval.
  - 5. The burden of proof of equality of proposed products is on the Contractor.
- B. Provide deck sections, type and gage as indicated on the drawings. Other manufacturers producing deck complying with these Specifications, and having equivalent properties and dimensions will be subject to the Architect's review upon submission of substantiating data, and may be used only if equivalent to deck sections specified, in the Architect's opinion.
- C. All deck units shall be approved by International Code Council Evaluation Service (ICC-ES) for use as a diaphragm.
  - 1. Diaphragm shear capacities shall be comparable (within 5%) to those listed on the drawings for the deck, welding, and spans indicated.
- D. Units shall be in lengths to span two or more supports. Where steel layout does not permit two-span minimums, notify the Structural Engineer prior to fabrication.
- E. All deck units shall have male and female interlocking side joints.
- F. All deck units with concrete or insulating concrete shall be vented to provide 1% open area.
- G. Prior to covering or filling metal decking, verify and coordinate installation requirements of suspended metal framing, suspended acoustical ceiling systems, mechanical and electrical work or other items as required. Provide inserts, clips, anchors or fasteners as indicated or as otherwise required to provide for the complete and proper installation of suspended items from the metal deck.
  - 1. Verify and coordinate locations, patterns, spacing, etc. of suspension members and connectors required by other Sections of the Specifications and as shown on drawings.
  - 2. Where suspension or hanger wires are required under other Sections, verify and coordinate locations, patterns, spacings, etc. with the appropriate trade. Drill holes at bottom of deck flutes of sufficient size to pass support wires. Wire supports shall be looped and secured with a minimum of three (3) tight turns around a minimum 1-1/2" x 8" long furring channel or No. 3 x 12" long reinforcing bar centered above the hole and laid in the deck flutes. Pig-tail loops into the concrete will not be permitted unless approved by the Construction Manager. Place no wires in flute with side lap.
  - 3. At unfilled metal decks or as otherwise indicated, required or shown, provide individual 18 gauge by 1-1/2" wide galvanized hanger tabs 6" long and having 2" round holes for attaching tie wires. Tabs shall be hooked over male portion of each edge joint at 16" on center before female joint of next sheet is placed over it. As an alternate, #3x12" long reinforcing bars centered above the hole and laid in the deck flutes may be used. No loading other than suspended ceilings may be suspended from metal deck without concrete fill. Suspend all piping, ducting, conduit and equipment from steel beams.
- H. Structural Properties: Deck shall have minimum structural properties as indicated on Structural Drawings.

- I. Accessories to be furnished shall include the following:
  - 1. Cell closures where shown on Drawings.
  - 2. Light gauge plate fillers attached to deck to provide an uninterrupted roof plane.
  - 3. Drain sumps and/or roof drain mounting plates as detailed.
  - 4. Cell end closures column flashing and miscellaneous closures to prevent concrete leakage.
  - 5. Miscellaneous accessories incidental to erection of deck.
- J. At concrete filled metal deck:
  - 1. Concrete fill over metal deck shall be screeded flat between screed rails to obtain a maximum deviation of  $\frac{1}{4}$ " over 10'-0" measured using a straightedge. Measurements shall be taken uniformly across the floor area. Areas of non-compliance shall be reviewed by the Owner and Architect and may require additional floor leveling.
  - 2. The depth of concrete over metal deck noted on plan shall be provided at all locations. In no case shall this depth be less than noted. Note that the concrete depth will vary due to deck and beam deflections during concrete placement, and shall be considered in the estimating of concrete volume and cost and placement strategies. The maximum thickness of concrete at the mid-span of decks and beams shall not exceed the specified thickness + 1".

## 2.2 MATERIALS

- A. Provide deck of type and gage shown on the drawings. Deck units and all necessary items shall be formed from steel sheets conforming to ASTM-A653, structural quality. The steel sheets shall have received, before being formed, a metal protective coating of zinc conforming to ASTM-A653 Class G60 coating.
- B. Powder Actuated Fasteners (shotpins): Where decking is attached with shotpins, they shall be by Hilti Inc., of the type indicated on the drawings and ICC-ES approved for use in a diaphragm.
- C. Welding rods: E60XX minimum.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Examine areas to receive work specified. Do not begin work until underlying work is complete, all required inspections have been made, and all conditions which might prevent proper installation or impair performance of work have been corrected.
- B. Beginning installation means accepting conditions of underlying work.
- C. If supporting steel work is not properly aligned or sufficiently level to permit proper bearing of metal decking, such deficiency shall be corrected by the Contractor before placing units.

### 3.2 ERECTION

- A. Deck shall be laid true to line, shall conform to profile shown on Drawings, and shall be without deformations, creases, wrinkles or noticeable defects.
- B. Connections: Deck shall be secured to structural frame by use of  $\frac{3}{4}$ " diameter fusion welds. Minimum number and spacing of connections shall be as indicated on Structural Drawings.

- C. The metal deck shall be fastened to all structural members both parallel and perpendicular. Spread deck and modify layout where structural members are parallel to the metal deck ribs.
- D. Bend decking to conform to slopes and warps as required for solid contact to framing that allows proper welding.
- E. Shoring for metal decking shall be provided by the contractor as required and as indicated in the corresponding ICC-ES report. Coordinate shoring requirements for construction live load (and concrete placement) with the manufacturer.
- F. All deck units shall break over beams.
- G. Provide low ribs at all beams parallel to deck. As an alternate, the deck may be broken and infilled with a flat pan to provide deck welding to parallel beams.
- H. Butt deck units tight over steel beams.
- I. Provide  $\frac{3}{4}$ " clear concrete cover around all welded studs.

### 3.3 DEFECTIVE DECK

- A. Units of decking that become deformed or damaged to such extent that they are weakened or unsuitable for use shall be removed and replaced at no cost to the Owner.

### 3.4 TOUCH UP AND CLEANING

- A. All welds and abrasions on deck surfaces not covered by concrete shall be touched up using a zinc dust-zinc oxide primer.
- B. Burn spots on supporting exposed steel shall be touched up with same primer as used on adjacent surface.
- C. Clean surfaces of installed deck by effective means to receive sprayed-on fireproofing or finish painting as indicated.

\*\*\*END OF SECTION\*\*\*

**SECTION 05400**  
**COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. The requirements of Division 1 apply to all Work in the Section.

**1.2 SCOPE**

- A. Furnish and install all components and related items pertaining to cold-formed metal framing systems.

**1.3 QUALITY ASSURANCE**

A. General:

1. Welders: Qualified for welding in horizontal, vertical, and overhead positions in accordance with AWS D1.3.
2. Wall system shall provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperatures.
3. Wall system shall accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

B. Standards and References: (Latest Edition unless noted otherwise)

1. 2007 California Building Code (CBC),
2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process..
3. Framing components shall conform to Standards of the Steel Stud Manufacturers Association (ICC-ES ER-4943P).

C. Submittals: (Per Article 5 of the General Conditions).

1. Manufacturers catalog with sizes to be used indicated.
2. ICC-ES report.
3. Mill certificates verifying steel properties.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Protect metal framing units from rusting and damage.
- B. Deliver to Project site in manufacturer's unopened containers or bundles, identified with name, brand, type and grade.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof covering.

**PART 2 - PRODUCTS**

**2.1 ACCEPTED MANUFACTURERS**

- A. Members of the Steel Stud Manufacturer's Association (SSMA), or approved equal.

**2.2 METAL FRAMING**

- A. System Components: Provide steel studs, joists, tracks, straps, runners, blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as shown on the Drawings for applications indicated. All studs, joists, tracks, and blocking shall conform to ICC-ES ER4943.
- B. Materials and Finishes:
1. 54 Mils (16 Gauge) and Thicker: Fabricate metal framing components of structural quality (SQ) steel sheet with a minimum yield point of 50,000-psi; conforming to ASTM A653, grade 50, class 1 or 3 or ASTM A1011, grade 50.
  2. 43 Mils (18 Gauge) and Thinner: Fabricate metal framing components of structural quality (SQ) steel sheet with a minimum yield point of 33,000-psi; conforming to ASTM A653, grade 33 or ASTM A1011 Grade 33)
  3. Finish: Galvanized complying with ASTM A653, G60. Finish accessories to match main framing components.
- C. See drawings for section properties and details.
- D. Studs and joists shall be of the size, shape, and gauge indicated, with a flange and flange return lip as shown on the Structural Drawings.
- E. Welding Electrodes: E60XX.
- F. Galvanizing Repair Paint: High zinc-dust content paint for repair of galvanized surfaces damaged by welding.
- G. Material Thickness: All sections are to be roll formed in various depths with the following minimum bare metal thicknesses:

Minimum Thickness (inch)	Minimum Design Thickness (inch)	Gauge	Mils
0.0179	0.0188	25	18
0.0329	0.0346	20	33
0.0428	0.0451	18	43
0.0538	0.0566	16	54
0.0677	0.0713	14	68
0.0966	0.1017	12	97
0.1180	0.1240	10	118

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install metal framing systems in accordance with the Structural Drawings. Where drawings conflict with manufacturer's recommendations, the Structural Drawings will govern.
- B. Runner Tracks:
1. Install continuous tracks sized to match studs. See Structural Drawings.
  2. Align at base and tops of studs.
  3. Attach tracks with screws, welding, bolting or shotpins as indicated on the Structural Drawings.
  4. Fasten corners and ends of tracks as shown.
- C. Studs:

1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces.
2. Where studs abut structural columns or walls, anchor ends of stiffeners to supporting structure.
3. Secure studs to top and bottom runner tracks by screw fastening at both flanges.
4. Install studs in one piece for full height; splicing of studs is not permitted.
5. Provide deflection allowance of 1/2" minimum in stud track, directly below horizontal building framing for all framing. See Structural Drawings.
6. Install supplementary backing and bracing wherever walls or partitions are indicated to support equipment, services, casework, heavy trim and furnishings and similar work requiring attachment to wall or partition. Comply with stud manufacturer's instructions and industry standards.
7. Frame wall openings larger than 2-foot square with double stud at each jamb. See Structural Drawings for opening framing.
8. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.
9. Install one row of metal blocking or bridging at mid-height of all studs over 10'-0" in height in addition to bracing that may be required at studs that do not receive sheathing (see item 10 below).
10. Install strapping to all sides of studs that do not receive sheathing as indicated on the structural drawings.

### 3.2 TOUCH-UP PAINTING

- A. Touch-up shop-applied protective coatings damaged during handling and installation.
- B. Use compatible primer for prime coated surfaces; use galvanizing repair paint for galvanized surfaces.

**\*\*\*END OF SECTION\*\*\***



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**SECTION 05500**  
**METAL FABRICATIONS**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 SCOPE OF WORK**

Shop fabricated ferrous metal items, galvanized and prime painted.

**1.03 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.04 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- D. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures.

**1.05 FIELD MEASUREMENTS**

Verify that field measurements are as indicated on Drawings and Shop Drawings.

**PART 2 -- PRODUCTS**

**2.01 MATERIALS**

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, 46 KSI.
- C. Plates: ASTM A283.
- D. Pipe: ASTM A53, Grade B.
- E. Bolts, Nuts, and Washers: ASTM A307 or as indicated.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer for Steel: SSPC 15, Type 1, red oxide.
- H. Touch-Up Primer for Galvanized Surfaces: Zinc rich type.
- I. Exposed Mechanical Fastenings: Flush countersunk screws or bolts.
- J. Miscellaneous Items: Miscellaneous metal items and their related components are not necessarily individually described. The most important and those requiring detail description are specified. Miscellaneous items not described shall be furnished and installed in accordance with the intent of the Drawings and Standard Specifications as required to complete the work.

**2.02 FABRICATION**

- A. Standard commercial products, conforming to requirements of Drawings and Standard Specifications may be used subject to approval of Architect. Bolt with proper size bolts. Nuts shall be drawn tight and end threads upset. Screws and bolts shall be standard and washers provided where necessary.
- B. Build anchors and other connecting members required to concrete into concrete as work progresses to avoid unnecessary cutting and drilling.
- C. Fit and shop assemble in largest practical sections, for delivery to site.
- D. Fabricate items with joints tightly fitted and secured.
- E. Continuously seal joined members by intermittent welds and plastic filler or as indicated on Drawings.
- F. Execute all work using skilled metal workers only. Use only certified welders. Do only such work at the site as cannot reasonably be performed in the shop. Make cuts, bends, punching and drilling accurate, neat and properly located. Leave exposed surfaces free of fabrication marks. Make members true to length to allow assembly without fillers.
- G. Do all welding per AWS Standard Specifications. Apply "Galvaweld" or equal to any surfaces welded after galvanizing.
- H. Furnish all necessary templates and patterns required by other trades. Supervise and be responsible for proper location and installation of built-in terms. Deliver any items of this Section required to be embedded in concrete, or built into partitions and other locations to respective Contractors. Provide holes and connections for work of other trades and make necessary connections.
- I. When possible, fit and shop assemble, ready for erection, with shop and field connections riveted, welded or attached with screws, countersunk and finished flush where exposed.
- J. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- K. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of component, except where specifically noted otherwise.
- L. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- M. Galvanize any ferrous metal exposed to exterior unless otherwise specified. All units galvanized shall be fabricated into the largest practicable sections before galvanizing.

## 2.03 FINISHES

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete, or where field welding is required.
- C. Prime paint items with one coat.
- D. Galvanized items to minimum 1.25-ounce/square foot zinc coating in accordance with ASTM A386.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings and Shop Drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, galvanized except surfaces to be in contact with concrete.
- G. Anchor firmly into position.

3.04 CLEAN-UP

On completion of work, remove all excess material, equipment, debris and cuttings; dispose of away from premises. Leave work in clean condition.

\*\*\* END OF SECTION \*\*\*

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**SECTION 05510**  
**METAL STAIRS**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS:**

- A. Requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE:**

- A. Furnish and install all metal stairs, intermediate landings, handrails and railings, and associated accessories including plates, angles, hangers and struts for securing to building structure.

**1.4 QUALITY ASSURANCE**

A. General:

1. Fabricator: Regularly providing work of type required for not less than five years.
2. Installer shall have a minimum of two years experience in the satisfactory installation of metal stairs.
4. For conditions where specific details are not shown, detailing shall be identical or similar to corresponding and comparable details. Should there be any questions, contact the Architect prior to proceeding.
5. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible; do not delay job progress; allow for trimming and fitting where necessary.
6. Comply with code requirements for stair and railing design to provide handicap access.
7. Welders performing welding on stairs shall be qualified in conformance with AWS D1.1
8. Concrete for treads and landings shall attain a minimum strength of 3000 psi in 28 days. Use a minimum of two #3 rebar at the mid-height of the concrete tread thickness and #3 at 18"cc each way at the landings.
9. Metal stair surfaces furnished to the Project site primed and not scheduled or indicated to be covered by an applied floor covering will be painted as specified in Section 09 90 00.
10. Specified primer shall be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09 90 00.
11. Field verify dimensions prior to fabrication to insure that materials and/or connections do not interfere with architectural clearances and finishes.

B. Standards and References: (Latest Edition unless otherwise noted)

1. American Welding Society (AWS): D1.1, Structural Welding Code.
2. National Association of Architectural Metal Manufacturers (NAAMM):
  - a. Metal Stairs Manual.
  - b. Pipe Rail Manual.
3. 2007 California Building Code (CBC),
4. California Building Code requirements for the physically handicapped.
5. AISC: American Institute of Steel Construction (Steel Manual)
6. Steel Structures Painting Council (SSPC)

C. Design Criteria:

1. Stairs and landings shall support a minimum uniform live load of 100-psf with a safety factor as required by code and individual stair treads shall support a 300-pound concentrated load placed in a position which would cause maximum stress.

2. Railings shall be designed to resist a load of at least 200-pounds applied in any direction at any point to the top rail and also a vertical and horizontal thrust of 50-pounds per lineal foot applied to the top rail.
  3. All loading conditions resulting in eccentricities or torsion to beams and/or columns shall be resolved by the installation of stiffeners and diagonal struts designed, supplied, and installed by the stair supplier.
  4. Stair assemblies shall be designed for seismic loads per the latest International Building Code.  $R_p = 2.5$ . Seismic forces and interstory drift shall be accounted for in the design and detailing. Resolve forces and brace to main structure.
  5. Maximum allowable Live Load deflection =  $L/360$ .
- D. Submittals: (Per Article 5 of the General Conditions)
1. Submit shop drawings and calculations signed by a Civil Engineer, registered in the state of California, for review by the Architect/Engineer and approval by the enforcement agency prior to fabrication.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: For surfaces exposed to view, use materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Metal Stairs and Intermediate Landings.
  1. Stair pans and risers shall be minimum 10 - gauge material. Actual gauge as required by design.
  2. Stringer and member sizes indicated on drawings shall be the minimum sizes allowed. Flat plate stringers are not acceptable substitutions
- C. Steel Sections, Plates, Shapes and Bars: ASTM A36.
- D. Structural Steel Sheet: Hot rolled, ASTM A570; or cold rolled, ASTM A611, Class 1; or grade required for design loading.
- E. Steel Pipe: ASTM A53, Type S seamless, grade as selected by fabricator and as required for design loading; minimum standard weight, STD or Schedule 40.
- F. Steel Tubing: Cold formed ASTM A500; or hot rolled, ASTM A501; minimum Grade B; seamless where exposed.
- G. Castings: Gray iron, ASTM A48, Class 30; malleable iron, ASTM A47.
- H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron ASTM A47, or cast steel ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.
- I. Grout: Non-shrink meeting ASTM E827, non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.
  1. Master Builders/Masterflow 713 or 928.
  2. Euclid N-S Grout.
- J. Fasteners and Rough Hardware: Type required for specific usage; provide zinc-coated fasteners for exterior use or where built into exterior walls.
- K. Welding Materials: AWS D1.1, type required for materials being welded.

- L. Paint: Provide primers as recommended by paint manufacturers for substrates and paint specified in Section 09 90 00. Comply with VOC limitations.
1. Galvanizing Repair Paint: High zinc-dust content paint for regalvanizing welds in galvanized steel.

## 2.2 FABRICATION

### A. General:

1. Construct stairs to conform to sizes and arrangements indicated; join pieces together by welding unless otherwise indicated.
2. Provide complete stair assemblies including metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components necessary for support of stairs and platforms and to anchor the stairs on the supporting structure.
3. Exact dimensions and conditions shall be detailed based on the conditions and details provided. Do not substitute details without separate written approval.

### B. Stair Framing:

1. Fabricate stringers of structural steel channels or tube steel as indicated. Flat plate stringers will not be permitted.
2. Provide closures for exposed ends of stringers.
3. Construct platforms of structural steel channel or tube steel headers and miscellaneous framing members.
4. Bolt or weld headers to stringers, and framing members to stringers and headers; fabricate and join with concealed bolts.

### C. Stair Type: See drawings for locations.

1. Closed riser and concrete filled treads and landings.
  - a. Form metal pans of hot-rolled or cold-rolled carbon steel sheet.
  - b. Weld risers and subreads to stringers; locate welds on side of metal pans to be concealed by concrete fill.
  - c. Provide landings of configuration and construction of same metal as risers and treads, thicknesses required to support design loading. Attach landings to framing members with welds.
  - d. Finish interior stairs with shop-applied primer as specified.
2. Closed riser and checkered plate treads and landings.
  - a. Form using fabricator's standard raised steel floor plate at thickness required to meet design loadings.
  - b. Shop weld treads between stair stringers to create a single flight unit.

### D. Railings and Handrails:

1. Railings and handrails shall be smooth with welded connections. Welds shall be ground smooth with no visible grind marks.
2. Railings and handrails shall be constructed of steel members of sizes standard with fabricator or as indicated on drawings.
3. Railings shall run continuously to each landing post.
4. Handrails shall be secured to walls with brackets.

### E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

1. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

### F. Weld corners and seams continuously, complying with AWS recommendations. Grind exposed welds smooth, flush and imperceptible to match and blend with adjoining surfaces.



G. Shop Painting:

1. Shop paint metal stairs, except members or portions of members to be embedded in concrete or masonry and surfaces and edges to be field welded.
2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 or SSPC SP-3, or SSPC SP-7.
3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
4. Brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
5. Apply one shop coat to fabricated metal items; apply two coats to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
6. Primer shall be smooth and suitable for application of finish paint specified in Section 09900.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Obtain Architect's review prior to site cutting or making adjustments which are not part of scheduled work.
  1. Perform necessary cutting and altering for installation of work of other sections.
  2. Beginning of the installation means acceptance of existing conditions.
- B. Install steel stairs and railings square and level, plumb and free from distortion or defects detrimental to appearance and performance.
- C. Make provision for erection stresses by temporary bracing; keep work in alignment.
- D. Ensure alignment with adjacent construction; coordinate with related work to ensure no interruption in installation.
- E. Field bolt and weld to match standard of shop bolting and welding; hide bolts and screws whenever possible, where not hidden, use flush countersunk fastenings.
  1. Perform field welding in accordance with AWS D1.1.
- F. After installation, touch-up field welds and scratched and damaged surfaces; use primer consistent with shop coat or recommended for galvanized surfaces, as applicable.
- G. Replace items damaged in course of installation and construction.
- H. Stair treads shall be uniformly spaced throughout each flight; treads and intermediate landings shall be level.

3.2 TOUCH-UP

- A. Field Touch-Up: Shop coats abraded or burned out by welding shall be touched up before field painting. Field touch-up shall be same paint used for shop coat.
- B. Finish painting is specified in Section 09900.

3.3 TOLERANCES

- A. Conform to NAAMM - Metal Stair Manual.

### 3.4 CLEANUP

- A. Upon completion of the Project, all debris must be removed and all components to receive final field painting to be properly prepared.
- B. All existing work such as shaft walls, door frames, etc., that are damaged under this work must be prepared to original condition with no additional cost or time to the Project.
- C. Following installation, clean metal stairs and leave in a condition suitable for the installation of concrete fill in treads.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 05720**  
**METAL STAIRS & RAILINGS**

**PART I -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 SECTION INCLUDES**

- A. Stool stair frame of structural sections, with closed risers.
- B. Pan to receive concrete fill stair treads and landings.
- C. Integral balusters hand railing at production stairs.

**1.03 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION**

- A. Section 03300-Cast-In-Place Concrete: Placement of metal anchors in concrete.
- B. Section 03470-Tilt-up Concrete: Placement of metal anchors in pre-cast concrete.
- C. Section 04300 - Unit Masonry System: Placement of metal anchors in masonry.

**1.04 REFERENCES**

- A. ANSI A17.1 - Buildings and Facilities - Providing Accessibility and Usability For Physically Handicapped People.
- B. ASTM A36 - Structural Steel.
- C. ASTM A53 - Hot-Dipped, Zinc coated Welded and Seamless Steel Pipe.
- D. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- E. ASTM A446 - Steel Shot, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- F. ASTM A500-Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- G. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- H. AWS A2.0 - Standard Welding Symbols.
- I. AWS D 1.1 - Structural Welding Code.
- J. SSPC - Steel Structures Painting Council.

**1.05 DESIGN REQUIREMENTS**

- A. Fabricate stair assembly to support live load of 100 lb/sq ft with deflection of stringer or landing framing not to exceed 1/360 of span.
- B. Railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set.

**1.06 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.07 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

#### 1.08 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located in the State of California.
- B. Welders' Certificates: Certifying welders employed on the Work, verifying AW5 qualification within the previous 12 months.

#### 1.09 FIELD MEASUREMENTS

Verify that field measurements are as indicated on Drawings, shop drawings, and Instructed by the manufacturer.

### PART 2 -- PRODUCTS

#### 2.01 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500.
- C. Plate: ASTM A283.
- D. Pipe: ASTM A53, Grade B.
  - 1. Railings: 1- 1/2" diameter pipe, welded joints.
  - 2. Posts: 1" x 1/4" fltbar,
  - 3. Fittings: Elbows, T-shapes; machined steel.
  - 4. Mounting: 2- 1/2" diameter sleeves cast into concrete. Pipe rail set into sleeves and grouted solid with epoxy grout.
  - 5. Splice Connectors: Steel concealed spigots.
- E. Sheet Steel: ASTM A446, Grade B Structural Quality.
- F. Stair Treads: Concrete in metal pan; dimensioned as shown on the Drawings.
- G. Concrete for Treads and Landings: Portland cement Type 1, 3000 psi 28 day strength, 2 to 3 inch slump.
- H. Tread and Landing Concrete Reinforcement: Mesh or Bar type as detailed.
- I. Bolts, Nuts, and Washers: ASTM A307 or as indicated on Drawings.
- J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, consistent with design of stair structure.
- K. Welding Materials: AWS D1.1; type required for materials being welded.
- L. Shop and Touch-Up Primer: 55PC I 5, Type I, red oxide.

#### 2.02 FABRICATION - GENERAL

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Continuously seal jointed pieces by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located, consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Accurately form components required for anchorage of stairs and landings and railings to each other and to building structure.

#### 2.03 FABRICATION-PAN STAIRS AND LANDINGS

- A. Fabricate stairs and landings with closed risers and treat of metal pan construction, ready to receive concrete.
- B. Form treat and risers with minimum 12 M sheet steel stock.
- C. Secure reinforced tread pans to stringers with clip angles or flat bars, as indicated on the Drawings; welded in place.
- D. Form stringers with rolled steel channels - sections as sized on the Drawings.
- E. Form landings with minimum 10 gage sheet stock. Reinforce underside with angles to attain design load requirements. Except at landings with metal floor dock continuous,
- F. Form balusters with 1-1/2 inch diameter steel sections, welded to stringers at production area stairs.
- G. Prime paint components.

#### 2.04 FABRICATION - PIPE HANDRAILS AND GUARDRAILS

Fabricate steel tubing to shapes and sizes shown with all ends closed, welds ground smooth. Brackets shall be as detailed. Provide all required anchoring and fastening devices. Construct removable railings to standards specified above and include floor mounting sockets as detailed.

#### 2.05 FINISHES

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete, fireproofing, or where field welding is required.
- C. Prime paint items with one coat.

### PART 3 -- EXECUTION

#### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

#### 3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

#### 3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Provide, anchors, plates or angles required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary, bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Field weld components Indicated on shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain Architect/Engineer approval prior to site cutting or making adjustments not scheduled.
- H. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete or fireproofing,

3.04 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 Inch,

3.05 SCHEDULE

- A. Stairs 5 and 6: Pan stairs and landings, Integral handrail, primed finish.
- B. Stairs 1, 2, and 3: Pan, stairs and landings, primed finish with Handrail.
- C. Guardrail: Pipe rail at Warehouse applications.

\*\*\* END OF SECTION \*\*\*

**SECTION 06410**  
**CUSTOM CASEWORK**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 SCOPE OF WORK**

A. Furnish all: labor, materials, equipment and services necessary and/or reasonably incidental to the proper execution of cabinetwork, including hardware as shown on Drawings and specified herein.

B. Work includes counters, shelving, countertops and cabinetry.

**1.03 STANDARDS OF WORKMANSHIP**

Quality of millwork and fabrication shall conform to:

1. Woodwork Institute of California (WIC)
2. National Kitchen Cabinet Association (NKCA)
3. American Woodworkers Institute (AWI)

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

A. In accordance with Article 5 of the General Conditions.

B. Submit:

1. Submit Shop Drawings, include materials, component profiles, fastening methods and schedule of finishes.
2. Submit samples of finishes.

**1.06 WARRANTY**

Contractor Guarantee: Contractor guarantees the work covered by the specification against all defects in material and workmanship for a period of not less than two (2) years from the date the Owner records Notice of Completion.

**PART 2 -- PRODUCTS**

**2.01 MATERIALS**

A. Softwood plywood: PS-1 graded per AWI. Application: 3/4" for cabinets -- plastic laminated.

B. Plastic Laminate: high pressure laminated plastic conforming to NEMA LP-3, 0.50" thickness for tops, and 0.028" thickness for vertical surfaces.

1. All splashes shall be 4" high; provide end splashes with sq. bottom joints.
2. Interiors: Low Pressure Melamine.
3. Backing Sheet: LD-3-BK 20 backing grade undecorated plastic laminate.



- C. Wood particleboard: Per AWI standard, composed of wood chips, made with waterproof resin binders, sanded faces, application 3/4" for countertops.
- D. Hardboard: PS-58: pressed wood fiber with resin binder, tempered grade, smooth two sides for drawer bottoms.
- E. Hardwood Lumber: Grade in accordance with AWI; maximum moisture content of 6%; application.
- F. Plastic Edge Trim: Same as face finish -- plastic laminate.
- G. Adhesive - Type II adhesive -- an approved thermosetting-on-contact adhesive.
- H. Doors and drawer fronts shall be 3/4" plywood with edges veneered or plastic laminate finish.
- I. Hardware: Cabinet hardware shall be concealed self-closing hinges, drawer slide, shelf standards and clips as manufactured by Blum, Knappe & Voigt or equal.
- J. Drawer Slides for Drawers 24" wide or less: 100 pound load rated, full extension, ball bearing. Accuride 3832.  
 Drawer Slides for File, Paper Storage and Heavy Duty Drawers 42" wide or less: 150 pound load rated, over travel extension, ball bearing. Accuride 4034.

## 2.02 FABRICATION

- A. Assemble casework in Shop for delivery to site in units easily handled and to permit passage through building openings.
- B. Apply plastic laminate finish in full-uninterrupted sheets consistent with manufactured sizes. Make corners and joints hairline. Locate counter butt joints minimum 2' from sink cutouts.
- C. Mechanically fasten splash backs to countertops with steel brackets 16" o.c.
- D. Countertop edges and splashes to have radius corners.
- E. Outside corners of force standing desks to be radiused per plans.
- F. Apply laminated backing sheet to reverse side of plastic laminate finish surfaces.
- G. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surface cut edges.
- H. On items to receive transparent finishes, use wood filler that match surrounding surfaces. Apply wood filler in exposed nail and screw indentations. Sand work smooth.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.
- E. Verify that surfaces and openings are ready to receive work and field measurements are as shown on Shop Drawings and instructed by the fabricator. Verify dimensions for work of other trades incorporated into the casework.

- F. Verify that mechanical, electrical, and other building items affecting work of this Section are placed and ready to receive this work.

### 3.02 INSTALLATION

- A. All parts shall be precision machined to close tolerances, accurately fitted and assembled with appropriate fastening and adhesives required to produce first quality fixtures, square, true, plumb and level.
- B. Carefully scribe casework that is against other building materials, leaving gaps of 1/32" maximum. Do not use additional overlay trim for this purpose.
- C. Anchor securely to wall and floor with all anchorage devices required. Coordinate to allow anchorage devices to be set with other work as applicable. Provide temporary protection over finish work as required during construction to protect the work from damage.
- D. Installation shall be complete including continuous bases. All work shall be installed by skilled workmen under the control and supervision of personnel trained in the handling and installation of this cabinetwork and equipment.
- E. Install and adjust cabinet hardware to correct operations.

**\*\*\* END OF SECTION \*\*\***

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**SECTION 06600**  
**PLASTIC SURFACING MATERIALS**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 DESCRIPTION**

Provide factory-finished Surface Materials and similar items where shown on the drawings, as specified herein, and as needed for a complete and proper installation. Work may include, but is not limited to:

1. Standard Decorative Laminates.
2. Solid Surfacing.
3. Marker Board Laminate.

**1.03 REFERENCES**

- A. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
- B. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- C. ISO 4586-2 - High Pressure Decorative Laminates; International Organization for Standardization.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- A. Samples:
  1. Selection Samples: Submit actual samples of surfacing materials to illustrate full range of colors, patterns, and finishes available.
  2. Verification Samples: Submit two samples, each 12 inches square, illustrating each selected surfacing material in specified color, pattern, and finish.
- B. Manufacturer's Instructions:
  1. Submit manufacturer's printed installation instructions for each product.
  2. Submit manufacturer's Safety Data Sheets (M.S.D.S.) for each adhesive.

**PART 2 -- PRODUCTS**

**2.01 MANUFACTURERS**

Acceptable Products: Wilsonart International, Dupont Corian, Avonite, LG Hi-Macs.

**2.02 STANDARD DECORATIVE LAMINATES**

- A. Acceptable Products: Wilsonart Laminate, Formica, Pionite, Nevamar.
- B. Product Description: Decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.

- C. Standard Decorative Laminate – General Purpose Type: having the following physical characteristics:
1. Sheet thickness: 0.048-inch (1.219 mm) plus/minus 0.005-inch (0.127 mm).
  2. Exceeding performance requirements of NEMA LD 3-1995 Grade HGS.
  3. Surface burning characteristics in accordance with ASTM E 84; unbonded: Flame spread 55; Smoke developed 30.
  4. Patterns and Finishes: Selected from manufacturer's full range of available selections, as selected and approved by Architect.

## 2.03 SOLID SURFACING MATERIAL

- A. Acceptable Product: Wilsonart Gibraltar Solid Surfacing, Type 051, or approved equal.
- B. Product Description: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.
1. Nominal sheet thickness: 0.50 inch (13 mm).
  2. Surface burning characteristics in accordance with ASTM E 84: Flame spread less than 25; Smoke developed less than 25.
  3. Liquid Absorption, ISO 4586-2, for 1/2-inch material thickness: 0.4 percent after 2 hours boiling water.
- C. Izod Impact, ASTM D 256, Method A: 0.2 foot pounds per inch.
1. Tensile Modulus, ASTM D 638 Nominal: 1.7 million pounds per square inch.
  2. Thermal Expansion, ASTM D 696: 0.000019-inch per inch per degree F, maximum.
  3. Hardness, ASTM D 2583, Barcol Impressor: 59.
  4. Flexural Modulus, ASTM D 790: 1.6 million pounds per square inch.
  5. Deflection Temperature under load, ASTM D 648: 90 degrees C.
  6. Stain Resistance: ANSI Z124.6 modified, Method 3.4: No effect.
  7. Boiling Water Resistance, NEMA LD 3-1995, Method 3.5: No effect.
  8. High Temperature Resistance: NEMA LD 3-1995, Method 3.6: No effect.
  9. Radiant Heat Resistance: NEMA LD 3-1995, Method 3.10: No effect.
  10. Light Resistance: NEMA LD 3-1995, Method 3.3: No effect.
  11. Ball Impact Resistance, NEMA LD 3-1995, Method 3.8, one half pound ball, unsupported: 125 inches.
  12. Specific Gravity: 0.977 ounces per cubic inch (1.69 grams per cubic centimeter).
  13. Approximate weight: 4.2 pounds per square foot (20.5 kg/square m).
  14. Weatherability: ASTM D 2565: Pass.
  15. Fungus Resistance, ASTM G 21: Pass.
  16. Bacterial Resistance, ASTM G 22: Pass.
  17. Pittsburgh Protocol Toxicity: 66.9 grams.
  18. Patterns and Finishes: Selected from manufacturer's full range of available selections, selected and approved by Architect.
  19. Impact Resistance NEMA LD3-1995 (1/2 lb. Ball) SSV bonded to substrate\*\*\* Method 3.08 modified. 125" (No Failure)

20. Tensile Toughness ASTM D 638. 21 (in. – lb./in. <sup>3</sup>)
21. Tensile Modulus ASTM D 638 Nominal.  $1.7 \times 10^{-5}$  lb./in. <sup>3</sup>
22. Density 1.60 gram/cm<sup>3</sup>
23. Approximate weight 4.2 lbs./ft<sup>2</sup>
24. Pittsburgh Protocol Toxicity = 30 grams range

## 2.04 MARKER BOARD LAMINATES

- A. Acceptable Product: Wilsonart Marker Board Laminate.
- B. Product Description: Overlay saturated with melamine resins and decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.
- C. Marker Board Laminate - Horizontal Grade Type: Type 136.
  1. Sheet thickness: 0.050-inch plus/minus 0.005-inch (1.27 plus/minus 0.127 mm).
  2. Exceeding performance requirements of NEMA LD 3-1995 Grade HGS.
  3. Surface burning characteristics in accordance with ASTM E 84; unbonded: Flame spread 40; Smoke developed 115.
- D. Marker Board Laminate - Vertical Grade Type: Type 336.
  1. Sheet thickness: 0.030-inch plus/minus 0.003-inch (0.762 plus/minus 0.076 mm).
  2. Exceeding performance requirements of NEMA LD 3-1995 Grade VGP.
  3. Surface burning characteristics in accordance with ASTM E 84; unbonded: Flame spread 40; Smoke developed 70.
  4. Colors: Selected from manufacturer's full range of available selections, as selected and approved by Architect.
- E. Marker Board Laminate - Fire-Rated Type: Type 636.
  1. Sheet thickness: 0.050-inch plus/minus 0.005-inch (1.27 plus/minus 0.127 mm).
  2. Exceeding performance requirements of NEMA LD 3-1995 Grade HGF.
  3. Surface burning characteristics in accordance with ASTM E 84; unbonded: Flame spread 25; Smoke developed 110.
  4. Color: Selected from manufacturer's full range of available selections, as selected and approved by Architect.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 PREPARATION

Surface preparation: Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed installation instructions.

### 3.03 APPLICATION

Install materials in accordance with manufacturer's printed instructions.

**\*\*\* END OF SECTION \*\*\***

**SECTION 07120**  
**MEMBRANE WATERPROOFING**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 SCOPE OF WORK**

Work included: Provide and install membrane waterproofing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

**1.03 QUALITY ASSURANCE**

- A. This Contractor shall examine all surfaces before commencing work to see that they are in proper condition to receive his work. All surfaces shall be dry, smooth and clean. The Contractor shall immediately notify the Architect, in writing, of any defective work by others that might prevent him from properly performing his work in a first-class manner in accordance with these Specifications. He shall not proceed with any work until such defects are remedied and work approved by the Architect. This Contractor shall apply his work during normal working hours so that the project manager may have the opportunity to oversee the actual operation.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. The Contractor shall see that all sleeves, metal work, flashings and counter flashings, to be furnished and/or installed under other divisions of the Specifications, are properly installed and assume full responsibility for the water-tightness of all such work.
- D. Guarantee: Written guarantee is required from the applicator, guaranteeing this work against defective workmanship for a period of two years from date which the Owner records the Notice of Completion.
- E. Certification: Upon completion, issue to the Architect a Certificate of Inspection and Compliance indicating that the completed work meets all the requirements of these Specifications and the manufacturer's printed instructions.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be provided under this Section;
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  - 3. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
- C. Provide approved written guarantee per system specified; refer to Application Specification of manufacturer.



## PART 2 -- PRODUCTS

### 2.01 MATERIALS

- A. Membrane or membrane assemblies for concrete walls behind berms shall be such as to provide a watertight condition for the life of the building and shall be a waterproofing Contractor approved by the manufacturer as manufactured by W.R. GRACE & CO. System shall apply Bituthene Waterproofing System 3000.

1. Bituthene 3000 Waterproofing Membrane is a factory-made composite product with a minimum thickness of 60 mils (1.5 mm). It consists of 56 mils (1.4 mm) of rubberized asphalt and 4 mils (0.1 mm) of cross-laminated polyethylene film. Bituthene 3000 is supplied in rolls 36" (0.9m) wide and 60' (18.3 m) long. The rubberized asphalt is covered with release paper that is removed during installation. The membrane is self-adhesive and cold applied. No special adhesive or equipment is necessary to form laps.
2. Physical Properties - Bituthene Liquid Membrane LM-3000:

Property:	Typical Value:	Test Method:
Solids Content	100%	ASTM D-1644
Elongation	250%	ASTM D-412
Peel Adhesion	5 lb./inch width	See footnote 1
Pliability (180° bend over 1" mandrel)	Unaffected at -25°F	ASTM D-146
Hydrostatic head	75 ft. min.	See footnote 2

#### Footnotes:

1. Liquid Membrane is applied to dry concrete blocks and cured for 7 days. Membrane is then peeled from the concrete blocks at a 90° angle.
2. Hydrostatic head tests are performed by applying liquid membrane on primed concrete, then sealing the waterproofed concrete to a pressure chamber. Water is introduced under pressure equivalent to 75 head feet.
3. Elastomeric membrane 3000 and 3100:

Property:	Typical Value:	Test Method:
Color	Dark gray-black	
Pliability (180° bend over 1" mandrel)	Unaffected at -25°F (-32°C)	ASTM D-146
Tensile strength: membrane	250 (psi) minimum	ASTM D-412
Tensile strength: film	4000 (psi) minimum	ASTM D-412 (Die C) modified
Elongation - ultimate failure of rubberized asphalt (%)	300 minimum	ASTM D-412 (Die C) modified
Cycling over crack	No effect after 100 cycles at 15°F (-26°C)	See footnote 1
Cycle over 1" joint	No effect after 1000 cycles at 15°F (-26°C)	See footnote 1
Puncture resistance-Bituthene Membrane (lb.)(stretched by blunt object)	40 minimum	ASTM E154
Puncture resistance: Polyethylene film	250 minimum (in. oz. tear)	ASTM D781 (Impact from sharp object)
Peel Adhesion	(Lb./in. width)	

Property:	Typical Value:	Test Method:
Resistance to hydrostatic head	150 ft. of water minimum	See footnote 2
Exposure to fungi in soil 16 wks	Unaffected	GSA-PBS 07111
Permeance-perms	0.1 Maximum 0.2 (Grains/sq.ft./in.Hg)	ASTM E-96 Method B
Water Absorption: 72 hrs	0.25 maximum (% By weight)	ASTM D-1228

Footnotes:

1. Membrane is applied across two primed blocks with no separation between blocks. At -15°F. blocks are pulled apart to 1/4", then returned to original position. Cycle is repeated 100 times. For joint cycling, the blocks are double covered with membrane, separated by 1", then cycled at -15°F between 3/4" and 1 1/4" a minimum of 1000 cycles.
  2. Hydrostatic head tests are performed by applying membrane on primed concrete, then sealing the waterproofed concrete to a pressure chamber. Water is introduced to 150 head feet.
- B. Bituthene Primer P-3000 is a rubber-based primer in solvent specifically formulated to provide good initial adhesion and excellent permanent adhesion of Bituthene Waterproofing Membranes.
- C. Bituthene Elastomeric Mastic EM-3000 is rubberized asphalt base mastic.
- D. Bituthene Liquid Membrane LM-3000 is a two-component, elastomeric cold-applied mastic grade material.
- E. Bituthene Protection Board PB-3000 is lightweight, expanded polystyrene having a nominal density of 1.0 lb./cu. ft.
1. Bituthene PB-3000 shall have the following physical properties:

Property:	Typical Value:	Test Method:
Nominal Density	1.0 lb./cu. ft.	
Thermal Conductivity K factor (BTU/Hr./Sq. Ft./F.In.)	.24 @ 40°F .26 @ 75°F	ASTM C-177
Thermal Resistance (R-Value)	1" thickness = 4 3/4" thickness = 3	ASTM C-177

- F. Bituthene Protection Board Adhesive PBA-3000 is a fast drying, rubber-based cement.
- G. All materials shall be furnished by the manufacturer whose specification is used to the extent of his standard and/or stock materials. Materials unable to be furnished by the manufacturer shall meet his reference specification requirements.
1. Contractor shall furnish a statement signed by the manufacturer or his authorized representative that the materials to be supplied are proper for the use indicated and that the manufacturer is in agreement with the Contractor's use of these material systems as they are applicable to this installation.
  2. All materials shall be delivered to the site in the original unbroken manufacturer's wrapping material with the original labels thereon.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.

- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 PREPARATION

- A. Verify that surfaces are solid, free of frozen matter, loose particles, cracks, pits, rough projections, and foreign matter detrimental to adhesion and application of waterproofing.
- B. Do not apply waterproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.
- C. The surface shall be inspected by a representative of the coatings manufacturer and by the waterproofing Contractor. A written notice to the prime Contractor shall be provided to indicate any substrate deficiencies that must be corrected prior to application of the waterproofing coatings. The start of the application work shall not commence until acceptance of the surface by the waterproofing Contractor and the representative of the manufacturer.
- D. Surface preparation: A smooth monolithic concrete surface is required. A broom surface is not acceptable. The concrete surface shall be dry, frost free, clean and cured a minimum of seven days prior to the application. The primer and membrane surface shall be free of voids, spalled areas, sharp projections, loose aggregate, and form release agents. Concrete curing compounds containing oil, wax or pigments shall not be used. Form release agents shall be the self-dissipating type that will not transfer to the concrete. Any surface defects such as cracks, holes or cavities shall be filled and finished flush with a Portland cement grout or concrete. Top surfaces of projecting ledges, below grade, except footings, shall be finished to a steep bevel with Portland cement mortar. Smooth concrete block walls shall be protected with membranes by striking off joints flush with surface.

### 3.03 INSTALLATION

#### A. Foundation Walls and Vertical Surfaces

- 1. General: The membrane, when in place, must withstand a minimum static ground water pressure of 150 feet (46 m).
- 2. Priming: Application of primer shall be limited to what can be covered by Bituthene Waterproofing Membrane in a given workday. Primed areas not covered by membrane during the workday will be re-primed. Apply primer by spray, roller or brush at a rate of 250-350 square feet per gallon. Roller should be a natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the dry surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes. Coverage of primer will vary due to the texture and porosity of the surface to receive the primer.
  - a. Bituthene Primer P-3000 should not be applied below 40°F (5°C) on vertical surfaces. At temperatures below 40°F (5°C), Bituthene P-3100 Primer must be used and it may be used up to 90°F (32°C). Allow P-3000 to dry one hour or until tack-free. Allow P-3100 to dry 30 minutes.
- 3. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8 feet in length or less. On higher walls apply two or more sections with the upper overlapping the lower by at least 2-1/2" (64 mm). Press all membrane in place with heavy hand pressure or rollers during application. Two piles of Bituthene Membrane are recommended for below grade or earth shelter applications on any wood surfaces.
- 4. Sealing Edges: Bituthene Waterproofing Membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are

terminated on the vertical surface, a reglet or counter flashing may be used or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press the edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of Bituthene EM-3000 to all vertical and horizontal terminations. Bituthene Liquid Membrane LM-3000 can be used as an alternative method.

5. Sealing Seams: All edges and seams must be overlapped at least 2-1/2" (64 mm). Apply succeeding sheets with a minimum 2-1/2" (64 mm) overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of Bituthene and press or roll in place. The edges of the patch shall be sealed with a troweling of EM-3000. Laps within 12" (300 mm) of all corners shall be sealed with a troweling of EM-3000.
6. Corner Forming: Outside corners must be free of sharp edges. Inside corners should receive a fillet formed with Liquid Membrane LM-3000, latex modified cement mortar (such as Daraweld C mixed with cement mortar) or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners:
  - a. Apply Bituthene Liquid Membrane LM-3000 six inches (150 mm) in each direction from the corner and form a fillet with a minimum 3/4" (19 mm) face.
  - b. Install an 11" (280 mm) minimum strip of Bituthene membrane centered on the corner. Install Bituthene Membrane over the treated inside and outside corners.
7. Protection of Membrane: The Bituthene Protection System shall be used on foundation walls and vertical surfaces subject to damage from other trades.

B. Horizontal Surfaces

1. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given workday. Primed areas not covered by membrane during the workday shall be re-primed. Apply by spray, roller or brush at a rate of 250 to 350 square feet per gallon. Roller should be a natural material such as lamb's wool, having a nap of approximately one inch (25 mm). Primer shall be applied to a clean, dry, frost-free and dust-free surface. Rollers should be dipped into pans to avoid pouring primer directly on the deck and creating puddles. Sufficient primer must be used to condition the surface to a dry, dust-free state suitable for the application of Bituthene Waterproofing Membranes. Coverage of primer will vary due to the texture and porosity of the surface to receive the primer.
  - a. Bituthene P-3000 Primer should not be applied below 25°F (-4°C) on horizontal surfaces.
2. Membrane Installation: Bituthene Waterproofing Membrane shall be applied to the primed surface starting at the low point. Successive sheets should overlap preceding ones by 2-1/2" (64 mm). Two plies of Bituthene Membrane are recommended for below grade or earth shelter applications on any wood surfaces. All membrane shall be firmly rolled as soon as possible to minimize bubbles. Roller shall be a linoleum roller or standard water filled garden roller less than 30" (760 mm) wide, weighing approximately 75 pounds (34 kg) when filled. Cover the face of the roller with a resilient material such as 1/2" (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Apply a double layer of Bituthene Membrane around posts or projections at least 6" (150 mm) in all directions and seal all terminations with Bituthene EM-3000. At drains, apply a bead of EM-3000 over a double layer of membrane under clamping

rings. Apply EM-3000 at all terminations and at all "T" joints at the end of each workday.

- a. An alternate method is to apply Bituthene Liquid Membrane LM-3000 around posts and protrusions, overlapping the sheet membrane a minimum of 2" (50 mm). At drains, apply LM-3000 from the center of the drain out to the sheet membrane overlapping it by a minimum of 2" (50 mm).
3. Sealing Edges: Bituthene Waterproofing Membrane shall be turned up on surrounding walls and terminated into a reglet or under counter flashing, or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of Bituthene Em-003000 to all vertical and horizontal terminations.
4. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2" (64 mm). Apply succeeding sheets with a minimum 2-1/2" (64 mm) overlap and stagger end laps. Roll the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Waterproofing Membrane. Slit any fishmouths, overlap the flaps, and repair with a patch and press or roll in place. The edges of the patch shall be sealed with a troweling of EM-3000. Laps within 12" (300 mm) of all corners shall be sealed with a troweling of EM-3000.
5. Corner Forming: Outside corners must be free of sharp edges. Inside corners should receive a fillet formed with Liquid Membrane LM-3000, latex modified cement mortar (such as Daraweld C mixed with cement mortar) or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners:
  - a. Apply Bituthene Liquid Membrane LM-3000 6" (150 mm) in each direction from the corner and form a fillet with a minimum 3/4" (19 mm) face.
  - b. Install an 11" (280 mm) minimum strip of Bituthene Membrane centered on the corner. Install Bituthene waterproofing membrane over the treated inside and outside corners.
6. Testing of horizontal waterproofing shall be by flooding the entire waterproofed area with a minimum 2" (50 mm) head of water for 24 hours. Mark any leaks and repair when the membrane is dry. Before flood testing, ascertain from the structural engineer that the structure will withstand the dead load of the water.
7. Protection of Membrane: After testing the horizontal surfaces and allowing for the membrane to dry, apply the Bituthene Protection System to the entire horizontal surface.

**\*\*\*END OF SECTION\*\*\***

**SECTION 07175**  
**WATER REPELLENT COATINGS**

**PART 1 -- GENERAL**

**1.01 SUMMARY**

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

**1.02 DESCRIPTION**

- A. Work included: Provide water repellent coatings on all masonry and masonry veneer, as specified herein, and as needed for a complete and proper installation.

**1.03 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Manufacturer's certification: Make required arrangements and pay the costs for a visit to the job site by an authorized representative of the manufacturer of the accepted water repellent coating, who shall inspect and certify that:
1. The surfaces to which the water repellent coating was to be applied were in proper condition to receive that application;
  2. The installers were properly trained in the manufacturer's recommended installation procedures and were prepared to use the application equipment recommended by the manufacturer; and
  3. The materials delivered to the job site were those accepted by the Architect for the work of this Section.
- C. Comply with State of California Volatile Organic requirements in accordance with ASTM D-4457 and ASTM D-3960.

**1.04 SUBSTITUTIONS**

Substitutions will be considered per Article 5 of the General Conditions.

**1.05 SUBMITTALS**

- A. In accordance with Article 5 of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Section;
  2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  3. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
  4. Samples of masonry veneer unit and concrete unit masonry with water repellent coating applied.
- C. Upon completion of the work of this Section, and as a condition of its acceptance, deliver to the Architect two copies of the manufacturer's certificate required under Paragraph 1.02-B above.

## 1.06 WARRANTY

Upon completion of the work of this Section, and as a condition of its acceptance, deliver to the Architect two copies of a written warranty signed by the Contractor, the water repellent coating application subcontractor, and the water repellent coating manufacturer, under which:

1. The three parties mutually agree to maintain the water repellent coated surface free from the penetration of water for a period of two years following Date of Owner accepted Final Completion; and
2. The water repellent coating manufacturer agrees to provide water repellent coating materials as required for that purpose for a period of five years following Date of Owner accepted Final Completion; and
3. These warranty services will be provided at no additional cost to the Owner.

## PART 2 -- PRODUCTS

### 2.01 MATERIALS

- A. At all unit masonry and masonry veneer walls, provide one of the following products or equal accepted in advance by the Architect:
  1. "Hydrozo Enviroseal Double 7 for brick" manufactured by Hydrozo Coatings Company, Lincoln, NE (402) 474-6981 or (800) 422-1902.
  2. Approved equal, which has been submitted under requirements of Section 01340.
- B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.

## PART 3 -- EXECUTION

### 3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the Work.
- C. Do not proceed until unsatisfactory conditions are corrected.
- D. Beginning of installation means acceptance of conditions.

### 3.02 INSTALLATION

Apply sufficient coats of the accepted material to achieve a consistent and uniform appearance, free from runs and sags, and with a uniformly resistive surface, which will successfully prevent penetration of water through the walls for the required period of warranty.

### 3.03 TESTING AND INSPECTING

- A. Twenty days after completion of this portion of the Work, and as a condition of its acceptance, demonstrate by running water test that the work of this Section will successfully repel water.
  1. Notify the Architect at least 72 hours in advance, and conduct the test in the Architect's presence.
  2. By means of an outrigger, or similar acceptable equipment, place the nozzle of a 3/4" garden hose at a point approximately 10'-0" away from the top of the wall where accepted by the Architect, aiming the nozzle at a slight downward angle to direct the full stream of water onto the wall.

3. Run the water onto the wall at full available force for not less than four hours.
  4. Upon completion of the four-hour period, inspect the interior surfaces of the wall for evidence of moisture penetration.
- B. If evidence of moisture penetration is discovered, apply an additional coat of the accepted water repellent to the exterior surface in areas directed by the Architect, repeating the application and the testing (at no additional cost to the Owner) until no evidence of moisture penetration is found.

**\*\*\* END OF SECTION \*\*\***