Percolation rates describe the movement of water horizontally and downward into the soil from a boring or pit. Infiltration rates describe the downward movement of water through a horizontal surface, such as the floor of a retention basin. Percolation rates are related to infiltration rates, but are generally higher and require conversion before use in basin design.

The percolation test data from BH-11 was used to estimate infiltration rates using the Porchet Inverse Borehole Method, in accordance with Riverside County guidelines. A conversion factor derived from California Test 750 (Caltrans, 1986) was applied to adjust for the presence of the gravel and pipe within the borehole. The minimum required factor of safety of 2 was applied to the measured infiltration rates to account for subsurface variations, uncertainty in the test method, and future siltation. The infiltration structure designer should determine whether additional design-related safety factors are appropriate.

The measured percolation test data and calculations for conversion to infiltration rates, porosity correction, and factor of safety for BH-11 are shown on the following Plate No. 1 *Estimated Infiltration Rate from Percolation Test Data* sheet. The BH-11 infiltration rates throughout the test period are shown on the following Drawing No. C1, *Infiltration Rate versus Time sheets*. The calculated infiltration rates for the first two data points for BH-11 are artificially low because all of the water seeped away before the 25 minute periods ended. The estimated infiltration rate at the test hole BH-11 is presented in the following table.

Table No. C-1, Estimated Infiltration Rate

Percolation Test	Depth (feet)	Soil Type	Measured Infiltration Rate (inches/hour)	Design Infiltration Rate (inches/hour)
BH-11	5.0	Silty Sand (SM)	5.65	3.00

The percolation test data from BH-12 was used to estimate the seepage pit percolation rate, in accordance with Riverside County DEH guidelines. A conversion factor derived from California Test 750 (Caltrans, 1986) was applied to adjust for the presence of the gravel and pipe within the borehole. The minimum required factor of safety of 2 was applied to the measured percolation rates to account for subsurface variations, uncertainty in the test method, and future siltation. The infiltration structure designer should determine whether additional design-related safety factors are appropriate.

The measured percolation test data and calculations for conversion to the seepage pit percolation rate, porosity correction, and factor of safety for BH-12 are shown on the following Plate No. 2 *Estimated Seepage Pit Percolation Rate from Percolation Test Data* sheet. The BH-12 seepage pit percolation rates throughout the test period are shown on the following Drawing No. C2, *Seepage Pit Percolation Rate versus Time*

sheets. The estimated seepage pit percolation rate at the test hole BH-12 is presented in the following table.

Table No. C-2, Seepage Pit Percolation Rate

Percolation Test	Depth (feet)	Soil Type	Measured Seepage Pit Percolation Rate (gal/s.f/day)	Design Seepage Pit Percolation Rate (gal/s.f/day)
BH-12	50.0	Silty Sand (SM)	1.37	1.37

Estimated Infiltration Rate from Percolation Test Data, BH-11

Project Name	Proposed NuView Library Expansion
Project Number	06-81-245-03
Test Number	BH-11
Personnel	Jay Burnham
Presoak Date	3/2/2015
Test Date	3/2/2015

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	60
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	1.89
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.52
Factor of Safety (FOS), F	2

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	25.00	24.00	60.00	25.00	36.00	0.00	36.00	18.00	8.64	4.46	2.23
2	25.00	21.00	60.00	50.00	39.00	0.00	39.00	19.50	8.71	4.49	2.25
3	10.00	24.00	60.00	80.00	36.00	0.00	36.00	18.00	21.60	11.14	5.57
4	10.00	17.76	60.00	110.00	42.24	0.00	42.24	21.12	21.92	11.31	5.65
5	10.00	21.84	58.32	140.00	38.16	1.68	36.48	19.92	19.97	10.30	5.15
6	10.00	21.84	58.08	170.00	38.16	1.92	36.24	20.04	19.73	10.18	5.09
7	10.00	21.60	58.08	200.00	38.40	1.92	36.48	20.16	19.75	10.19	5.09
8	10.00	21.60	57.84	230.00	38.40	2.16	36.24	20.28	19.52	10.07	5.03

Recommended Design Infiltration Rate (inches/hr)	**3.00**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

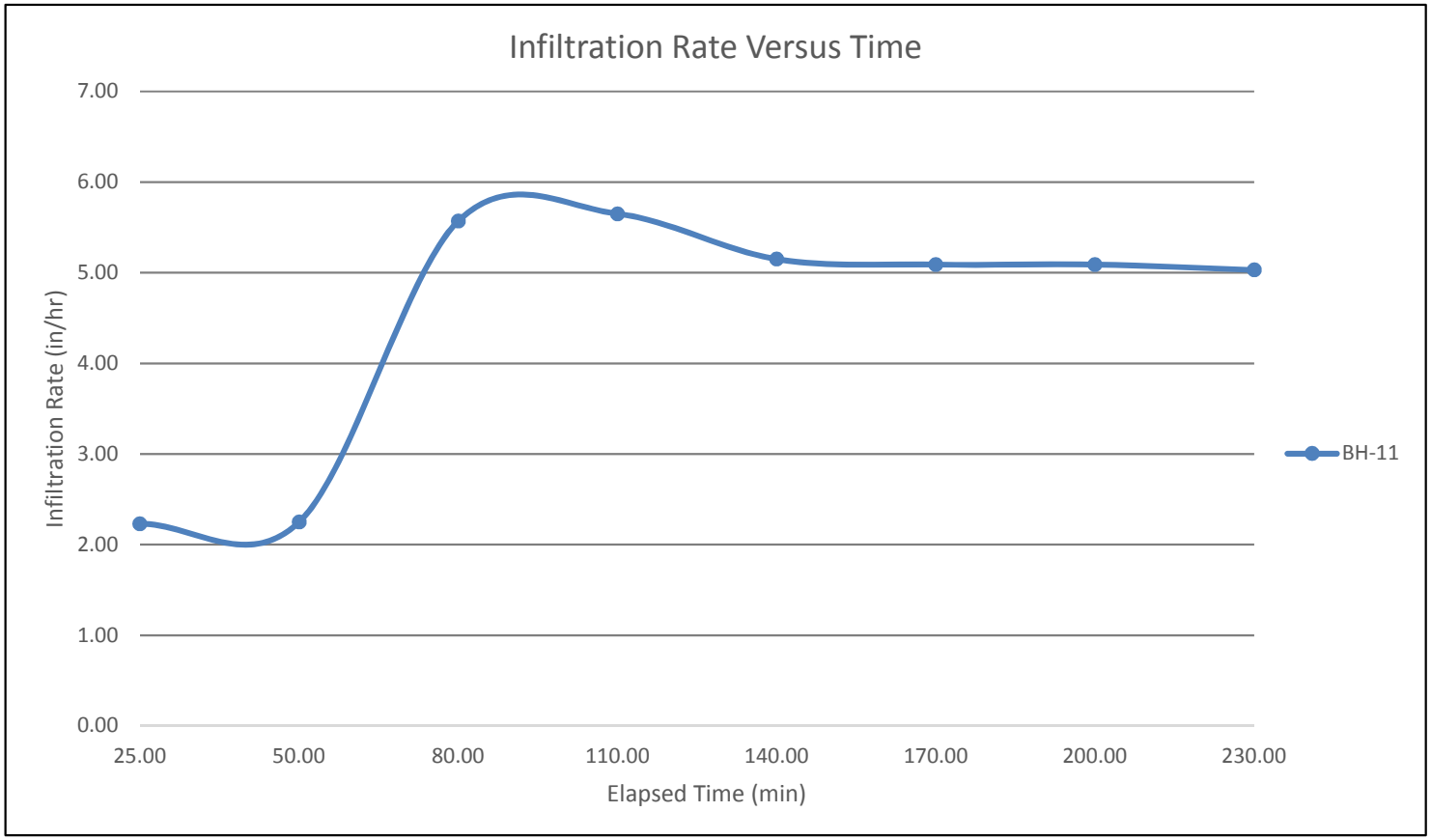
$I_f = I_C * F$

Plate No.

1

Infiltration Rate versus Time, BH-11

Project Name	Proposed NuView Library Expansion
Project Number	06-81-245-03
Test Number	BH-11
Personnel	Jay Burnham
Presoak Date	3/2/2015
Test Date	3/2/2015



Drawing No.
C1

Estimated Seepage Pit Percolation Rate from Percolation Test Data, BH-12

Project Name	Proposed NuView Library Expansion
Project Number	06-81-245-03
Test Number	BH-12
Personnel	Jay Burnham
Presoak Date	3/2/2015
Test Date	3/3/2016

Shaded cells contain calculated values.

Test Hole Diameter, D (feet)	0.67
Test Hole Radius, r (inches)	4.00
Total Depth of Test hole, D_T (feet)	50
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	1.89
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.52
Factor of Safety (FOS), F	2

Interval No.	Time Interval, T (Hours)	Initial Depth to Water, D_0 (feet)	Final Depth to Water, D_f (feet)	Elapsed Time (Hour)	Initial Height of Water, H_0 (feet)	Final Height of Water, H_f (feet)	Drop During Time Interval, F (feet)	Average Wetted Depth, L (feet)	Rate through sidewall per day, Q (gal/s.f./day)	Corrected Rate, Qc (gal/s.f./day)	Rate with FOS, Q_f (gal/s.f./day)
1	0.50	7.00	27.70	0.50	43.00	22.30	20.70	32.65	7.61	3.92	1.96
2	0.50	7.00	23.72	1.00	43.00	26.28	16.72	34.64	5.79	2.99	1.49
3	0.50	7.00	25.52	1.50	43.00	24.48	18.52	33.74	6.59	3.40	1.70
4	0.50	7.00	23.85	2.00	43.00	26.15	16.85	34.58	5.85	3.02	1.51
5	0.50	7.00	23.56	2.50	43.00	26.44	16.56	34.72	5.72	2.95	1.48
6	0.50	7.00	23.22	3.00	43.00	26.78	16.22	34.89	5.58	2.88	1.44
7	0.50	7.00	22.98	3.50	43.00	27.02	15.98	35.01	5.48	2.82	1.41
8	0.50	7.00	22.74	4.00	43.00	27.26	15.74	35.13	5.38	2.77	1.39
9	0.50	7.00	22.66	4.50	43.00	27.34	15.66	35.17	5.34	2.76	1.38
10	0.50	7.00	22.62	5.00	43.00	27.38	15.62	35.19	5.33	2.75	1.37
11	0.50	7.00	22.58	5.50	43.00	27.42	15.58	35.21	5.31	2.74	1.37
12	0.50	7.00	22.62	6.00	43.00	27.38	15.62	35.19	5.33	2.75	1.37

Recommended Design Percolation Rate (gal/s.f./day)	**1.37**

Seepage pit percolation rate calculations are based on the Riverside County OWTS Installation Guide

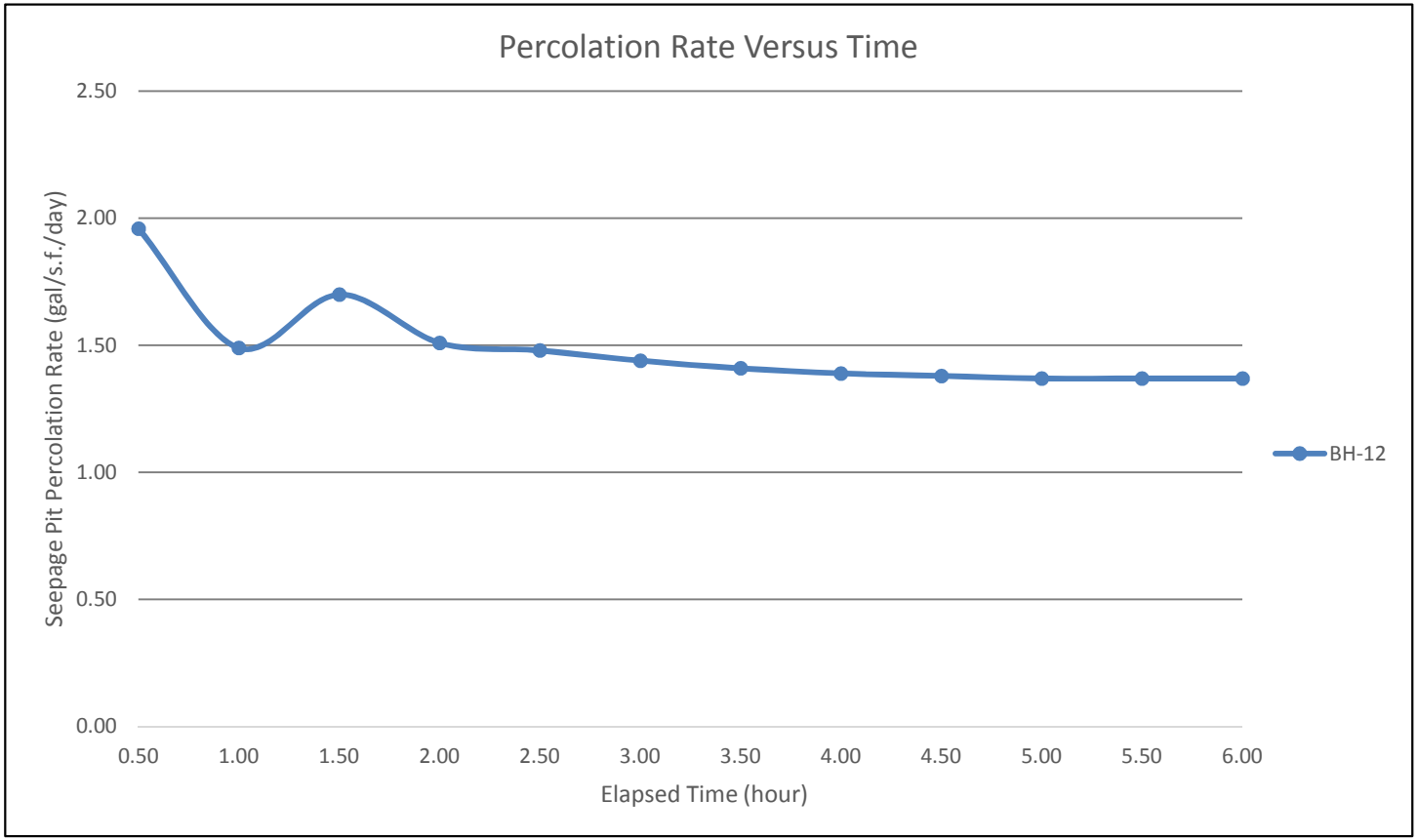
$H_0 = D_T - D_0$
$H_f = D_T - D_f$
$F = H_0 - H_f$
$L = (H_0 + H_f) / 2$
$Q=((F/T) * (D * 9)) / (L)$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.
$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$
$I_c = I_t * C$
$I_f = I_C * F$

Plate No.
2

Seepage Pit Percolation Rate versus Time, BH-12

Project Name	Proposed NuView Library Expansion
Project Number	06-81-245-03
Test Number	BH-12
Personnel	Jay Burnham
Presoak Date	3/2/2015
Test Date	3/3/2016



Drawing No.
C2

Appendix D

Dry Seismic Settlement Analysis

APPENDIX D

DRY SEISMIC SETTLEMENT ANALYSIS

The subsurface data obtained from the 50-foot borings BH-4 and BH-12 drilled during the field investigation was used to evaluate the dry seismic settlement due to potential densification of relatively loose sediments subjected to ground shaking during earthquakes.

The dry seismic settlement analysis was performed using Liquefy Pro (Civiltech, 2012). A disaggregated mean earthquake magnitude of M7.2 and a peak ground acceleration (PGA) of 0.629g, where g is the acceleration due to gravity, were selected for this analysis. The PGA was calculated using the U.S. Seismic Design Map tool (USGS, 2016) and is based on the California Building Code (CBSC, 2013) and ASCE Standard 7-10 (ASCE, 2013) Equation 11.8-1. A factor of safety against liquefaction of 1.3 was utilized in accordance with California Geological Society Special Publication 117A: *Guidelines for Evaluating and Mitigating Seismic Hazards in California* (CGS, 2008). Groundwater was not considered because the historic high groundwater level at the site is estimated to be deeper than 100 feet bgs.

The result of our analysis is presented on Plate D-1 and D-2 and in the following table.

Table D-1, Estimated Dry Soils Seismic Settlement

Location	Dry Seismic Settlement (inches)
BH-4	3.46
BH-12	6.22

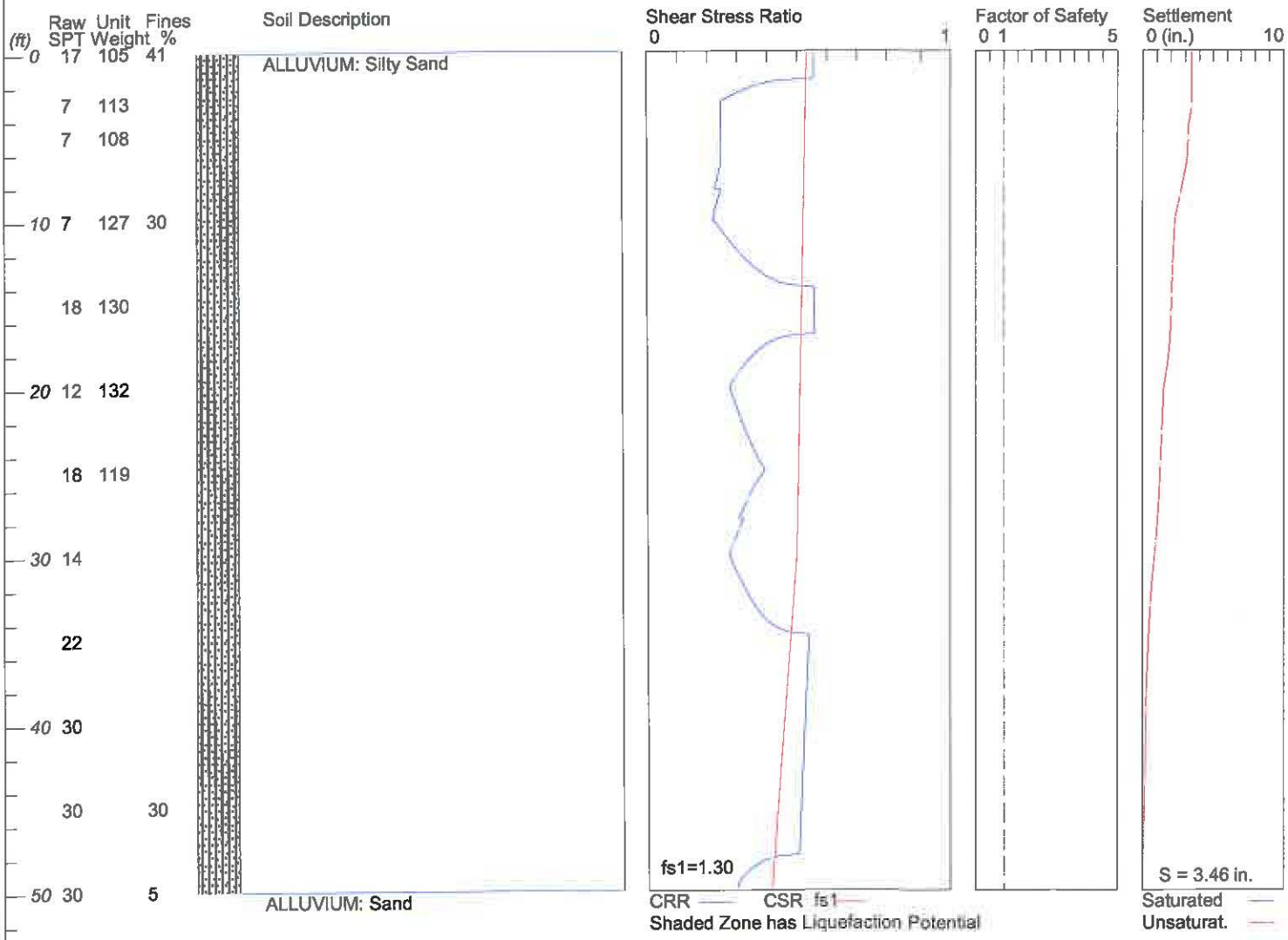
Based on our analysis, the site has the potential for up to 6.2 inches of dynamic dry settlement, and up to 2.7 inches of differential settlement over a distance of 40 linear feet.

LIQUEFACTION ANALYSIS

Proposed NuView Library Expansion

Hole No.=BH-4 Water Depth=100 ft Surface Elev.=1469

Magnitude=7.2
Acceleration=0.629g

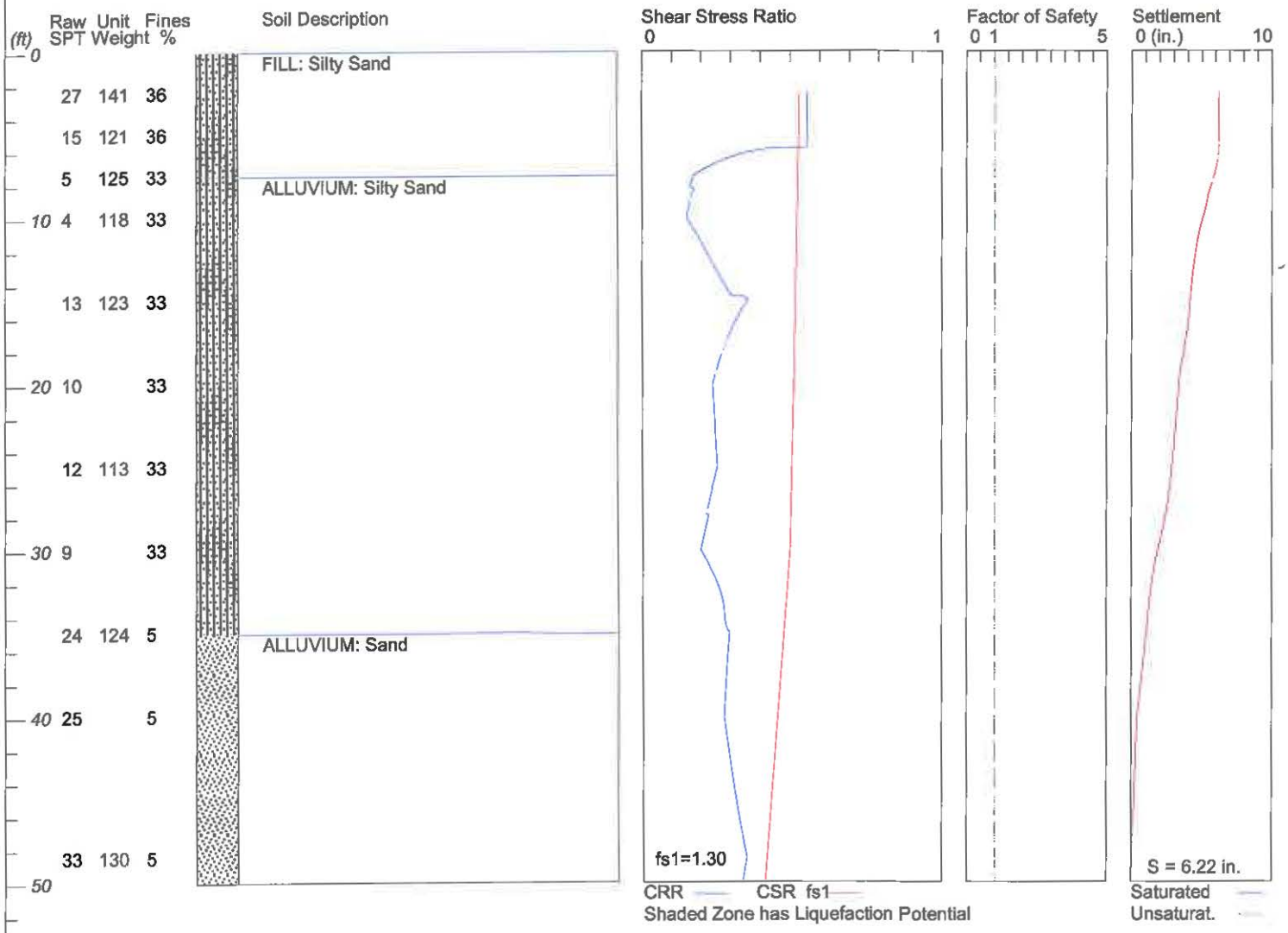


LIQUEFACTION ANALYSIS

Proposed NuView Library Expansion

Hole No.=BH-12 Water Depth=100 ft Surface Elev.=1469

Magnitude=7.2
Acceleration=0.629g



(ft)	Raw SPT	Unit Weight	Fines %
0			
	27	141	36
	15	121	36
	5	125	33
10	4	118	33
	13	123	33
20	10		33
	12	113	33
30	9		33
	24	124	5
40	25		5
	33	130	5
50			
60			
70			

SECTION 02 41 13

SELECTIVE DEMOLITION AND RECONSTRUCTION

PART 1 -- GENERAL

1.01 SUMMARY

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

1.02 SCOPE OF WORK

A. Work included:

1. Carefully demolish and remove from the site those items scheduled to be so demolished and removed. Furnish materials and perform labor required to execute this work as required by the Drawings and/or as specified and as necessary to complete the Contract, including, but not limited to, these major items:

    a. Protection of existing work to remain.

    b. Barricades, lights, signs and safety precautions required by governing codes.

    c. Removal and disposition of all material resulting from this work, except materials to be stored for Owner.

    d. Patching as necessary to match existing.

    e. Saw-cutting existing concrete and asphalt concrete.

    f. Cleaning existing items to remain.

    g. Relocation of existing items as necessary to provide for new construction and as required by the Drawings.

    h. Removal and/or relocation of utility lines (water, electric, sewer) as required by the Drawings, and such lines not shown but encountered in the course of the work.

    i. Removal and/or relocation of existing irrigation lines.

B. Related scope: All new work

1.03 GENERAL REQUIREMENTS

A. Codes: Perform all work in accordance with the Codes listed in the Contract Documents and as required by local governing authority.

B. All bidders submitting bids for this work shall first examine the site and all conditions and limitations thereon and thereabouts. Bid shall take into account all such conditions and limitations, whether or not the same are specifically mentioned in any of the contract documents and every bid shall be construed as including whatever sums are needed to complete the work in every part as shown, described, or reasonably required or implied, and attain the completed conditions contemplated by the Contract. The demolition drawings, including demolition work shown on construction drawings, shall be considered as a guide only. The exact extent of the demolition and reconstruction work shall be determined by a site visit and investigation.

C. Partial removal: Items scheduled to be removed and of salvageable value to Contractor, excluding those items to be retained by the Owners, may be removed from the structure as work progresses. Salvaged items must be transported from site as they are removed.

Storage or sale of removed items on site will not be permitted.

D. Noise control: Carry on all work in a manner which will produce the least amount of noise.

Instruct all workmen in noise control procedures.

E. Items of existing work indicated to remain upon completion of the Contract, but which require removal to complete the work, shall be carefully removed and replaced upon completion. The replaced work shall match its condition at the start of the work.

1.04 QUALITY ASSURANCE

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.

1.05 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.06 SUBMITTALS

Provide in accordance with Article 3 of the General Conditions.

PART 2 -- PRODUCTS

Provide as necessary for proper completion of this Work.

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 GENERAL PROVISIONS

A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.

B. In company with the Architect and Owner, after receiving Notice to Proceed, visit the site and verify the extent and location of selective demolition required.

1. Carefully identify limits of selective demolition.

2. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.

C. Take into consideration as necessary work, all obvious existing conditions and installations on the site as though they were completely shown or described. Accept the site of the work as it exists and clear obstructions to the work shown.

D. Examine the site and all conditions and limitations thereon and thereabouts. Take into account all such existing conditions and limitations whether or not the same are specifically shown or mentioned in any of the Contract Documents and include whatever is needed to complete the work in every part as shown, described or reasonably required or implied to attain the completed condition contemplated by the Contract.

E. Prepare and follow an organized plan for demolition and removal of items.

1. Shut off, cap, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction. Review plans, and

confer with the Architect, to determine which lines are to be abandoned and which are to be kept active.

2. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid, and ready to receive new materials specified in other Sections of these Specifications.

3. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.

F. Demolished material shall be considered to property of the Contractor and shall be completely removed from the job site. Do not store or permit debris to accumulate on the site. Burning of removed materials from demolished operations will not be permitted on site.

3.03 POLLUTION CONTROLS

A. Use temporary enclosures and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work.

3.04 PROTECTION

A. Site security: Erect wire or solid wood fences, barricades, warning lights and signs as required by the governing building code, to protect all manner of person from injury, to prevent trespassing, and to prevent theft or damage to the work.

B. Protection of work to remain: Use stakes, barricades, and such other means of protection as required to prevent damage to existing work and equipment to remain.

C. Protect all landscaping scheduled to remain.

D. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

1. Erect temporary covered passageways as required by authorities having jurisdiction.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of building structure to remain.

3.05 TRAFFIC

A. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

B. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.06 UTILITY SERVICES

A. Maintain existing utilities, keep in service, and protect against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

3.07 REPLACEMENTS

A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the acceptance of the Architect and at no additional cost to the Owner.

B. Patch and fill holes caused by removal of piping and conduit in concrete slabs, and concrete walls with 3,000 psi concrete; level flush with adjacent surfaces.

3.08 ASPHALT CONCRETE PAVEMENT

All asphalt concrete pavement damaged, cut, trenched, etc. and any base material under the pavement shall be replaced and/or repaired using same specifications as existing pavement.

3.09 REMOVED MATERIALS TO BE SALVAGED OR REUSED

A. Materials to be salvaged will be noted as such on the Construction Drawings. Existing Vertical blinds shall be included in salvage. Where room sizes match blind sizes, Contractor to include reinstallation of blinds as directed by Owner. Blinds shall be cleaned prior to reinstallation.

B. Exercise extreme care when removing materials to be salvaged or reused. Use only mechanics skilled in the appropriate crafts.

C. Store and protect salvaged materials until needed to be re-installed on the project, or deliver to Owner in good condition.

3.010 DEMOLITION

A. Asphalt Concrete: Remove existing asphalt concrete and base material scheduled to be removed and prepare surface in accordance with Section 02510. All edges shall be saw-cut in straight and true lines.

B. Concrete: Exercise due caution in cutting and/or patching concrete so as not to damage or deface that portion of the existing structure which is to remain. Should any such impairment occur, immediately clean or restore to original condition at no cost to Owner.

3.011 RECONSTRUCTION - GENERAL

A. By careful study of the Contract Documents, determine the location and extent of reconstruction to be performed.

B. In company with the Architect, visit the site and verify the extent and location of reconstruction required.

C. Inspect existing surfaces to determine required surface preparation procedures.

D. Plumbing and Electrical: In any case where a new line may tie into and extend existing line within the limits of the reconstruction Work, Contractor shall examine the entire existing line and determine whether the new Work will be adversely affected by it, and notify Architect of any such defect before tying in.

3.012 IN ALL RECONSTRUCTION WORK

Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

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

SECTION 03 50 80

UNDERSLAB VAPOR BARRIER

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

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.

C. Related Sections:

1. Prepare subgrade according to Section 02 20 00 and/or the Soils Report.
2. Concrete is specified in Section 03 30 00.

1.02 SUBMITTALS

A. Provide in accordance with Article 3 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 the Instructions to Bidders, Section 3.3 Substitutions.

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 03 10 00

CONCRETE FORMWORK AND ACCESORIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK

A. Design, furnish and install forms for concrete as indicated on drawings and specified here. Remove forms and shores at specified time. Clean up.

1.03 RELATED WORK (See also Table of Contents)

A. Rough Carpentry: Section 06 10 00.

B. Structural Steel: Section 05 12 00.

C. Metal Fabrications: Section 05 50 00.

D. Items relating solely to mechanical or electrical work are included under those Divisions, except as specifically indicated otherwise on Drawings.

E. Reinforcing Steel: Section 03 20 00.

F. Cast-In-Place Concrete: Section 03 30 00.

1.04 QUALITY ASSURANCE

A. General:

1. Conform to all requirements of ACI 347 and CBC Section 1906.1 and 1906.2.

2. Concrete formwork shall be designed and constructed to safely support fluid concrete and superimposed construction loads without excessive deflection or concrete leakage. Provide bracing to maintain accurate alignment and to resist all anticipated lateral loads. Forms shall conform with drawings as to shape, line, and dimension. Design, engineering and construction of forms shall be Contractor's responsibility. Formwork for exposed concrete shall be constructed to tolerances indicated in ACI 303R.

3. Cooperate and coordinate with other trades who furnish and/or install piping, conduit, reglets, anchors, inserts, sleeves, hangers, etc., as their work requires; including provisions for recesses and chases.

B. Submittals:

1. Product Data. Provide manufacturers data and installation instructions for the following:

a. Tie rods and spreaders.

b. Formwork for exposed concrete.

c. Form coatings and release agents.

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

1. Current California Building Code (CBC).

2. "Recommended Practice for Concrete Formwork", ACI 347, American Concrete Institute, latest edition.

3. Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (For Douglas Fir Form Lumber).

4. U.S. Product Standard PS 1-83 (For Plywood Form Lumber).
5. “Guide to Cast-In-Place Architectural Concrete Practice”, ACI 303R, American Concrete Institute, latest edition.

1.05 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.06 SUBMITTALS

Provide in accordance with Article 3 of the General Conditions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Form Material:
   1. Smooth Concrete exposed to view: 5/8 inch minimum APA Plyform or steel.
   2. Concrete concealed from view: 5/8 inch minimum APA Plyform, steel or clean and sound 1 x 8 Standard Grade Douglas Fir.

B. Fiber Forms: Tubular column forms spirally constructed of laminated plies of fiber. Plies shall be laminated using a non-water sensitive adhesive and surface wax impregnated for moisture protection. Forms shall give a smooth and seamless appearance to the cast concrete. Provide reveals, as shown on the drawings, as supplied by the form manufacturer. Forms shall be as manufactured by Sonoco Products, plastic lined; Burke Smoothtube by Burke Co.; or approved equal.

C. Form Clamps: Assembly to have cone washers, (1 inch break back) 3/8” inch center rod.

D. Form Ties:
   1. Concrete exposed to view: Snap ties allowing full 1 inch break back.
   2. Concrete concealed from view: Snap ties or wire.
   3. Verify special spacing requirements with architectural drawings at exposed concrete.

E. Spreaders: Metal (no wood).

F. Form Coating: Non-grain and non-staining types of form coating that will not leave a residual matter on the face of the concrete or adversely affect proper bonding of any subsequent paint or other surface applications.
   1. Form coating containing mineral oils or other non-drying materials will not be permitted for any concrete work.

G. Joint Tape: No. 471 plastic film tape 3 inches wide, as manufactured by the Industrial Tape Division of 3M Company.

H. Expansion Joint Filler (Preformed): ½ inch thick; Flexcell by Celotex Corporation, Elastic Fiber Expansion Joint by Phillip Carey Mfg. Co., or Sealtight Fiber Expansion Joint by W.R. Meadows, Inc.

I. Extruded Polystyrene Foam: ASTM C578 type IV. Dow Chemical Corp. "Styrofoam", UC Industries "Foamular", or approved equal.

PART 3 – EXECUTION

3.01 FORM CONSTRUCTION

A. Construct substantial forms to the shapes, lines, grades and elevations shown, sufficiently tight to prevent leakage of mortar, and tied, clamped and braced to prevent spreading, shifting or settling. Plywood joints shall be square and tight; plywood shall be arranged in such manner as to minimize number of joints and to provide a smooth, attractive finished concrete surface.

B. Apply form coating to forms before reinforcing steel is in place.

C. Sleeves, anchors and bolts, including those for angle frames, supports, ties and other materials in connection with concrete construction, shall be secured in position before the concrete is placed.

D. Proper provisions shall be made for openings, blockouts, sleeves, offsets, sinkages, recesses and depressions required by other trades and suppliers prior to placing concrete.

1. The Contractor shall also see that sleeves have been installed and other provisions have been made for the installation of mechanical, electrical and other equipment.

2. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.

E. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, with no additional cost to the Owner.

F. Form Not Required: Concrete footings may be poured directly against cut earth where feasible and when the Architect's approval has been obtained.

1. See structural drawings for requirements for placing concrete footings directly against earth without forms.

G. Use ¾ inch minimum wood chamfer strips typical at all exposed corners unless noted otherwise on drawings.

3.02 CLEANING OF FORMS

A. All dirt, chips, sawdust, rubbish, water, etc. shall be completely removed from form by water hosing and air pressure before any concrete is deposited therein. No wooden ties or blocking shall be left in concrete except where indicated for attachment of other work.

B. Thoroughly clean and patch all holes in formwork and re-coat as required before reusing. Forms not suited to obtain concrete surfaces and tolerances in conformity with Contract requirements will be rejected by Architect.

1. Reuse of forming materials shall be limited only as required to produce the finishes as specified, free from blemishes and other defects unless covered by other building materials in which case blemish free concrete is not required.

3.03 INSPECTION OF FORMS

A. Notify the Architect at least 48 hours in advance of the beginning of pouring operations and at the completion of formwork and location of all construction joints. An inspection of forms and joints will be made for approval of finished work and general layout only. The foregoing inspection shall in no way relieve the Contractor of responsibility of design and safety or formwork, bulkheads and shorings.

3.04 REMOVAL OF FORMS AND SHORING

A. Do not remove forms until concrete has attained sufficient strength to support its weight and any construction loading. Concrete must be allowed to cure long enough to avoid damage during form removal. Contractor or his representative in charge of concrete construction shall

be present during removal of forms and shores, and shall be personally responsible for safety of this operation at all times and under all conditions.

B. As a minimum, formwork and shoring shall remain in place for the following periods:

1. Concrete on grade: 24 hours
2. Walls and Columns: 3 days
3. Formwork may be removed and reshores installed before the times indicated above, provided the concrete has cured sufficiently to avoid damage when formwork is removed. Shores must be immediately replaced with reshores in a sequence designed to avoid inducing stress in the concrete member.

3.05 ADJUSTING AND CLEANING

A. Upon completion of this Work, clean up and remove from Site all equipment and debris resulting from this work.

B. Surfaces to be painted shall be smooth and free of substances such as dirt, wax, excessive latence, grease or materials that would prevent proper bonding of finishes.

1. Removal of foregoing contaminants, and complete removal of parting and curing compounds affecting proper paint bond, shall be responsibility of this Section of Work. Sandblast cleaning shall not be employed without specific approval of Structural Engineer.

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

SECTION 03 20 00

REINFORCING STEEL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK

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.

1.03 RELATED WORK (See also Table of Contents)

A. Concrete Formwork: Section 03 10 00.

B. Cast-In-Place Concrete: Section 03 30 00.

1.04 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. Current 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 Current 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.

1.05 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.

1.06 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.07 SUBMITTALS

Provide in accordance with Article 3 of the General Conditions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Reinforcement Bars: ASTM A615, Grade 60 for all bars.

1. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.
2. Longitudinal reinforcement in column and beams of special moment-resisting frames shall meet the chemical requirements of ASTM A706.

B. Stirrups and Ties: ASTM A615, Grade 60 for all 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

3.01 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.

3.02 CONDITION OF SURFACES

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

3.03 GENERAL

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

3.04 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 03 21 00

SYNTHETIC FIBER REINFORCEMENT

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SECTION INCLUDES

A. Polypropylene fibers used as concrete secondary reinforcement.

1.03 RELATED SECTIONS

A. Section 03 20 00 - Reinforcing Steel.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.04 REFERENCES

A. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

B. ASTM C 1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

C. Southwest Certification Services (SWCS), Omega Point Laboratories No. 8662-1.

D. UL Report File No. R8534-11.

1.05 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.06 SUBMITTALS

A. Provide in accordance with Article 3 of the General Conditions.

B. Product Data: Submit manufacturer's product data, including application rate and mixing instructions.

C. Samples: Submit manufacturer's sample of synthetic fiber reinforcement.

D. Manufacturer's Certification:

1. Submit manufacturer's certification that synthetic fiber reinforcement complies with specified requirements.

2. Submit evidence of manufacturer's ISO 9001:2000 certification.

3. Submit evidence of satisfactory performance history of synthetic fiber reinforcement.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Synthetic fiber reinforcement manufactured in ISO 9001:2000 certified facility.

2. Minimum 10-year satisfactory performance history of specified synthetic fiber reinforcement.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver synthetic fiber reinforcement in manufacturer's original, unopened, undamaged containers and packaging, with labels clearly identifying product name,

unique identification number, code approvals, directions for use, manufacturer, and weight of fibers.

B. Storage:

1. Store synthetic fiber reinforcement in clean, dry area indoors in accordance with manufacturer's instructions.

2. Keep packaging sealed until ready for use.

C. Handling: Protect synthetic fiber reinforcement during handling to prevent contamination.

PART 2 -- PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Propex Operating Company, LLC, PO Box 22788, Chattanooga, Tennessee 37422. Toll Free (800) 621-1273. Website: www.fibermesh.com

E-mail: fibermesh@propexglobal.com.

2.02 SYNTHETIC FIBER REINFORCEMENT

A. Synthetic Fiber Reinforcement: Fibermesh 300.

1. Material: 100 percent virgin homopolymer polypropylene multifilament fibers, containing no reprocessed olefin materials.

2. Conformance: ASTM C 1116, Type III.

3. Fire Classifications:

a. UL Report File No. R8534-11.

b. Southwest Certification Services (SWCS), Omega Point Laboratories No. 8662-1.

4. Fiber Length: Graded and Single-cut lengths.

5. Alkali Resistance: Alkali proof.

6. Absorption: Nil.

7. Specific Gravity: 0.91.

8. Melt Point: 324 degrees F (162 degrees C).

PART 3 -- EXECUTION

3.01 MIXING

A. Add synthetic fiber reinforcement to concrete mixture in accordance with manufacturer's instructions.

B. Add synthetic fiber reinforcement into concrete mixer before, during, or after batching other concrete materials.

C. Application Rate: Add synthetic fiber reinforcement at standard application rate of 1.5 pounds per cubic yard (0.90 kg/m^3) of concrete.

D. Mix synthetic fiber reinforcement in concrete mixer in accordance with mixing time and speed of ASTM C 94 to ensure uniform distribution and random orientation of fibers throughout concrete.

E. Concrete shall be as specified in Section 03 30 00.

3.02 PLACING AND FINISHING

A. Placing and finishing concrete shall be as specified in Section 03 30 00.

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

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK

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.

1.03 RELATED WORK (See also Table of Contents)

A. Concrete Formwork: Section 03 10 00.

B. Reinforcing Steel: Section 03 20 00.

C. Structural Steel: Section 05 12 00.

D. Metal Fabrications: Section 05 50 00.

1.04 QUALITY ASSURANCE

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

1. Current 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 302	Guide for Concrete Floor and Slab Construction
f.	ACI 305R	Hot Weather Concreting
g.	ACI 318	Building Code Requirements for Reinforced Concrete
h.	ACI 360	Design of Slabs-On-Ground

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

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 03 20 00 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 Current 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 03 21 00 for reinforcing steel tests and inspections.

5. Provide concrete batch plant inspections per ASTM C685.

1.05 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.06 SUBMITTALS

Provide in accordance with Article 3 of the General Conditions.

PART 2 – PRODUCTS

2.01 MATERIAL

A. Portland Cement: ASTM C 150, 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 115 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 2.02.A.4

2.02 CONCRETE

A. Concrete Mixes:

1. Type A Concrete:

Strength: 4000 lbs. per square inch at 28 days.

Maximum Aggregate Size: 1-1/2 inch.

Cement Content: As required by mix design (ACI 318 Section 5.2).

6.0 sacks per yard minimum.

Maximum Water to Cement Ratio: 0.52

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: 4000 lbs. per square inch at 28 days.

Maximum Aggregate Size: 1 inch.

Minimum Cement Content: As required by mix design. (ACI 318 Section 5.2).

6.0 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: 2500 lbs. per square inch at 28 days.

   Maximum Aggregate Size: 1 inch.

   Minimum Cement Content: As required by mix design (ACI 318 Section 5.2).

   6.0 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.

4. 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 exposed to freeze-thaw cycles.

   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.

2.03 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

3.01 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. For slab on grade construction, see Section 3.1.E.

    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.

5. For slabs, construction joints shall be in locations shown on plan. If not shown, locate at intervals not exceeding 150 feet in each direction. Refer to drawings for proper details for reinforcing at construction joints.

E. Concrete Slabs on Grade:

1. Exterior and interior 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 minimum of four (4 inch) inches of compacted crushed rock, unless otherwise indicated, over a vapor retarder.
3. Protect slab on grade subbase from moisture prior to placing concrete. Avoid wetting rock layer to allow adequate concrete curing and avoid future vapor transmission. If the subbase has been wet excessively, verify that water has been eliminated prior to placement of concrete.
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 laid out in a checkerboard pattern; pour 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:
1. Unless otherwise indicated, use 3/8 inch thick expansion joint filler. See Section 2.1 H
2. Joints in interior slabs on grade shall be only in locations indicated.
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.

3.02 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.

3.03 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. Slabs on grade – Comply with F_F & F_L as specified by Architect, or at a minimum shall be sufficiently even to contact a 10' long straightedge with a tolerance of 1/8 inch.

c. Concrete over metal deck – Refer to Section 05 30 00 for minimum requirements, or at a minimum shall be sufficiently even to contact a 10' long straightedge with a tolerance of 1/8 inch.

d. Elevated slabs – Comply with Architectural requirements.

e. 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 qualities 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.

3.04 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.

3.05 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. “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.

3.06 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.

3.07 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.

3.08 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 03 32 00

CONCRETE SEALERS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

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

1.02 SCOPE OF WORK

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.

C. Related work:

1. Documents affecting work of this Section included, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications.

2. Section 03 30 00: Cast-In-Place Concrete

3. Section 03 35 00: Concrete Finishing

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 the Instructions to Bidders, Section 3.3 Substitutions.

1.05 SUBMITTALS

A. Provide in accordance with Article 3 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. "Lithocrome" 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. "Lithocrome 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 form 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 03 35 00

CONCRETE FINISHING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

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

1.02 SCOPE OF WORK

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 the Instructions to Bidders, Section 3.3 Substitutions.

1.05 SUBMITTALS

A. Submit in accordance with Article 3 of the General Conditions.

B. Product data, 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.

1.07 CLOSE-OUT: also comply with the requirements of Section 01 77 00 – Contract Closeout.

A. Reports: None required.

B. As-Builts: Not required

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of General Conditions.

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 team (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 04 05 13

MORTAR AND GROUT

PART 1 -- GENERAL

1.01 SUMMARY

In the event of conflicts between the information below and any article of the General Conditions, the General Conditions shall always take precedence.

1.02 SCOPE OF WORK

Work included in this Section: Mortar and grout for masonry.

1.03 SUBSTITUTIONS

Substitutions will be considered per the General Conditions.

1.04 SUBMITTALS

Provide in accordance with the General Conditions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperatures to minimum 40° F prior to, during, and 48 hours after completion of masonry work.

B. Protect construction from direct exposure to wind and sun when erected in ambient air temperature of 99° F in the shade, with relative humidity less than 50%.

1.07 MIX TESTS

A. Testing of Mortar Mix: in accordance with ASTM C780. Test mortar mix for compressive strength. Refer to structural drawings for required strength.

B. Testing of Grout Mix: in accordance with ASTM C1019. Test grout mix for compressive strength. Refer to structural drawings for required strength.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, Type I or II (Type I for glass block).

B. Mortar Aggregate: ASTM C144, standard masonry type.

1. Provide clean, sharp, well-graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter complying with UBC Standards.

2. Not less than 3% shall pass the No. 100 sieve.

C. Hydrated Lime: ASTM C207, Type S.

D. Grout "Course": 1 part Portland cement to 2-1/4 parts minimum to 3 parts maximum of damp loose sand to 1/10 part lime putty and 2 parts coarse of maximum 3/8 inch aggregate with sufficient water to achieve fluid consistency per ASTM C476. Not less

than 5% of the sand shall pass No. 100 sieve. Use in grout spaces 2 inches wide or more and in all filled cell construction.

E. Grout "Fine": 2-1/4 to 3 parts maximum damp, loose sand to 1/2 to 1/4 part lime putty with 1 part Portland cement and sufficient water to achieve fluid consistent per ASTM C476. Not less than 5% of the sand shall pass No. 100 sieve. To be used where shown on Drawings and where grout space is less than 2" in least dimension.

F. Water: Clean, potable and free from deleterious amounts of acids, alkalis and organic materials.

G. Lime Putty: Shall be made from pulverized (processed) quick lime or from hydrated lime.

2.02 COLOR

Mortar and Grout Color: Provide pre-ground mineral oxides, non-fading and alkali proof as manufactured by L.M. Scofield or approved equal. The Architect shall select color.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270 - Type S.

B. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

C. Do not use anti-freeze compounds to lower the freezing point of mortar. Do not use any admixtures unless specifically accepted in advance by the Architect through the submittal process.

D. Use mortar within two hours after mixing at temperatures of 80° F, or two-and-one-half hours at temperatures under 50° F.

E. Mechanically mix in a batch mixer for not less than three minutes, using only sufficient water to produce a mortar that is spreadable and of a workable consistency.

F. Re-temper mortar with water as required to maintain high plasticity. Do not re-temper mortar after 1-1/2 hours following initial mixing.

2.04 GROUT MIXING

A. Mix concrete in accordance with ASTM C94.

B. Add admixtures in accordance with manufacturer's instructions when previously approved. Provide uniformity of mix.

a. Waterproofing admixture shall be A.C. Horn's "Hydratite" or approved equal.

b. To reduce early water loss and produce expansive action admixture shall be Sika Grout Aid.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

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. Request inspection of spaces to be grouted. Do not proceed until all sub-surfaces and spaces are acceptable.

3.02 INSTALLATION

A. Install mortar and grout to requirements of the specific masonry Sections.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove grout spaces of excess mortar.

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

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SECTION 04 05 16

REINFORCED UNIT MASONRY SYSTEM

PART 1 -- GENERAL

1.01 SUMMARY

In the event of conflicts between the information below and any article of the General Conditions, the General Conditions shall always take precedence.

1.02 SCOPE OF WORK

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.

1.03 SUBSTITUTIONS

Substitutions will be considered per the General Conditions.

1.04 SUBMITTALS

A. Provide in accordance with the General Conditions.

B. Submit shop drawings indicating bar sizes, spaces, locations, quantities of reinforcement, bending and cutting schedules and spacing devices.

C. Submit product data on masonry units.

1.05 QUALITY CONTROL

A. Company specializing in performance of work of this Section for a minimum of 5 years. 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 engineered masonry work under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.

1.06 DELIVERY AND STORAGE

All materials shall be delivered, stored and handled so as to prevent the inclusion of foreign materials and/or damage. Packaged materials shall be delivered and stored in original packages until ready for use. Packages or materials showing evidence of damage shall be rejected.

PART 2 -- PRODUCTS

2.01 MASONRY UNITS

A. Concrete Block shall be hollow concrete masonry units conforming to the requirements for Grade N units, Type I under ASTM Specification C-90.

B. Masonry Units shall be 8"x8"x16" nominal as manufactured by Orco Block Co. or approved equal (909) 849-7891.

1. Block types, sizes, and patterns as indicated on the drawings.

2.02 MORTAR AND GROUT

A. Mortar shall be as specified in Section 04100 and shall develop a compressive strength of not less than 750 lbs. per square inch at seven (7) days or less than 1800 pounds per

square inch at twenty-eight (28) days or as specified on the Structural Drawings. The total clay content, including that in the sand, shall not exceed 2 percent of the sand content or 6 percent of the cement content.

B. Grout fill for cells shall consist coarse grade as specified in Section 04100. Minimum grout strength to be 2000 pounds per square inch (psi) unless otherwise specified on the Structural Drawings.

2.03 REINFORCEMENT AND ANCHORAGE

A. Single wythe joint reinforcement for CMU: Truss type; hot dip galvanized after fabrication cold-drawn steel conforming to ANSI/ASTM A82.

B. Reinforcing Steel for CMU: Deformed bar billet type, specified in Section 03200; size as shown on Drawings, unprotected finish.

C. Strap anchors for CMU: Bent Steel shapes as shown on Drawings or required for complete and proper installation of this Work.

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. Verify items provided by other Sections of work are properly sized and located.

E. Verify that built-in items are in proper location, and ready for roughing into masonry work.

F. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Preparation. Concrete surface to receive masonry shall be free from all dirt, oil, curling compound, or other deleterious substance. All such surfaces shall be thoroughly washed with water before laying block and shall be in a condition to provide maximum suction at the time the mortar bed is placed.

D. Verify that Channel and Anchor placement for Glass Block is at all head and jambs.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in running bond. One Course is one unit and one mortar joint and is equal to 8 inches. Form flush mortar joints. Do not use chipped or broken units.

3.04 ENVIRONMENTAL CONDITIONS

A. Do not place masonry units when air temperature is below 40 degrees F.

B. Protect masonry from direct exposure to wind and sun. When erected in ambient air temperature of 99 degrees F in the shade, with relative humidity less than 50%.

3.05 PLACING AND BONDING – CMU

A. General:

1. Do not commence installation of the work of this Section until horizontal and vertical alignment of foundation is within 1/2" of plumb and the lines shown on the Drawings.

2. Use masonry saws to cut and fit masonry units.

3. Set units plumb, true to line, and with level courses accurately spaced.

4. Clean the top surface of foundation free from dirt, debris, and laitance, and expose the aggregate prior to start of installing first course of sandblasting or water blasting.

5. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.

6. Keep the walls continuously clean, preventing grout and mortar stains. If grout does run over, clean immediately.

7. All bolts embedded in masonry shall be grouted in place with not less than one inch of grout between the bolt and a masonry unit and shall be accurately set with templates.

B. Do not use chipped or broken units. If such units are discovered in the finished wall, the Architect may require their immediate removal and replacement with new units at no additional cost to the Owner.

C. Laying up: Pattern shall be running bond.

1. Place units in mortar with full shoved bed and head joints.

2. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

3. Hold racking to an absolute minimum.

4. Provide running bond with vertical joints located at center of masonry units in the alternate course below.

5. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

6. Interlock intersections and external corners.

D. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

E. Remove excess mortar as Work progresses.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where resilient base is scheduled. Joints shall be 3/8” thick. Split block joints shall be raked.

I. Isolate masonry partitions from vertical structural framing members with a control joint.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 REINFORCEMENT AND ANCHORAGES -- CONCRETE UNIT MASONRY

A. Install horizontal joint reinforcement 16 inches unless structural plans note otherwise.

B. Place joint reinforcement continuous in first joint below top of walls.

C. Lap joint reinforcement ends minimum 40 bar diameters. Install reinforcement in first horizontal course above openings. Extend minimum 24 inches each side of openings.

D. Support and secure reinforcing bars from displacement. Maintain position with 1/2 inch of dimensioned position. Provide metal accessories to ensure adequate alignment of steel during grout filling operations.

E. Embed anchors attached to structural steel members. Embed anchorages in every second block joint.

F. Reinforce joint corners and intersections with strap anchors 16 inches OC.

3.07 GROUTED COMPONENTS

A. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

B. Place and consolidate grout fill without displacing reinforcing. Solidly fill all cells and courses unless otherwise indicated on the Drawings. Maximum grout lift shall be 24 inches.

C. Consolidate grout at time of pour by puddling with mechanical vibrator to completely fit all voids and interstices in the masonry work.

3.08 ENGINEERED MASONRY

A. Lay masonry units with core cells vertically aligned clear of mortar and unobstructed.

B. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces, bevel back and upward. Permit mortar to cure seven (7) days before placing grout.

C. Reinforce masonry unit cores with reinforcement bars and grout as indicated.

D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with Section 03200. See Drawings for indication of locations where splicing is unacceptable.

E. Wet masonry unit surfaces in contact with grout just prior to grout placement.

F. Grout spaces less than 2 inches in width with fine grout using low lift grouting techniques. Grout spaces equal to or greater than 2 inches in width with course grout using high or low lift grouting techniques.

G. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.

H. Low Lift Grouting: Place first lift of grout to a height of 16 inches and rod for grout consolidation. Place subsequent lifts in 8-inch increments and rod for grout consolidation.

3.09 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control joints.

B. Install performed control joint devices in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions. Control joints shall be 12'-0" O.C. maximum.

C. Size control joint in accordance with Section 07900 for sealant performance.

3.10 BUILT-IN WORK

A. As work progresses, build in metal doorframes, anchor bolts, plates, and other items furnished by other Sections.

B. Build in items plumb and level.

C. Bed anchors of metal doorframes in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build in organic materials subject to deterioration.

3.11 DEFECTIVE MASONRY OR MATERIALS

Any masonry materials delivered to the job site that do not conform to the requirements of these Specifications, shall be immediately removed from the work. Completed masonry that does not conform to the requirements of the Drawings and these Specifications shall be deemed defective materials and/or workmanship, and the Contractor shall remove it from the site, at no extra cost to the Owner.

3.12 CURING

All masonry work shall be kept continuously moist until and for not less than three (3) days after grouting. Curing water shall not be permitted to pond around buildings or structures.

3.13 TOLERANCES

A. Maximum Variation From Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.

C. Maximum Variation From Plane of Wall: 1/4 in. in 10 feet and 1/2 in. in 20 feet or more.

D. Maximum Variation From Plumb: 1/4 inch per story non-cumulative.

E. Maximum Variation From Level Coursing: 1/8 inch in 3 feet, 1/4 inch in 10 feet, and 1/2 inch in 30 feet.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.14 CUTTING AND FITTING

A. Cut and fit for pipes, conduits, sleeves, and grounds. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 CLEANING

A. Clean surfaces of masonry as required for proper application of the specified finishes.

B. Concrete Unit Masonry:

1. Use all means necessary to prevent staining of the exposed face by mortar, grout, and other material.

2. Remove mortar and grout stains as the work progresses.

3. Upon completion of the work of this Section, clean all exposed veneer surfaces with a 10% solution of muriatic acid in clear water, using fiber bristle brooms or brushes, followed by thorough rinsing with clear water.

4. In the event ordinary cleaning is not adequate, use a light sandblasting or other means as directed by the Architect, and at no additional cost to the Owner.

5. Replace defective mortar. Match adjacent work.

3.16 TEST & INSPECTIONS

A. Refer to structural drawings.

B. Mortar shall be tested as per U.B.C. Standards.

C. Grout shall be tested as per U.B.C. Standards.

3.17 PROTECTION OF FINISHED WORK

A. Protect finished installation.

B. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

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

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 -- GENERAL

1.01 SUMMARY

In the event of conflicts between the information below and any article of the General Conditions, the General Conditions shall always take precedence.

1.02 GENERAL REQUIREMENTS

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

1.03 SCOPE

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 03 20 00, Reinforcing Steel.

1.04 RELATED WORK

A. Reinforcing Steel: Section 03 20 00

B. Cast-in-Place Concrete: Section 03 30 00

C. Mortar and Grout: Section 04 05 13

D. Structural Steel: Section 05 10 00

1.05 SUBSTITUTIONS

Substitutions will be considered per the General Conditions.

1.06 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. 2001 California Building Code (CBC), Volumes 1, 2, 3.
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 2102.2.
6. Concrete Masonry Design Manual published for the Concrete Masonry Association of California and Nevada, current Edition.

C. Submittals: Provide in accordance with the General Conditions.

1. Suppliers certificate indicating units comply with material standards indicated below:
2. See Section 03 20 00 for reinforcing steel submittals.

D. Tests and Inspections:

1. All tests and inspections herein are to be performed by an independent testing laboratory approved by the Building Official.

2. 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.

3. If masonry placement and grouting inspection is indicated as required on the structural drawings, a special inspector shall be employed per CBC Section 1701.5.7 to inspect the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.

4. See Section 03 20 00 for reinforcing steel tests and inspections.

1.07 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

2.01 MASONRY UNITS

A. Masonry units shall be hollow load bearing masonry units conforming to ASTM C90 and CBC Section 2102.2.5.

1. Weight: Light weight.

2. Type: I.

3. Maximum lineal shrinkage from saturated to oven dry condition of not more than 0.06 percent.

4. Twenty-eight day compressive strength of 1000 psi on gross area and 1900 psi on net area.

5. 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.

2.02 MORTAR AND GROUT

Specified under Section 04 05 13

2.03 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 Dynabolt sleeve expansion bolts as manufactured by ITW Ramset 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.

2.04 JOINTS

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.

2.05 SEALER

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

3.01 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. 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 concrete surfaces to receive masonry. Remove latence or other foreign material lodged in surfaces by sandblasting or other means as required.

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.

3.03 COURSING

A. Erect masonry in accordance with CBC Section 2104.4.

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; ½-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.

3.04 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.

3.05 JOINTS

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 ½-inch from cell to provide positive bond with grout.

3. Joints shall be struck flush at all areas to receive plaster finish.

3.06 MASONRY REINFORCEMENT

A. Place reinforcement in accordance with ACI 315, to a tolerance of +/- ½-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.

3.07 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.

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.

2. Lay up walls, subject to maximum height limitations of CBC Table 21-C.

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.

3.08 EXPANSION JOINTS

See drawings for type and location of expansion joints.

3.09 BOND BEAMS

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

3.010 BUILT-IN WORK

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.

3.011 CUTTING AND FITTING

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

3.012 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 effloresence.

3.013 SEALER

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.

3.014 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 04 05 16; “Mortar and Grout” shall constitute defective masonry.

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

SECTION 04 73 00

MANUFACTURED STONE VENEER

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Simulated stone veneers for exterior applications.
2. Reinforcement, anchorages, mortar, and accessories.

B. Related Sections:

1. Section 06 10 00 - Rough Carpentry
2. Section 07 90 00 - Caulking and Sealants
3. Sections 09 20 00 - Lath and Plaster

1.03 SUBMITTALS

A. Submit following in accordance with Section 01 33 00

1. Product Data: Submit for fabricated wire reinforcement and each type of stone specified. Include all applicable physical and performance data.
2. Samples: Submit one 3 feet X 4 feet samples of simulated stone units to illustrate color, texture, and size range of each type of unit.
3. Manufacturer's detailed installation instructions.
4. Certifications listed in Quality Assurance article of Part 1 of this Section.

1.04 FIELD SAMPLES

A. Sample Installation: Construct stone wall at job site 3 feet X 4 feet in size, including mortar, special shapes, bonding, joint work, reinforcement, moisture barrier, grouting, corbelling, mortar color, expansion, control joints, and accessories.

1. Obtain Architect's approval before beginning work. Protect and retain sample as a basis on which the quality of the work will be judged. Do not remove until Substantial Completion.
2. Accepted Field Sample: May not remain as part of completed Work.

1.05 QUALITY ASSURANCE

A. Installer: Minimum 5 years' experience in similar types of work of similar scope and be able to furnish list of previous jobs and references if requested by Architect.

B. Fabricator: Licensee of manufacturer with not less than 5 years' experience manufacturing simulated stone products of size, type, and quantity as required for this project.

C. Certifications

1. Provide written documentation that products have met or exceeded at least one of the following certifications for a minimum of 10 years.

a. ICBO - International Conference of Building Officials

b. SBCCI - Southern Building Code Congress International

c. ICC - International Code Council

2. Provide written documentation that stone products comply with specified minimum criteria when tested in accordance with testing standards specified in Part 2 of this Section.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Minimum air temperature of 40 degrees F (4 degrees C) prior to, during and for 48 hours after completion of work; and

2. Cold Weather Requirements: IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect materials in accordance with Section 01 66 00.

1. Store mortar materials on pallets in dry place.

2. Protect materials from rain, moisture, and freezing temperatures.

3. Protect reinforcement and accessories from elements.

1.08 WARRANTY

A. Special Warranty: Prepare and submit in accordance with Section 01 78 00.

1. Provide a 40-year warranty against manufacturing defects in manufactured stone products.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Coronado Stone Products. Address: 11191 Calabash Avenue, Fontana, CA 92337. Phone: 909-357-8295. Website: www.coronado.com.

B. Stone Product: Subject to compliance with requirements, provide the following product:

1. Coronado Product: Coronado Honey Ledge as manufactured by Coronado Stone Products.

2. Color: As indicated in the Drawings.

2.02 STONE MATERIALS

A. Simulated Stone:

1. Precast simulated stone, composed of the following materials:

a. Portland Cement: ASTM C 150, Type 1, 2, or 3 depending upon color to be produced.

b. Course Aggregates: ASTM C 330, lightweight type, color as necessary to obtain final approved color of stone.

c. Sand: ASTM C 144, special color if required to match approved sample.

d. Iron oxide colors.

e. Water: Clean and free from deleterious substances.

B. Stone Accessories

1. Provide accessory and accent stones as indicated in the Drawings.

2.03 MORTAR MATERIALS

A. Pigments: Meeting ASTM C 979, mineral oxide type.

1. Mortar Color as manufactured by Coronado Stone: As indicated in the Drawings.

B. Bonding Agent: As recommended by simulated stone manufacturer for direct bonding of simulated stone to masonry or concrete substrates when not using metal lath.

C. Water: Potable

D. Mixing: Use thinset with acrylic additive in accordance with thinset manufacturer's recommendation.

1. Thoroughly mix mortar and grout ingredients in quantities needed for immediate use. Mix grout to ASTM C 270, Type S proportions and mortar to ASTM C 270, Type S requirements.

2. Do not use anti-free compounds to lower freezing point of mortar.

2.04 RELATED MATERIALS

A. Setting Accessories:

1. Moisture Barrier:

a. Tyvek Stucco Wrap, by E.I. Dupont, or comparable product as approved by Architect. Provide tape to seal joints, seams, and tears, of same permeance as membrane.

2. Joint Sealant: Refer to Section 07 90 00.

3. Fasteners: Coated 1-1/2 inch nails, staples, or screws of type and for spacing as recommended by simulated stone manufacturer.

4. Cleaner: Non-acid cleaner as recommended by simulated stone manufacturer.

5. Sealer: Breathable type, non-film forming, non-yellowing.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examination: Examine conditions and proceed with work in accordance with Section 01 40 00.

1. Verify that field conditions are acceptable and are ready to receive work.

2. Verify items provided by other Sections of work are properly sized and located.

3. Verify that built-in items are in proper location and ready for roughing into masonry work.

4. Verify correct product prior to installation.

5. Verify that masonry and concrete substrates do not have residual coatings (paint, bond breaker, curing compounds, etc.) present, which may affect bonding of mortar to substrate.

a. Install metal lath if residual coatings are present on substrate.

6. Consult Owner and manufacturer if deficiencies exist. Correct deficiencies in

accordance with stone manufacturer's recommendations.

B. Protect surrounding area from possible damage during installation work.

C. Initiating installation constitutes Installer's acceptance of existing surfaces and substrate.

3.02 APPLICATION

A. Moisture Barrier:

1. Apply sheets horizontally, starting at the base of the wall, and lapping each successive upper sheet over the previous lower sheet.

2. Lap horizontal and vertical joints 6 inches.

3. Cut and seal joints, penetrations, openings, and projections with manufacturer's recommended tape.

4. Install with corrosion-resistant staples.

B. Lathing: Apply metal lath taut, with long dimension perpendicular to supports.

1. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

2. Lap sides of lath minimum 1-1/2 inches.

3. Attach metal lath to framing using nails or screws of type, size and spacing as recommended by system manufacturer.

4. Continuously reinforce internal angles with corner mesh, except where the metal lath return 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

5. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

C. Mortar

1. Apply bonding agent to masonry or concrete substrates in accordance with manufacturer's recommendations.

D. Simulated Stone Veneer: Install in accordance with manufacturer's instructions.

1. Coronado Honey Ledge: Do not install stones vertically. Blend the stone on the wall from several different boxes to ensure proper color and size variation.

2. Apply 3/8 to 1/2 inch of mortar covering to back of each stone.

3. Press units firmly into position, wiggle each piece slightly and apply light pressure to unit to ensure firm bonding, causing mortar to extrude slightly around edges of units.

4. Place units with uniform mortar joints in accordance with manufacturer's instructions.

5. Install outside corner return units with short and long lengths alternated.

6. Install accessory pieces (quoins, caps, sills, moldings) as work progresses, using same techniques as units in field of wall.

E. Plan work to minimize jobsite cutting. Perform necessary cutting with proper tools to provide uniform edges; take care to prevent breaking unit corners or edges.

F. Remove excess mortar; do not allow mortar to dry on face of units.

1. Point and tool joints before mortar has set.

2. Clean and finish joints in accordance with architect's and manufacturer's

instructions.

G. Control Joints: Size in accordance with Section 07 90 00 for sealant performance, but in no case larger than adjacent mortar joints in exposed stone units.

H. Expansion Joints: Provide where indicated on Drawings or as recommended by system manufacturer.

I. Built-in Work: As work progresses, build in door and window frames, nailing strips, anchor bolts, plates, and other items specified in various sections.

1. Build in items plumb and level.

2. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar.

3. Do not build in organic materials subject to deterioration.

3.03 ADJUSTING

A. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to provide correct size, shape and location.

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

3.04 CLEANING AND SEALING

A. Cleaning: Comply with Section 01 74 00.

1. Remove excess mortar and smears using brush or steel wool.

2. Replace defective mortar. Match adjacent work.

3. Clean soiled surfaces with non-acidic solution, acceptable to the stone manufacturer, which will not harm masonry or adjacent materials.

4. Leave surfaces thoroughly clean and free of mortar and other soiling.

5. Use nonmetallic tools in cleaning operations.

B. Sealer: Apply sealer to completed surface in accordance with manufacturer's instructions.

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

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SECTION 05 10 00

SUPPORTING FROM STRUCTURE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

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

1.02 SUMMARY

A. Work Included:

1. This section provides guidelines and limitations for supporting all mechanical, electrical, plumbing or architectural items from the building structure, and for seismic bracing for all such items.
2. Design and install all support and bracing systems except as noted. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

B. Work Not Included:

1. The Contractor is not required to design support and bracing for items for which the contract documents provide specific attachment, support, and bracing. Items specifically noted in the CBC as not requiring bracing may be exempt from seismic bracing if all conditions of attachment in the CBC are compliant. Seismic bracing is not typically required for the following items:
    a. Gas piping less than 1 inch inside diameter.
    b. Piping for boilers and mechanical equipment less than 1.25 inches inside diameter.
    c. All other piping less than 2.5 inches inside diameter, unless racked together.
    d. All piping and duct suspended by individual hangers 12 inches or less in length with flexible connections.
    e. All rectangular air handling ducts less than 6 square feet in cross sectional area.
    f. All round air handling ducts less than 28 inches in diameter.
    g. All electrical conduits less than 2.5 inches inside diameter, unless racked together.

1.03 QUALITY ASSURANCE

A. General:

1. Design and install all support systems to comply with the requirements of the Current California Building Code Chapter 16.
2. For seismic bracing design engage the services of a structural engineer licensed in California.
3. For guidelines regarding seismic bracing for mechanical, electrical and plumbing systems, refer to the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems". Where SMACNA guidelines deviate from CBC requirements, CBC requirements shall govern.

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

1. The General Conditions, Supplementary Conditions, and applicable portions of Division 1 apply to the work of this Section as if printed herein.
2. If the year of the adoption or latest revision is omitted from the designation, it shall mean the specification, manual or test designation in effect the date of Notice to Proceed with the Work given.

1.04 SUBSTITUTIONS

A. Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.05 SUBMITTALS

A. Provide in accordance with Article 3 of the General Conditions.

B. Submit the following:

1. Submit shop drawings for all substructures and attachment methods.
2. Submit proposed alternative methods of attachment for review by the Architect, prior to deviating from the requirements given below.
3. For all seismic bracing systems, submit structural calculations and details prepared and signed by the Contractor's licensed engineer which include all resultant forces applied to the building structure. Do not overstress building structure. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

1.06 CLOSE-OUT: also comply with the requirements of Section 01 77 00 – Contract Closeout.

A. Reports: None required.

B. As-Builts: Comply with the requirements of Section 01 77 00 – Contract Closeout.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of General Conditions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Furnish all substructures and fasteners required to comply with the limitations given below. Use materials as specified in the various sections and as appropriate to the use.

B. All exterior materials: hot dipped galvanized or stainless steel.

PART 3 – EXECUTION

3.01 INSPECTION

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

B. Verify that specified items may be installed in accordance with the approved design.

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 GUIDELINES AND LIMITATIONS

A. The General Contractor shall coordinate the load requirements from all sub-contractors so that no combination of loads exceeds the limitations given below without written approval.

B. Maximum Loading: Attach no loads greater than the following without specific approval of the Structural Engineer.

1. Metal deck without concrete fill - acoustical tile and gypsum board ceilings only; no piping, ducting or conduit. Maximum ceiling weight - 3.5 psf. Maximum wire hanger load = 60#.
2. Metal deck with concrete fill - ceilings as indicated for metal deck without concrete fill above, plus electrical conduits, gas piping and ducting not exceeding 3.0 psf. Maximum point load from trapeze = 200 lbs. at 8'-0" cc each way. Mechanical units hung from concrete filled deck shall not exceed 500 lbs.
3. Steel beams and girders: water and gas piping, electrical conduits, ducting and trapeze of same not to exceed 3.0 psf. Maximum load on a single span = 600#. Mechanical units hung from beams shall not exceed 1000# unless specifically indicated on structural plans.
4. Cast-In-Place concrete slabs - ceilings, piping, conduit and ducts shall not exceed 10 psf. Maximum hanger load 600#. Mechanical units hung from slabs shall not exceed 800#.
5. Wood sawn joists - loads from ceilings, piping, conduit and ducting shall not exceed 5.0 psf. Maximum concentrated load = 300 lbs. per joist.
6. Steel Joists - Loads from ceiling, piping, conduit and ducting shall not exceed 8 psf. Maximum concentrated load = 500 lbs. per joist.

3.03 SEISMIC BRACING

A. In applying formulas from Chapter 16 of the Current CBC the value for Ip (importance factor) shall be assumed to be no less than 1.0. See structural drawings for other seismic factors.

B. Design and install seismic bracing so as not to ground out vibration and sound isolation items.

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

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SECTION 05 12 00

STRUCTURAL STEEL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SUMMARY

Furnish and install all structural steel as shown and specified including, but not necessarily limited to the following:

1. Prime coat painting and touch up.
2. All cast-in-place anchor bolts, nuts, plates, etc.
3. 10 gauge steel or 3/4 inch plywood templates for column anchor bolts.

1.03 QUALITY ASSURANCE

A. General:

1. Comply with the referenced ASTM standards for materials.
2. Perform all welding only with AWS certified welders.
3. Verification of accuracy:
    a. Engage and pay for a registered civil engineer or licensed land surveyor to check the alignment, plumbness, elevation, and overall accuracy of the erected framing at appropriate stages during construction and at completion of erection. Prior to erection, a survey shall be made of the as-built locations of all anchor rods and other embedded items associated with the attachment of structural steel. The party providing the survey shall submit written verification that the entire installation is in accordance with the contract documents and meets the allowable erection tolerances as set forth in the AISC "Code of Standard Practice for Steel Buildings and Bridges".
    b. Columns shall be verified at each lift. Column shim details and procedures shall be submitted for review.
4. Paint:
    a. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use thinners approved by paint manufacturer, and use within recommend limits.
    b. Coordination of Work: Review other Sections in which prime paints are to be provided to ensure compatibility of coatings system for various substrates. Upon request, furnish information or characteristics of finish materials to be used.
    c. Requirements of Regulatory Agencies: Comply with applicable rules and regulations of governing agencies for air quality control.

B. Except where other requirements are specified, comply with the following standards by American Institute of Steel Construction (AISC) and American Welding Association (AWS):

1. AISC 360-05 "Specification for Structural Steel Buildings".
2. 2005 AISC "Code of Standard Practice for Steel Buildings and Bridges".
3. AISC 341-05 “Seismic Provisions for Structural Steel Buildings”

4. AISC 358-05 “Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications”
5. AISC "Specifications for Structural Joints Using A325 or A490 Bolts".
6. 2005 AISC Section 10, Architecturally Exposed Structural Steel, Code of Standard Practice for Steel Buildings and Bridges
7. AWS D1.1 "Structural Welding Code".
8. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
9. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures
10. SSPC-SP2 Hand Tool Cleaning
11. SSPC-SP3 Power Tool Cleaning
12. SSPC-SP6 Commercial Blast Cleaning
13. SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gauges
14. 2010 International Building Code (IBC).

1.04 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.05 SUBMITTALS:

A. Provide in accordance with Article 3 of the General Conditions.

B. Submit the following:

1. Product Data: Include laboratory test reports and other data to show compliance with specifications (include specified standards). Include certified copies of mill reports covering chemical and physical properties of each type of structural steel.
2. Shop Drawings:
    a. Shop drawings shall include complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
    b. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
    c. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.
    d. Dimensions required to locate structural steel for manufactured items such as mechanical equipment, electrical equipment, dock levelers, etc., shall be coordinated and provided by the General Contractor. General Contractor shall also coordinate and provide dimensions to locate structural steel for window washing supports such as davits, tie-backs, etc.
3. Procedures:
    a. Provide weld procedures for both pre-qualified welds and special welds to be submitted to the Owner's Testing Laboratory and the Architect.
    b. Provide installation procedure and inspection for direct tension indicator washers detailed in supplemental specifications provided by the manufacturer for approval.
    c. Procedures shall be submitted for both shop and field welds.

1.06 PRODUCT HANDLING

A. Comply with the requirements of Section 01 66 00.

B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.07 SEQUENCING/SCHEDULING

Cooperate and coordinate this work with other trades for anchor bolts, and other required inserts, templates, etc. Align this work prior to installation of other materials.

1.08 TESTS AND INSPECTIONS:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the Current 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. Testing Laboratory:

    a. An inspection and testing laboratory will be selected by the Owner for testing and inspection as required by the Contract Documents. The selected laboratory shall conform to the requirements of ASTM E329 (Recommended Practice for Inspection and Testing Agencies used in Construction). Documentary evidence of such conformance shall be submitted to the Owner and the governing agency.

    b. All materials, work, methods and equipment shall be subject to inspection at the mill, fabricating plant and at the building site. Material or workmanship not complying fully with the Contract Documents will not be accepted. The Contractor shall give the Testing Laboratory reasonable notice when ready for inspection and shall supply samples and test pieces and all facilities for inspection without extra charge. The Owner will assume the expense of making the tests and inspection except as otherwise specified in Division 1.

3. Cost of Testing and Inspection: Costs of testing and inspection of structural steel, except as specified hereunder and in Division 1, will be paid for by the Owner.

    a. All transportation costs and per diem living costs for inspection at fabricators' plant further than 75 miles from the job site will be back-charged to the Contractor.

    b. It is assumed that all fabrication will take place in one shop location only. All additional inspection costs will be back-charged to the Contractor.

    c. All mill tests and costs of re-test of plain materials shall be at the expense of the Contractor.

    d. Costs of tests required due to Contractor's failure to provide steel identifiable in accordance with the indicated ASTM designation shall be at the expense of the Contractor.

4. Structural Steel Testing and Inspection:

    a. Structural Steel: If structural steel tests are indicated as required on the structural drawings, one tension and one bend test shall be made for each

size of structural shape, plate and for each tube and pipe size. Tests to be made in accordance with requirements of appropriate ASTM designations.

b. If structural steel tests are not indicated as required on the structural drawings, then for shapes, plates, bars, pipe and tubing, manufacturer's certified mill test reports and analysis for each heat will be acceptable for steel identifiable in accordance with indicated ASTM designation. Mill test reports shall indicate the physical and chemical properties of all structural steel used. Correlate individual heat numbers with each specified structural section.

c. Unidentifiable Steel:

1) For Fy less than or equal to 36.0 ksi : Provide one tension and elongation test and one bend for each 5 tons or fraction thereof for each size.

2) For Fy greater than 36.0 ksi : Provide one tension and elongation test and one bend or flattening for each piece.

d. Costs of retests and additional testing required by the use of unidentifiable steels shall be the Contractor's responsibility. Additional costs of testing incurred by the Owner shall be deducted from the Contract Final Payment.

5. Expansion Anchors: Load test as indicated on drawings.

6. Welding Inspection:

a. For Moment Resisting Frame Welding inspection and testing requirements, see specification Section 05 12 24 - Welding of Moment Resisting Frames.

b. If shop or field welding inspection is indicated on the structural drawings, all shop and field welded operations will be inspected by a qualified welding inspector employed by the Testing Laboratory. Such inspector will be a person trained and thoroughly experienced in inspection of welds. The inspector's ability to distinguish between sound and unsound welding will be reliably established

c. The welding inspector will make a systematic record of all welds. This record shall include:

1) Identification marks of welders.

2) List of defective welds.

3) Manner of correction of defects.

d. The welding inspector will check the material, equipment and procedure, as well as the welds. He will also check the ability of the welder. He will furnish the Architect with a report, duly verified by him that the welding which is required to be inspected is proper, and has been done in conformity with the Contract Documents, and that he has used all means to determine the quality of the welds.

e. All full penetration groove welds will be subject to ultrasonic testing, as per AWS D1.1, Section 6 "Inspection, Part "C", Ultrasonic Testing of Groove Welds. All defective welds shall be repaired and retested with ultrasonic equipment at the Contractor's expense.

f. Column Flanges: An area extending 6 inches above and below point where girder flanges are attached will be inspected. Column flange edges will be inspected visually, and entire area ultrasonically for lamination, plate discontinuities, and non-metallic inclusions.

g. All partial penetration groove welds shall be tested by ultrasonic testing.

h. When ultrasonic indications arising from the weld root be interpreted as either a weld defect or the backing strip itself, the Engineer will be notified. The Engineer may require the removal of backing strip. The backing strip will be removed at the expense of the Contractor, and if no root defect is visible the weld will be retested. If no defect is indicated on this retest, and no significant amount of base and weld metal have been removed, no further repair of welding is necessary. If a defect is indicated, it will be repaired and retested at Contractor's expense.

i. The ultrasonic instrumentation will be calibrated by the technician to evaluate the quality of the welds in accordance with AWS D1.1.

j. Other methods of inspection, for example, X-Ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the inspection laboratory, and with the approval of the Engineer.

k. Base metal thicker than 1-1/2 inches, when subjected to through thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such weld before and after joint completion.

l. End-welded studs shall be sampled, tested, and inspected per the requirements of the Structural Welding Code - Steel D1.1 Chapter 7, published by the American Welding Society.

m. At the discretion of the owner's testing agency, the ultrasonic testing frequency may be reduced but may not be less than the following:

n. Initially, all welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish the qualifications of each individual welder. If the reject rate is demonstrated to be less than 5 percent of the welds tested for each welder, then the frequency of testing for that welder may be reduced to 25 percent. If the reject rate increases to 5 percent or more, 100 percent testing will be re-established until the rate is reduced to less than 5 percent. The percentage of rejects will be calculated for each welder independently.

o. A sampling of a least 40 completed welds will be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejectable defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over 3' in length, each 12 linear inch increment of welds, 1 inch or less in thickness, will be considered as one weld. For evaluating the reject rate of continuous welds greater than 1 inch thickness, each 6 linear inches will be considered one weld.

7. High Strength Bolting Tests and Inspection:

a. Furnish certified test reports for each lot of bolts in accordance with Section 9 of ASTM A325 and A490. Install bolts under the supervision of a qualified inspector in accordance with Section 9, Research Council "Specifications for Structural Joints using ASTM A325 or A490 Bolts".

b. If high strength bolting inspection is indicated or required on the structural drawings, the testing laboratory will visually inspect all high strength bolts.

c. While the work is in progress, the Inspector shall determine that the requirements of this Specification are met in the work. The Inspector shall observe the calibration procedures and shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is properly used to tighten all bolts.

1) In addition to the requirement of the foregoing paragraph, for all connections specified to be slip critical (SC), the Inspector shall assure that the specified procedure was followed to achieve the pretension specified in the AISC. The pretension shall be verified by the inspector for these bolts.

2) Bolts in connections identified as not being slip-critical nor subject to direct tension need not be inspected for bolt tension other than to ensure that the piles of the connected elements have been brought into snug contact.

1.09 CLOSE-OUT: also comply with the requirements of Section 01 77 00 – Contract Closeout.

A. Reports: Final Report related to Item 1.08.

B. As-Builts: Comply with the requirements of Section 01 77 00 – Contract Closeout.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of the General Conditions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Structural Steel: Except where indicated on drawings.

1. W shapes: ASTM A572-50 or ASTM A992-50 unless indicated otherwise on drawings.

2. Channels and other rolled shapes: ASTM A36 unless indicated otherwise on drawings.

3. Angles, plates and bars: ASTM A36 unless indicated otherwise on drawings.

B. AISC group 4 and 5 shapes and plates greater than 2 inches thick: ASTM A36 and/or ASTM A572 Grade 50 with supplementary requirements S91 Fine Austenitic Grain Size and S5 Charpy V-Notch Impact Test. For location of Charpy V-Notch test, see ASTM A6 Supplementary Requirement S30. Charpy V-Notch test shall be per ASTM A673, frequency P and shall meet a minimum average value of 20 ft-lbs absorbed energy at 70^{o} F.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Type E or S, Grade B.

E. Anchor Bolts: All anchor bolts cast in concrete or masonry shall be headed bolts with cut threads conforming to ASTM F1554 grade 36, 55 or 105 as indicated on drawings.

F. Machine Bolts: ASTM A307.

G. High Strength Bolts, Nuts and Washers: Install in accordance with requirements for A325 and A490 slip critical and snug tight conditions as indicated on drawings. Install high strength bolts with snug tight type connections with threads included in shear plane except as otherwise noted. Install hardened washers in conformance with AISC Specifications.

1. Bolt Specifications: Bolts shall conform to the requirements of the current edition of the Specifications of the American Society for Testing and Materials for High-Strength Bolts for Structural Steel Joints, ASTM A325, Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength, ASTM A490 as indicated on drawings.

2. Bolt Geometry: Bolt dimensions shall conform to the current requirements of the American National Standards Institute for Heavy Hex Structural Bolts, ANSI Standard

B18.2.1. The length of bolts shall be such that the end of the bolt will be flush with or outside the face of the nut when properly installed.

3. Nut Specifications: Nuts shall conform to the current chemical and mechanical requirements of the American Society for Testing and Materials Standard Specification for Carbon and Alloy Steel Nuts, ASTM A563, Appendix Table X1.1. Provide grade A Heavy Hex nuts for grade 36 threaded rods. Use grade C, Heavy Hex nuts for grade 55 and 105 threaded rod.
4. Washers: Flat circular washers and square or rectangular beveled washers shall conform to the current requirements of the American Society for Testing and Materials Standard Specification for Hardened Steel Washers, ASTM F436.
5. Tension Control Fastener System: Bolts shall conform to the requirements of the current edition of the Specifications of the American Society for Testing and Materials for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, ASTM F1852, providing equivalent properties to ASTM A325 or A490 as indicated on drawings.

H. Headed Stud-Type Shear Connectors: ASTM A108 Grade 1015 or 1020 Cold-finished carbon steel with dimensions complying with AISC Specifications.
   1. Tensile strength, 60,000 psi.
   2. Elongation in 2 inches, 20 percent
   3. Reduction of area, 50 percent.

I. Provide hexagonal heads and nuts for all connections per ASTM A563, Appendix Table X1.1.

J. Electrodes for Welding: Comply with AWS Code, E70 Series minimum. Fabricator to select proper electrodes according to weld procedures as submitted.

K. Shop Primer:
   1. Type A Material: Tnemec Company, Inc., 88HS
   2. Type B Material: Tnemec Company, Inc., 90-97 Tneme-Zinc.
   3. All paints shall meet the California Air Resources Board Standards.
   4. Finish paint Material (uno): Tnemec Company, Inc., Series 75- Endura-Shield. Color to be selected by owner.

L. Powder Driven Fasteners: Tempered steel pins with special corrosive resistant plating or coating. Pins shall have guide washers to accurately control penetration. Fastening shall be accomplished by low-velocity piston-driven power activated tool. Pins and tool shall be as manufactured by Hilti Fastening Systems.

M. Expansion Bolts: Hilti Fastening Systems “Kwik-Bolt Concrete Expansion Anchors” to concrete; Ramset “Dynabolt Sleeve Anchors” to masonry or approved equal.

PART 3 – EXECUTION

3.01 INSPECTION

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

B. Verify that specified items may be installed in accordance with the approved design

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 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assembly structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated to provide the flattest floor possible. The contractor shall coordinate member tolerances with finishes.

   Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

   Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as indicted. Bolt field connections, except where welded connections or other connections are indicated.

C. Unless noted otherwise, make holes 1/16 inches larger than the nominal bolt diameter.

D. Welding, Shop and Field: Weld by shielded arc method, submerged arc method, flux cored arc method, or other method approved by AWS. Perform welding in accordance with AWS Code. All welders, both manual and automatic, shall be certified in accordance with AWS "Standard Qualification Procedure" for the Work to be performed. See paragraph "welding" herein, for detailed requirements. If sizes of fillet welds are not shown on drawings, use AWS minimum weld size but not less than 3/16 inch fillet welds.

E. Bolt Holes for Other Work: Provide holes required for securing other work to structural steel framing.

   Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

   Cut, drill, or punch holes perpendicular to metal surfaces and remove all burrs. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

F. AISC Group 4 and 5 shapes and built up members shall meet the requirements for joints in AISC Sections J1.7, J1.8, J2.6 and M2.2.

G. High Strength Bolts:

   1. Installation and Tightening:

      a. Handling and Storage of Fasteners: Fasteners shall be protected from dirt and moisture at the job site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protected storage. Fasteners not used shall be returned to protected storage at the end of the shift. Fasteners shall not be cleaned of lubricant that is present in as-delivered condition.

      b. Tension Calibrator: A tension measuring device shall be required at all job sites where bolts in slip-critical joints are being installed and tightened. The tension measuring device shall be used to confirm: (1) the suitability to satisfy the requirements of AISC for the complete fastener assembly, including lubrication if required to be used in the work, (2) calibration of wrenches, if applicable, and (3) the understanding and proper use by the bolting crew of the method to be used. The frequency of confirmation testing, the number of tests to be performed and the test procedure shall be as specified in 1.d. below, as applicable. The accuracy of the tension measuring device shall be confirmed through calibration by an approved testing agency at least annually.

c. Joint Assembly and Tightening of Shear/Bearing Connections: Bolts in connections not within the slip-critical category shall be installed in properly aligned holes, but need only be tightened to the snug tight condition. The snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. If a slotted hole occurs in an outer ply, a flat hardened washer or common plate washer shall be installed over the slot.

d. Joint Assembly and Tightening of Connections Requiring Full Pre-tensioning. Slip-critical connections shall be installed in properly aligned holes and tightened by one of the following methods.

1) Turn-of-nut Tightening: When turn-of-nut tightening is used, hardened washers are not required except as specified in the AISC. A representative sample of not less than three bolts and nuts of each diameter, length and grade to be used in the work shall be checked at the start of work in a device capable of indicating bolt tension. The test shall demonstrate that the method of estimating the snug-tight condition and controlling turns from snug tight to be used by the bolting crews develops a tension not less than five percent greater than the tension required for slip-critical connections.

2) Installation of Alternate Design Bolts: A representative sample of not less than three bolts of each diameter, length and grade shall be checked at the job site in a device capable of indicating bolt tension. The test assembly shall include flat hardened washers, if required in the actual connection, arranged as in the actual connections to be tensioned. The calibration test shall demonstrate that each bolt develops a tension not less than five percent greater than the tension required by AISC. Manufacturer's installation procedure shall be followed for installation of bolts in the calibration device and in all connections. When alternate design features of the fasteners involve an irreversible mechanism such as yield or twist-off of an element, bolts shall be installed in all holes of the connection and initially brought to a snug tight condition. All fasteners shall then be tightened, progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously tightened fasteners prior to final twist-off or yielding of the control or indicator element of the individual fasteners. In some cases, proper tensioning of the bolts may require more than a single cycle of systematic tightening.

e. Mark bolts that have been completely tightened with an identifying symbol.

3.03 WELDING

A. General: Quality of materials and design and fabrication of all welded connections shall conform to AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Building," "AWS Code for Welding in Building Construction," and requirements of this section.

Location and type of all welds shall be as shown. Make no other welded splices, except those shown on drawings, without prior approval of the architect.

B. Automatic Welding: Use electrode wire and flux for automatic and semi-automatic welding acceptable to Structural Engineer. All methods, sequences, qualification and procedures, including preheating, and post heating if necessary, shall be detailed in writing and submitted to the Structural Engineer for review.

C. Qualification of Welders:

1. Structural steel welding: Manual and automatic welds for structural steel construction shall be made only by operators who have been previous qualified by tests, as prescribed in AWS D1.1 to perform type of work required.
2. Welders shall be checked by welding inspector. Those not doing satisfactory work may be removed, and may be required to pass qualification tests again. All qualification testing shall be at the Contractor's expense.
3. Only welders whose weld procedures and pre-qualification by testing that have passed shall be considered qualified for such welds.

D. Control cooling process after weld is completed by either step down post heat or thermal blankets as determined by procedures and prequalification.

E. Box columns and built-up members shall have ultrasonic testing before and after welding.

F. Flame cut surfaces shall be ground to remove contaminated steel layer to provide welds proper fusion without impurities.

G. Preparation of surface: Surfaces to be welded shall be free of loose scale, slag, rust, grease, paint, and any other foreign material.

H. Welding equipment: Welding equipment to be used in each case shall be acceptable to welding inspector. Use equipment with suitable devices to regulate speed, and manually adjust operating amperage and voltage. The amperage capacity shall be sufficient to overcome line drop, and to give adequate welding heat.

I. Remove runoff tabs and grind surfaces smooth where the tabs would interfere with fireproofing and architectural finishes.

J. End-welded studs:

1. Automatic end-welded studs: Automatically end-weld in accordance with the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plates. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8 inch for 5/8 inch, and 3/16 inch for 3/4 inch diameter. Stud sizes indicated on drawings represent the finish stud height.
2. Fillet-end welded studs: Studs may be welded using prequalified FCAW, GMAW, or SMAW processes provided the requirements of the AWS D1.1 Chapter 7 Section 7.5.5 are met as well as any other pertinent requirements of D1.1.

K. Provide mill camber as shown on the construction documents within AISC tolerance. Place mill tolerance upward for all beams specified no camber.

3.04 ERECTION

A. Structural steel erection: Comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Building", latest edition.

B. Erection Sequence: Erect steel in accordance with special erection sequences where special erection sequences are indicated on the contract documents.

C. Before and during erection, keep all structural steel clean. Ship, handle and store steel in manner to avoid injury to members. Steel members showing evidence to rough handling or injury will be rejected.

D. Mark each member with erection identification corresponding to mark shown on erection drawings. Carefully plan erection of structural steel so that no cutting and removal of material will be necessary. Do not torch burn in the field, unless specifically permitted by Engineer.

E. Provide sufficient bracing, shoring and guys to effect safe and satisfactory erection. Provide bracing and shoring capable of holding steel work plumb and properly aligned while field connections are being made, and until lateral force resisting elements are deemed by Architect capable of bracing structure. Temporary bracing shall be adequate to resist lateral forces from wind or seismic prior to the completion of the lateral resisting system.

F. Set bearing and base plates with extreme care. Bring level, to line and grade with leveling plates or by leveling nuts and bolts. Grout solid under plates with a flowable non-shrink grout per Section 03300 prior to applying vertical load.

G. Field Assembly: Set structural framing accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces which will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

   Shimming or other adjustments not indicated on drawings shall be approved by the Engineer prior to installation. Level and plumb individual members of the structure within specified AISC tolerances except as noted herein. Column shimming shall be 1/4 inch.

H. All welds shall be full and clean, and conform to AISC and AWS specifications.

I. Erection Tolerances: Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500 plus:

   1. The maximum displacement of the center line of columns adjacent to elevator shafts, from the established column line, shall not be more than 1 inch at any point.

   2. In order to provide a true, flat plane for the exterior elevations, install all steel framing at the exterior walls of the building, so that the center lines of such framing does not vary by more than 1 inch for the length of the building. Also install each vertical member on such grids so that its vertical center line does not vary by more than 1/2 inch from a vertical line for each story and 1 inch for its full height.

   3. All columns and beams shall adhere to Section M2.7 of the referenced "Specification for Structural Steel for Buildings" which states that completed members shall be free of twists, bends, and open joints. Take special care that column base plates are parallel and perpendicular to faces of columns and that bolt holes are accurately placed.

J. Temporary Flooring:

   1. Provide planking and scaffolding necessary in connection with erection of structural steel, support of erection machinery, and construction materials. Temporary floors and use of steel shall be as required by applicable regulatory requirements.

   2. If steel decking is used as a working platform, it shall be temporarily tack-welded to supports to extent necessary for such use in accordance with applicable regulatory requirements. The concentrated loading from welding machines and other heavy machinery required for steel erection shall be distributed by planking or other approved means. Metal decking that becomes damaged as the result of being used as a working platform shall be replaced at no additional cost to the Owner.

K. Tower Crane: The design for the support and bracing for a tower crane shall be the responsibility of the General Contractor. The design shall be prepared by a structural engineer licensed in the state of California. Drawings and calculations shall be stamped and signed by the structural engineer. Concentric, torsional, and/or eccentric loading to the main structure shall be resolved by the addition of structural steel for shear tabs, stiffeners, drag ties, bracing struts, etc., such items shall be designed, detailed, furnished and installed by the contractor.

3.05 PAINTING AND CLEANING

A. Prior to prime coat application, clean all loose rust, mill scale, oil, dirt, and all other materials from all steel to be left exposed. Use hand tool, power tool, sandblasting, chemical cleaning, and any other method necessary to provide a smooth, sound surface for painting.

B. Shop prime all steel except the following:

1. Steel encased in concrete.
2. Contact surfaces for slip-critical (sc) high strength bolts.
3. Areas within 4 inches of field welds.
4. Tops of members to receive metal decking.
5. Steel to be fireproofed.
6. Surfaces to be galvanized.

C. Use the following Type A shop painting systems on all normal environment interior steelwork:

1. Surface Preparation: SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 Commercial Blast Cleaning is required.
2. Application: Follow coating manufacturer's printed directions.
3. Material: Type A Tnemec Series 88HS Azeron Primer.
4. Number of Coats: One
5. Dry Film Thickness: 2.0 mils minimum.
6. Volume Solids: 60.0 +/- 2.0% minimum
7. Generic Description: Modified Alkyd.

D. Use the following Type B shop painting systems on all exterior steelwork and interior steelwork subjected to wet conditions or fumes:

1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
2. Application: Follow coating manufacturer's printed directions.
3. Material: Type B Tnemec 90-97 Tneme-Zinc primer
4. Number of Coats: One
5. Dry Film Thickness: 2.5 mils minimum.
6. Volume Solids: 63% +/- 2%
7. Generic Description: Organic Zinc-Rich Urethane

E. Use the following finish painting systems on all exterior steelwork and interior steel work subjected to wet conditions or fumes:

1. Application: Follow coating manufacturer’s printed directions. Apply over Type B primer system above.
2. Material: Tnemec Series 75 Endura-Shield paint.
3. Number of Coats: One
4. Dry Film Thickness: 3 to 5 mils
5. Volume Solids: 72% +/- 2%
6. Generic Description: Aliphatic Polyurethane

F. Apply two shop prime coats to areas which will be inaccessible after erection.

G. Clean contact surfaces of high strength bolts of all burrs and material which might prevent solid seating of the parts. Steel to receive bolts shall be primer painted except beneath the contact area of slip-critical bolts.

H. After erection, field touch up all welded areas, high strength bolts and damaged areas. For all steel to remain exposed, remove all blemishes, paint drips, and touch up prime coat.

3.06 HOISTING AND BRACING

A. Provide all hoisting and erecting equipment and power.

B. Provide and maintain any and all safety railings, toe boards, etc., required for the erection of steel framing and metal decking.

C. Brace the erected frame in a manner which will assure safety and proper alignment to receive the metal decking and until the concrete slabs have been poured and have set.

D. Erect building frame true and level. Erect columns in a manner to allow for movement due to welding shrinkage and thermal expansion and contraction of framing. Check plumbness after erection of each level. Maintain structural stability of frame during erection. Provide temporary bracing where necessary to maintain frame stability and to support required loads, including equipment and its operation.

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

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SUMMARY

A. Shop fabricated metal items and miscellaneous metal work.

B. Refer to Schedule at end of this Section.

1.03 QUALITY ASSURANCE

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

1. Current California Building Code (CBC), with State of California Amendments
2. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.

B. Submittals: (Submit under provisions of 01 33 00 - Submittals)

1. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevation, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
2. Manufacturer's descriptive data: Submit for manufacturer's items.

1.04 SUBSTITUTIONS

Substitutions will be considered per the Instructions to Bidders, Section 3.3 Substitutions.

1.05 SUBMITTALS

A. Provide in accordance with Article 3 of the General Conditions.

B. Submit Product data on specified products, describing physical and performance characteristics: sizes, patterns, colors available, and method of installation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Adhere to requirements of Section 01 66 00.

B. Deliver all parts ready for erection; store in close proximity to final locations.

1.07 CLOSE-OUT: also comply with the requirements of Section 01 78 00 – Contract Closeout.

A. Reports: None required.

B. As-Builts: Comply with the requirements of Section 01 78 00 – Contract Closeout.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty:

Comply with the requirements of the General Conditions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Steel Sections: ASTM A36.

B. Steel Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Type E or S, Grade. B.

D. Steel Bolts, Nuts, and Washers: ASTM A307.

E. Welding Materials: AWS D1.1; type required for materials being welded.

F. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", Galvweldalloy", or approved equal.

G. Primer: Tnemec Company "Series V10 Red Primer", Sherwin-Williams "Kern Primer"; or approved equal.

H. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.

I. Expansion Bolts: Hilti "Kwik Bolt TZ" Expansion Anchor Bolts, galvanized unless otherwise indicated.

J. Non-shrink Grout: Master builders 928 or equal.

2.02 FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate items with joints tightly fitted and secured.

C. Fit and shop assemble in largest practical sections, for delivery to jobsite.

D. Grind exposed welds flush and smooth adjacent finished surfaces. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.

F. Make exposed joints butt tight, flush and hairline.

G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

2.03 FINISH

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.

C. Prime paint interior items with one coat unless scheduled to be galvanized.

D. Galvanize exterior items and scheduled interior items to minimum 2.00 oz/sq ft zinc coating.

PART 3 – EXECUTION

3.01 INSPECTION

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

B. Verify that specified items may be installed in accordance with the approved design

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 PREPARATION

A. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.

B. Clean and strip primed steel items to bare metal where site welding is scheduled.

C. Make provision for erection loads with temporary bracing. Keep work in alignment.

D. Supply items required to be cast into concrete with setting templates, for installation under appropriate Sections.

3.03 INSTALLATION

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

B. Perform field welding in accordance with AWS D1.1.

C. After installation, touch-up field welds, scratched or damaged surfaces with primer, except repair exposed galvanized work (not to be painted) with hot process field galvanizing, in accord with manufacturer's published directions.

3.04 SCHEDULE

Provide and install items listed in Schedule and shown on Drawings with anchorage and attachment necessary for installation. The following Schedule lists principal items only. Refer to drawing details for items not specifically scheduled.

1. Miscellaneous plates or angles not attached to structural steel; complete with anchorage for embedment.
2. Exterior mounted ladders.
3. Handrails and guardrails.
4. Bollards.
5. Gates for trash enclosure.

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

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