

**Alum Rock Union School District**

**BID NO. B2223-Bonds08**

**William Sheppard MS**

**HARDSCAPE IMPROVEMENTS**

**SUMMER 2022**

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**SECTION 02 30 00**

**SUBSURFACE INVESTIGATION**

**PART 1 – GENERAL**

1.1 REQUIREMENTS INCLUDE

A. Contractor:

1. Verify data and existing conditions.
2. At Contractor's option, perform additional subsurface investigation at own expense.
3. Review and abide by recommendations presented in the Geotechnical Report.

1.2 RELATED DOCUMENTS

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

1.3 RELATED REQUIREMENTS

A. Specified elsewhere:

1. 02 41 13 - Selective Demolition
2. 31 30 00 - Earthwork

B. By others: Preliminary Geotechnical Exploration Report provided where available.

1. Soil boring data is included for information only. The Owner does not guarantee the accuracy or validity of the data, nor do they assume any responsibility for the Contractor's interpretation of the data.
2. Soil boring locations are shown on the plans where available.

**PART 2 - PRODUCTS** (Not Applicable.)

**PART 3 - EXECUTION** (Not Applicable.)

*END OF SECTION*

**SECTION 02 41 13**

**SELECTIVE DEMOLITION**

**PART 1 – GENERAL**

**1.1 SUMMARY:**

- A. Section includes Requirements for performing selective exterior demolition.

**1.2 SUBMITTALS:**

Comply with requirements of Shop Drawings, Product Data and Samples Section 01 33 00.

- A. Salvageable items: Submit typewritten list of items to be salvaged, for Owner's approval.

**1.3 QUALITY ASSURANCE:**

- A. Perform demolition in conformance with ANSI A10.6.

**1.4 EXISTING CONDITIONS:**

- A. Prior to start of demolition operations, conduct survey of existing conditions. On such survey, list items specified and indicated to be salvaged.
- B. Following performance of demolition, inspect and report defects and structural weaknesses of construction and improvements partially demolished, cut and removed; of construction and improvements remaining; and of adjacent construction and improvements.
- C. Protection: Protect the structural integrity of existing construction and improvements to remain.

**PART 2 – PRODUCTS**

**2.1 MATERIALS:**

- A. General:
  - 1. Remove and dispose of items and materials not designated to be salvaged. Other than hazardous material, all debris disposal shall be coordinated with local disposal services.
  - 2. If, in the course of removing designated items and materials, the condition of other materials or the structure so exposed appears to be damaged or of otherwise questionable condition, immediately notify the Architect, who will determine if the other materials or structure shall be removed, and if so, to what extent.
  - 3. Nothing to be removed from the site shall be stored, sold, or burned on the site without the Architect's and Owners prior written consent.
  - 4. Remove and dispose of debris found in work areas at start of work.
  - 5. Follow directions of this specification for removal of hazardous materials that are encountered.

**PART 3 – EXECUTION**

**3.1 EXAMINATION:**

- A. Verify that conditions are satisfactory for beginning selective demolition. If unsatisfactory conditions exist, do not begin demolition operations until such conditions have been corrected.

### **3.2 PREPARATION:**

- A. Prior to start of demolition operations, prepare a proposed layout and sequence for the work; coordinate with related work which requires cutting and sawing.
- B. Review proposed layout and sequence with the Architect prior to starting demolition operations.
- C. Cap, re-route and protect utility lines prior to start of demolition operations per the Mechanical, Plumbing and Electrical work.

### **3.3 GENERAL:**

- A. As demolition progresses, continuously inspect for damage. Should signs of damage arise, immediately notify the Architect and stop demolition operations in the affected location until advised as to how to proceed.
- B. Remove items designated for demolition, and as required for the performance of the work. If in doubt as to whether an item is to be demolished, contact the Architect for a decision prior to proceeding with its demolition.
- C. Remove items carefully; provide for neat and structurally sound junctions between existing and new materials.
- D. As applicable, remove miscellaneous items and fastenings associated with items to be demolished.
- E. Demolish concrete in small sections.
- F. Clean surfaces affected by demolition operations of adhesives, bitumen, and other adhering materials, as required to afford suitable substrates for the application of new materials.

### **3.4 CUTTING AND CORING:**

- A. Make new openings neat, as close as possible to profiles indicated, and only to the extent required to accommodate new work.
- B. Do not cut or alter structural members without the prior written consent of the Architect or Engineer.
- C. At concrete, masonry, and other materials where edges of cuts and holes will remain exposed in the completed work, perform cutting and coring with power equipment.

*END OF SECTION*

**SECTION 03 11 00**  
**CONCRETE FORMING**

**PART 1 GENERAL**

1.01 SCOPE

A. Work Specified

1. Furnish all labor, materials and equipment and perform all operations required to complete all formwork as indicated on the drawings and specified herein.

1.02 DESCRIPTION

A. Work Included: Forms, shores, bracing, removal and other operations as necessary for all cast in place concrete placed.

1. Setting and securing into forms anchor bolts and other metal items embedded in concrete, using materials and layouts furnished and delivered to job site as specified under other sections.

1.03 QUALITY ASSURANCE

A. Reference Standards

1. ACI 347 "Recommended Practice for Concrete Formwork"
2. American Plywood Association (APA)
3. West Coast Lumberman's Association (WCLA)

**PART 2 PRODUCTS**

2.01 MATERIALS

A. Form Materials:

1. Non-exposed formwork facing:

- a. For concrete which is not exposed to view, forms may be of plywood as specified for exposed surfaces, or square edge 1" x nominal Douglas Fir, Construction Grade, S4S.
- b. All exposed concrete edges shall be chamfered 1/2", or as noted on the drawings.

2. Exposed Surface Formwork Facing:

- a. Forms for all exterior and interior concrete flat surfaces shall be new Douglas Fir Plywood (APA) 5-ply, 5/8-inch, B-B Plyform, Class I, Exterior Type, oiled and edged and edge-sealed, conforming to U.S. Product Standard PS 1-83 in large sheet sizes to achieve joint patterns shown, unless otherwise specified as board formed.

- b. All exposed concrete edges shall be chamfered 1/2", or as noted on the drawings.

- B. Earth Forms: Earth trench forms will be allowed if soil will stand in excavations and not ravel or cave. Excavate earth forms two (2) inches wider (1" each side) than called for on the drawings each side of the foundation.
- C. Form Coating:
  - 1. Form sealer: Nox-crete Form Coating, or approved equal for wood forms only.
  - 2. Spray-on compounds shall not affect color, bond or subsequent treatment of concrete surface.

**PART 3 EXECUTION**

3.01 CONSTRUCTION OF FORMS

- A. General:
  - 1. All concrete work shall be formed to the shapes, sizes, lines and dimensions shown on the plans.
  - 2. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor.
  - 3. Schedule the work and notify other trades in ample time so that provisions for their work in the formwork can be made without delaying the progress of the project.
  - 4. Verify that all sleeves, pipes, etc. for the electrical, plumbing, heating and ventilation work, or other work, are installed. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc. in the formwork before concrete is poured.
  - 5. The Architect and DSA-ORS shall be notified for a review of the formwork at least 24 hours prior to placing reinforcing steel.
  - 6. Excessive deflection of forms after concrete is poured shall be sufficient cause for rejection of that portion of concrete and formwork.
  - 7. Excessive deflection will be considered to be that which will produce visible and noticeable waves in the finished concrete.
- B. Arrangements of formwork shall be properly tied, braced, shored, and supported to insure stability against pressures from any source, without failure of any component part and without excessive deflection.
- C. Proper provisions shall be made for all openings, offsets, inserts, anchorages, blocking and other features of the work as shown or required.
- D. Warped, checked or scuffed forms shall be rejected.

3.02 TREATMENT OF FORMS

- A. Contact surface of all plywood forms shall be treated with a form sealer. Treatment shall be in strict conformance with the manufacturer's specifications. The sealer to be used shall leave no residue upon the face of the concrete, nor have the effect of preventing bonding of subsequent paint or plaster coats.

3.03 FORM REMOVAL

- A. Forms shall not be removed before minimum curing period has elapsed without approved, alternate curing methods being employed.
- B. Forms shall be removed without damage to the concrete and in such a manner that will insure complete safety of the structure and without damaging exposed concrete, edges, chamfers and inserts. In no case shall they be removed until the concrete has hardened sufficiently to permit their removal with safety, and the members have attained sufficient strength to safely support the imposed loads.
- C. The minimum time for removal of forms after concrete has been poured shall be as follows:
  - 1. Columns and walls: 7 days, provided members are not subjected to overhead loads.
  - 2. Footings: Side forms may be removed 24 hours after concrete is poured, if back-filled immediately, otherwise 7 days minimum.
  - 3. Beams, elevated slab, etc. 28 days unless adequate shoring and curing procedures are provided.
- D. The times listed above are minimum. These time periods may be extended if deemed necessary by the Architect.
- E. Concrete shall not be subjected to superimposed loads (structure or construction) until it has attained its full design strength, and not for a period of at least 14 days after placing.
- F. Concrete shall not be subjected to construction loads in excess of design loads.

*END OF SECTION*

**SECTION 03 20 00**  
**CONCRETE REINFORCING**

**PART 1 GENERAL**

1.01 SCOPE

- A. Work Specified
1. Furnish all labor, materials and equipment and perform all operations required to complete all reinforcing steel work as indicated on the drawings and specified herein.

1.02 DESCRIPTION

- A. Complete steel reinforcing for all concrete and masonry work to be reinforced shown or specified, as indicated on the drawings. Coordinate this work with the other work affected by these operations, such as forms, electrical work, mechanical work, structural steel, concrete.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Unless otherwise noted, the following standards shall govern the work.
1. California Building Code 2007 edition (noted herein as CBC), Chapter 19A and Chapter 21A Masonry
  2. CRSI – Manual of Standard Practice and Recommended Practice for Placing Reinforcing Bars (MSP latest edition)
  3. ACI 315 – Manual of Standard Practice for Detailing Reinforcing Concrete
  4. AWS – American Welding Society
  5. ASTM – American Society for Testing and Materials
- B. Testing and Inspection
1. Reinforcing steel: Sample and test by the Owners Testing Laboratory in accordance with ASTM A615 and CBC 1903A.5 and 1929A.2.
  2. Material Tests: Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and accompanied by their mill's analyses — one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction thereof from each size of reinforcing steel.
  3. Where identification of materials by heat number to mill tests cannot be made, the Contractor shall have the materials tested at his expense, make one series of tension and bend tests for each 2-1/2 tons or fraction thereof from each size and type of reinforcing steel. Tests shall be performed by a qualified testing laboratory.
  4. Reinforcing steel welding inspection by the Owner's testing laboratory shall be continuous during preheat and welding.

5. Welding of reinforcement shall be inspected per CBC 1929A.12.

#### 1.04 SUBMITTALS

- A. The fabricator shall provide the Owner's testing laboratory with the manufacturer's mill test reports for the materials to be used on the job. Reports to include chemical and physical properties of the reinforcing for each heat number manufactured. All fabricated materials to be tagged with heat number. See paragraph 1.03 B.
- B. Submit shop drawings showing fabrication and placing of details of all reinforcing steel to the Architect for review prior to start of fabrication. The Architect review is of a general nature only. An effort will be made to discover any errors, but all responsibility shall remain with the Contractor.
- C. Provide adequate samples of reinforcing to Owner's testing laboratory.

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Reinforcing steel shall be delivered to job site in bundles, tagged identifying heat number and mill. Store reinforcement above the ground on platforms to prevent damage, accumulation of dirt and rust.

### **PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. Reinforcing Steel: The reinforcing bars shall conform to ASTM A706 or to ASTM 615, Grade 60, except (1) the maximum yield strength shall be 78,000 psi, and (2) the tensile strength shall not be less than 1.25 times the actual yield strength. Bars used as column ties, stirrups, and field bent dowels shall be Grade 40, unless otherwise noted on the drawings.
- B. Welded wire Fabric: ASTM A-185
- C. Tie Wire: No. 16 AWG or heavier, black annealed
- D. Supports for reinforcing bars
  1. Supports for reinforcing on ground shall be blocks of concrete of sufficient strength and size to support the bars.
  2. Supports for reinforcing over formwork, concrete, or metal shall be plastic or galvanized steel chairs of type reviewed by the Architect and of sufficient strength and spacing to support the bars and any construction loads imposed on them. Metal bar supports shall conform to current ACI and CRSI standards. Metal bar supports shall have plastic tips where exposed to weather and/or to view after removal of forms.

**PART 3 EXECUTION**

3.01 FABRICATION

- A. Bending and placing of bars shall be in accordance with the Manual of Standard Practice and Recommended Practice for Placing Reinforcing Bars (CRSI MSP – latest edition) unless otherwise shown, noted or specified. Unless otherwise allowed, all reinforcing bars shall be shop fabricated.
- B. Steel reinforcing shall not be bent in a manner that will injure the material or the embedding concrete. Heating of reinforcement for bending will not be permitted. Bars shall be bent once only (no rebending or straightening allowed), unless otherwise indicated on drawings.
- C. All details of reinforcement not shown or indicated on the drawings or specifically called for in the specifications shall conform to ACI 315 and CBC 1998 edition.

3.02 PLACING

A. General

- 1. Reinforcing bars shall be of size shown on the drawings, schedules and details, accurately placed as to spacing and clearance, and securely tied at all intersections and supports with wire and in such manner as will preclude displacement during placement of concrete.
- 2. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide additional steel as metal spreaders and separators to maintain properly positioned steel in forms. Support additional reinforcement upon concrete pads, bars, or form hangers. All clearance requirements shall be met.
- 3. Before placing, clean bars free from rust, scale, dirt, grease, dried coatings of concrete or other foreign substances which are, in the Architect's opinion, detrimental to the bond. After placing, maintain bars in a clean condition until completely embedded in concrete.

B. Reinforcing Spacing and Coverage

- 1. Bars shall not be spaced closer than four (4) diameters of the largest of two adjacent bars, except at bar laps, which shall be placed such that a minimum of 2 bars diameter is clear between bars. Where members' reinforcing is placed in two layers, the distance between layers shall not be less than four bar diameters of the largest bar, and the bars in the upper layers shall be placed directly above those in the bottom layer, unless otherwise detailed or dimensioned.
- 2. Coverage of bars (including stirrups and column ties) shall be as follows, unless otherwise shown:

Footings:	3" soil face, 2" top
Slabs (on grade):	2" soil face, 1" top face
Slabs (elevated):	1-1/2" top and bottom
Beam & column	1-1/2"
Walls:	1-1/2" & 2" clear to form at soil face

C. Obstructions

1. Where obstructions (pipes, conduit, ducts, etc.) prevent the intended placement of reinforcing, provide additional reinforcing as directed by the Architect around the obstruction to match that interrupted reinforcing.
2. Provide additional stirrups, ties, trim bars, etc. as directed around all openings, sleeves, pipes, and conduit that pass through structural elements.

D. Welded Wire Fabric: Welded wire fabric reinforcement shall be rolled out, straightened, cut to required size, and laid out flat in place. Securely wire to fabric and other reinforcement at frequent intervals. Extend fabric over supporting beams and walls. At edges of slabs, construction joints, and expansion joints, extend fabric to within one inch of pour. As concrete for slabs is placed, lift fabric reinforcement at intervals to ensure proper embedment. Support fabric in mid-depth of slab. Slabs shall be reinforced with 6" x 6" - W1.4 x W1.4 welded wire fabric reinforcing, unless noted otherwise on drawings.

3.03 DOWELS, SPLICING AND OFFSETS

- A. Lap all bars at splices, corners and intersections as shown on structural drawings for concrete work. Laps of welded wire fabric shall be at least two times the spacing of the members in the direction lapped, but not less than twelve inches.
- B. Splices of reinforcement shall not be made at points of maximum stress. Splice lengths are as noted on the structural drawings and shall provide sufficient lap to transfer the stress by bond and shear between bars.

Bars shall be spaced the minimum distance specified and all lapped bars shall be 2 bar diameters (minimum) clear of the next bar. Stagger splices 50% of adjacent bars. All splices not shown on the drawings shall be approved by Architect prior to placement.

3.04 WELDING

- A. Reinforcing bars shall not have welded joints unless indicated on the drawings or unless prior approval has been given by the Architect. Welding shall conform to the requirements of the American Welding Society Structural Welding Code for reinforcing steel D1.4 and CBC and UBC Standard 19-2 and CBC 1929A.12. Field welding shall be performed by welders certified for the type of welding to be done. All reinforcement requires preheat prior to welding. Preheat operations and welding must be inspected by a testing laboratory. If A706 reinforcement is not used and if mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. Bars with a carbon equivalent (CE) above 0.75 shall not be used for welded connections.

3.05 MISPLACED REINFORCING

- A. Any reinforcing bars found to be misplaced after concrete has been placed shall be corrected at the Contractor's expense.

3.07 SEPARATION

- A. All reinforcing shall be kept separate from soil, pipe, conduit ducts, etc. by approved non-metallic separators.

3.08 CLEAN UP

- A. The subcontractor shall be responsible for removing excess material and debris associated with his work from the job site.

*END OF SECTION*

**SECTION 03 30 00**

**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

1.01 SCOPE

A. Work Specified

1. Provide all labor, materials, equipment and services to complete all concrete work required.

1.02 DESCRIPTION

A. The work shall include, but not necessarily be limited to, the following:

1. Foundations, beams, columns, slabs, walls and retaining walls.
2. Installation of all bolts, inserts, sleeves, connections, etc. in the concrete.
3. Coordination with other trades:
  - a. Make all preparations and do all work necessary to receive and adjoin the other work. Except where otherwise specified, the various trades will furnish bolts, anchors, etc. required for anchoring their work to the concrete. This Contractor will install the bolts and anchors into the forms, and furnish and install the necessary blocking.
  - b. The Contractor shall be responsible for the installation of all accessories embedded in the concrete and for the provision of holes, etc. necessary for the execution of the work of other trades. Any patching or cutting made necessary by failure or delay in complying with this requirement shall be at the Contractor's expense.
  - c. The other trades shall be responsible for the accurate location of their accessories. Any cutting and patching which may be necessary because of inaccurate placement shall be at their expense.

1.03 QUALITY ASSURANCE

A. Reference standards: Unless otherwise noted, the following standards shall govern the work.

1. American Society for Testing and Materials (ASTM), latest revision
2. California Building Code 2007 Edition (noted herein as CBC), Chapter 19A
3. American Concrete Institute (ACI):  
ACI 304 – Recommended practice for measuring, mixing and placing concrete.  
  
ACI 306 and ACI 305 – Recommended practice for cold weather and hot weather concreting.

B. Contractor submittals to the Architect and the Owner's testing laboratory (unless noted otherwise).

1. Cement chemical analysis: Cement shall meet all requirements specified; laboratory analysis of specified aggregates.

Source and origin of materials: The supplier shall submit Certificates of Compliance stating that the specific materials supplied conform to CBC 1929A.1.

2. Concrete Mix Designs:

- a. The mix designs for all structural classes of concrete are to be prepared by a recognized testing laboratory and a qualified licensed civil engineer.
- b. Submit a certification that the mix design meets the requirements of the specifications and meets the requirements of the CBC for concrete durability and quality, including a historical background as a pre-qualified mix; that the mix is over-designed if the mix is not pre-qualified, or that trial batches will be made and tested at the expense of the supplier.
- c. If a deviation from these specifications is desired, the preparer shall submit those deviations, along with a written explanation indicating that the submitted mix designs will provide an equivalent or better concrete product than as specified.
- d. Adjustments to review mix designs to account for weather conditions, etc.
- e. Mix design to be in accordance with CBC 1905A.3.3.1, and all requirements of these specifications.

3. Placing Record: Contractor shall maintain a record of time and date for each placement of concrete per CBC 1929A and Section 3.02 B. Submit at the end of the job.

4. Manufacturer's instructions and specifications for other concrete related materials such as: bond breakers, cure/sealer, admixtures, etc. shall be submitted to the Architect.

5. Proposed location of construction and cold joints shall be submitted to the Architect when different or in addition to those shown on the drawings.

6. Batch plant certificates shall be provided to the owner's testing laboratory and the Architect upon delivery of each load of concrete. Failure of the supplier to provide a batch plant certificate with each truckload of concrete is cause for rejection of the load. Certificates to include information per Section 1.03 C4 below.

7. Engineering analysis prepared by a California licensed Civil or Structural Engineer to justify construction-imposed loads on slabs, beams, walls when those loads are in excess of those required by the CBC for the specified use.

C. Testing and Inspection by the Owner's Testing Laboratory

1. The Owner's testing laboratory will review concrete mix designs and certificates of compliance, as supplied by the contractor for conformance to CBC 1903A and these specifications.

2. Review of: Contractor submittals, batch plant certificates, admixtures, etc.

3. Test aggregates per CBC 1903A.3.

4. Batch plant inspection at automated plants to occur at commencement of concrete work each day. Batch plant inspection at non-automated plants and when accuracy is questionable shall be continuous. Additionally, water cement ratio (WCR) is to be verified where a WCR is specified herein. The computed WCR is to be written on the batch plant certificate, to be taken to the job site prior to the truck leaving the plant.

5. Batch Plant Certificates: Obtain a batch plant weigh master's certificate at the site. If no batch plant certificate is provided at the site, recommend to the General Contractor that the truckload of concrete be rejected. So note in daily log, along with the location of the load of concrete in the structure if the load is not rejected.
  - a. To verify mix design quantities and condition upon delivery to the site, the laboratory's inspector shall obtain Batch Plant Certificates for each transit mixer. Certificates to include: Date, time, ingredient quantities, water added at plant and on job, total mixer revolutions at time of placement, and time of departure. For concrete with specified water cement ratio (WCR), no water is to be added on site unless the WCR upon leaving the plant is below the specified WCR. In this case water may be added on site until the specified WCR is met.
6. All cement used shall be sampled by the Owner's testing laboratory in accordance with CBC 1929A.1. Cement samples shall be held for possible testing until completion of construction.
7. Construction testing and inspection: Provide continuous inspection at the batch plant and during placement of structural class concrete with design strength of more than 2500 psi. Structural and non-structural class concrete with a design strength of 2500 psi or less to have periodic inspection on a 100 cubic yard basis as required to ensure conformance. See 2.02 for concrete classifications.
  - a. Sensitive flooring areas will be tested for moisture content prior to installation of flooring systems. Refer to flooring specifications for conditions and timing for testing.
  - b. Review and propose adjustments to reviewed mix designs to account for site, weather conditions, etc.
  - c. The Owner's testing laboratory inspector will make a set of four specimens at the job for each class of concrete per each 50 cubic yards or fraction thereof, and not less than one set of specimens for each 2000 square feet of surface area, for slabs or walls of each grade of structural concrete used for each day's placement. Perform standard 6"x12" cylinder tests in accordance with CBC 1903A.8. A record of the location of each concrete batch in the building will be kept and noted on the specimen. These cylinders will represent as nearly as possible the batch of concrete from which they are taken.
  - d. Standard compression tests of cylinders will be made, one at 7 days and one at 28 days in accordance with CBC 1903A.8. The minimum strength of each of the three cylinders shall be the specified design strength. If the strength of the test cylinders falls below the minimum compressive strength specified, the proportion of the concrete mix for that remaining segment of the structure must be adjusted to yield concrete of the specified minimum strength. All low-strength concrete in place shall be tested by taking cores from the structure as outlined in CBC 1905A.6.4, at the Contractor's expense.

If the compressive tests of the core specimens fail to attain a minimum of 85% of the specified design strength, the concrete will be deemed defective and shall be removed and replaced or adequately strengthened in a manner acceptable to the Architect and the Division of the State Architect, at the Contractor's expense. Field specimens of concrete and tests thereof shall be in accordance with CBC 1905A.6.4.

- f. The Contractor shall provide a satisfactory bin filled with damp sand for storage of the specimen cylinders until delivered to the laboratory.
- 7. Non-structural Concrete
  - a. Testing and inspection is not required.
- 8. Slump test and air tests will be made at the time of taking test specimens, and/or at one-hour intervals during placing of concrete in accordance with ASTM D143.
- 9. Testing of drilled and/or grouted concrete anchors:
  - a. Testing laboratory shall test all such anchors as noted on the drawings.
- 10. To verify mix design quantities and condition upon delivery to the site, the inspector will obtain, for each transit mixer, batch certificates for each delivery indicating batch date, time, ingredient quantities, water added at plant and job site, and number of mixer revolutions up to start of placing. For concrete with specified water cement ratio, no water is to be added on site.
- 11. The laboratory's inspector will report to the Contractor when material does not meet the requirements noted herein. The Contractor shall disallow use of such material unless prior approval for use is given by Architect and DSA-ORS.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Cement: Store in weather-tight enclosures and protect against dampness, contamination, and warehouse set. All cement to be from the same source.
- B. Aggregates:
  - 1. Stockpile to prevent excessive segregation or contamination with other materials or other sizes of aggregate.
  - 2. Use only one supply source for each aggregate stockpile.
- C. Admixtures:
  - 1. Store to prevent contamination, evaporation, or damage.
  - 2. Protect liquid admixtures from freezing or temperature ranges.
  - 3. Agitate emulsions prior to use.

1.05 COLD AND HOT WEATHER REQUIREMENTS

- A. Allowable concrete temperatures.
  - 1. Cold weather requirements per CBC 1905A.12 and as follows: When depositing concrete at freezing or near-freezing temperatures, the concrete shall have a temperature of at least fifty (50) degrees F., but not more than ninety (90) degrees F. The concrete shall be protected from freezing and maintained at a temperature of at least 50 degrees F. for not less than seven days after placing. When necessary, concrete materials shall be heated before mixing. Special precautions shall be taken for the protection of transit-mixed

concrete. The use of salts or chemicals either as protection or as an admixture will not be permitted unless approved by the Architect in writing. During freezing weather an air temperature log shall be kept by the Contractor for the first seven days after placement. Intervals shall not exceed four hours.

2. Hot Weather Requirements per CBC 1905A and as follows: Concrete shall be below 75 degrees F when placed (add ice, cool aggregates as necessary). Do not place concrete in hot/windy weather without review of procedures by the Engineer. Generally, erect sunshades and/or windbreakers to protect flat work during finishing and immediate curing operations. Do not place concrete for flatwork when the air temperature exceeds 90 degrees F. Retarders shall be added to improve curing and evaporate retardants utilized. Modified mix designs to be reviewed by Architect and the Owner's testing laboratory.
- B. Do not place concrete during sub or near freezing weather, snow, rain or sleet unless protection from moisture and/or cold is provided.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Materials shall be new and best of their class or kind. The materials, if found defective, unsuitable, or not as specified, will be condemned, and must be promptly removed from the premises. Materials specified by brand name shall be delivered in unbroken packages bearing manufacturer's label and shall be the brand specified or an approved equal. Other materials shall conform to the applicable sections of the current editions of the various standard specifications quoted herein. Materials must be properly protected from the weather or other damage, and shall be stored to prevent inclusion of foreign materials.
- B. Portland Cement: ASTM C150, Type II, low alkali with the following properties:
1. Cement shall conform to CBC 1903A.2.
  2. Fly Ash (Pozzolan): ASTM C 618 or AASHTO 295. Fly Ash is not Portland cement and may not be substituted for Portland cement on an equivalent weight basis, or without written request by the preparer of the mix design indicating the purpose of the substitution. This request may be denied by the Engineer.
- C. Concrete aggregates: CBC 1903A.3; stone aggregate. Source shall remain constant throughout the duration of the job. The exact proportions of combined fine aggregates and coarse aggregates to be used in the mix shall meet the requirements of CBC.
- D. Water: potable, clean, from domestic source.
- E. Admixtures: All admixtures shall be used in strict accordance with the manufacturer's recommendations. Admixtures containing calcium chlorides or other accelerators shall not be used without the approval of the Architect and the Owners testing laboratory. Admixtures shall conform to CBC 1903A.6.
1. Mid Range Water Reducing Admixtures: ASTM C-494, Type A, Polyheed 997 by Master Builders, WRDA 79 by W.R. Grace or acceptable equivalent
  2. Water Reducing Admixture and Retarder: ASTM C-494, Type D, "Pozzolith 300R", Master Builders; "Plastiflow-R" by Nox-crete; or acceptable equivalent
  3. Air Entrainment - MBAE -10 (Master Builders Air Entrainment)

4. High range water reducing admixtures: (Super Plasticizer) Rheobuild 1000 by Master Builders or acceptable equivalent
  5. The use of water reducing admixtures to increase slump required reduction of total water content per manufacturers recommendations.
  6. The use of high range water reducing admixtures in large quantity requires water reduction in accordance with the manufacturers recommendations.
- F. Slurry
1. Slurry shall consist of the same proportions of cement-to-fine-aggregates used in the regular concrete mix (coarse aggregate only omitted) and shall be well mixed with such amounts of water as will produce a thick consistency.
- G. Grout
1. Grout for Base Plates and Sill Plates: Non-shrink, high-strength grout shall be used for all grouting; conform to or exceed requirements of CRD-C621 and ASTM C1107. Grout shall be metallic type for concealed work and non-metallic type for exposed work. Acceptable manufacturers include The Burke Company, Master Builders, and W.R. Meadows, Inc. Grout shall attain 7000 psi in 20 days minimum when placed in a "fluid" state. Grout brands to meet or exceed the properties of MasterFlow at 928 at fluid consistency.
- H. Dry Pack
1. Dry pack for cosmetic concrete repairs only shall consist of one part cement to 2-1/2 parts fine aggregate (screen out all materials retained on a No. 4 sieve), mixed with a minimum amount of water, in small amounts. The consistency shall be such that when a ball of the mixture is compressed in the hand it will maintain its shape, showing finger marks, but without showing any surface water.
- I. Concrete Joint Material: Expansion joints shall be formed by premolded bituminous joint material, non-extruding, 3/8" thick, conforming to ASTM D944, as manufactured by Serviced Products, W.R. Meadows, Inc. National Expansion Joint Co., Celotex Corporation, or acceptable equal.
- J. Concrete Bonding Agent: "Concresive" Liquid LPL, Masters Builders Inc., "Top Bond #40", Nox - Chem, "Rezi-Weld 1000" by W.R. Meadows, or approved equal.
- K. Slab Curing Paper: American Sisalkraft Corp's. "Orange Label Sisalkraft" reinforced waterproof building paper, Pabco's "Pabcotite" paper, or approved equal conforming to ASTM C171, Type I.
- L. Curing Compounds: ASTM C309, Type I, Class B 20% min. solids, water base acrylic cure/sealer which will not discolor concrete or affect bonding of other finishes. Products may be "Vocomp 20", "Vocomp 25" or "Vocomp 30" by W.R. Meadows Co., or acceptable equivalent. See Curing and Protection Section 3.06.
- M. Vapor Barrier: Unless specified elsewhere, 10 mil Polyvinyl chloride with sealed lap joints.
- N. Chemical Floor Hardener: "Techkote #1080", National Expansion Joint Co. "Pena-lith" by W. R. Meadows Co., or approved equivalent.
- O. Evaporation Retardant: "Con-Film" by Master Builders.
- P. Water Stop: Seal-tight PVC water stop by W. R. Meadows Co.
- Q. Slab Joint Sealer: Gardox Horizontal Joint Sealant by Seal Tight or equal, to conform with CRD 525 and 526, Type H.

## 2.02 CONCRETE MIXES

### A. General

1. Contractor submittals shall be supplied to the Architect and the Owner's testing laboratory at least 15 days before placing concrete. Prior to submittal of mix designs, the Contractor shall review them for compatibility with his placing requirements to ensure that the concrete as designed can be placed in accordance with the drawings and specifications.
2. The proportions of the concrete mixes shall be such as to produce concrete of required average strength (as defined by CBC 1905A), set time, slumps, aggregate sizes, and shrinkage, and of a consistency that will allow thorough compaction without excessive puddling, spading, or vibration, and without permitting the materials to segregate, or free water to collect on the surface. The size and type of aggregates shall be such that they will produce low-to-moderate shrinkage, dense and uniform concrete free from rock pockets, honeycomb and other irregularities. All concrete mixes shall have entrained air for workability (4% maximum). The minimum set time for concrete to be used for flatwork shall be 3-1/2 hours, other concrete 3 hours as measured from placement of materials in the mixer. Minimum and maximum criteria presented herein are guidelines and do not represent specific mix designs. Minimum cement content indicates minimum sacks of cement, not cementitious material. Increasing cement content, to increase early strengths or to achieve specified WCR, while maintaining water content is discouraged in order to minimize effects of shrinkage.
3. Concrete may, at the Contractor's option, be designed for either pump or conventional placement with aggregate size, slumps, etc. to be maintained as specified below.
4. Variations in mix design, including changing type and or quantity of admixtures, are to be resubmitted to the Owner's testing laboratory and the Architect for review prior to use.
5. Mix designs with a specified maximum water cement ratio may be designed with a lower WCR than specified in order to allow for addition of water at the site.

B. Class of Concrete for Minimum Requirements

Class	Coarse Aggregate Size (Inches) and Fine Aggregate***	Minimum WCR & Maximum Nominal Slump & Tolerance (Inches)*, **	Minimum 28-Day Design Strength ****	Minimum Cement Sacks/ C.Y.*****
<b>Non-Structural</b>				
1. Lean Concrete for Backfill	1" x #4	---	---	3.0
2. Slab on Grade Exterior (Walks & Patios)	1" x #4	4" ± 1"	2,500	4.5
<b>Structural</b>				
3. Interior Slab on Grade	1" x #4	3" ± 1/2"	4,000	6.0
4. Foundation	1" x #4	3-1/2" ± 1/2"	3,000	5.0
5. Formed Cast Slab Above Grade	1-1/2" x #4	3" ± 1/2" WCR = .46	4,000	6.0
6. Cast Slab Above Grade on Metal Deck	1" x #4	3" ± 1/2"	3,000	5.0
7. Columns & Walls & Beams	1" x #4	3 1/2" ± 1/2 WCR = .46	4,000	6.0
8. Tilt-Up Concrete Wall Panels	1" x #4	3 1/2" ± 1/2 WCR = .53	3,000	5.25
9. Light Weight Concrete	3/4" Expanded Shale x #4	3" ± 1/2"	3,000	5.5

\* The tolerance is the maximum deviation allowable without rejection. The mix design shall be based on the nominal value specified and is without water reducing mixtures. Slump to be measured at the end of the hose.

\*\* The maximum water cement ratio is limited at time of placement as noted. No water is to be added on site such that the specified WCR or maximum slump is exceeded without approval of the testing laboratory and the Architect/Engineer. Workability is to be achieved utilizing an acceptable mid range to high range water reducing admixture.

\*\*\* Gradation of aggregate is per CBC 1903A.3.

\*\*\*\* Minimum cement content is based on a pre-qualified mix design as defined by CBC 1905A.

## **PART 3 EXECUTION**

### **3.01 MIXING CONCRETE**

- A. Final proportions shall be in accordance with reviewed mix designs. Adjustments to accepted proportions, for whatever reason, shall be reviewed by the Engineer prior to use.
- B. Batch and mix concrete per CBC 1903A.9.
- C. Batch and transit equipment shall be adequate for the work and operated as necessary to provide concrete complying with specified requirements.
- D. Mixed concrete shall be placed in the forms within 1-1/2 hours from the time of introduction of cement and water into the mixer. Use of, or re-mixing and tempering mixed concrete older than 1 hour, will not be permitted.
- E. Concrete mixes with a maximum WCR specified shall not have water added at site unless the water content at batch time provides for a WCR less than specified.

### **3.02 PLACING CONCRETE**

- A. Inspection and Testing:
  - 1. Review by Architect: Notice shall be given 48 hours (2 working days) before each concrete placement, in order that review of reinforcing, forms, etc. can be made prior to placing concrete.
  - 2. Owner's Testing Laboratory: Contractor shall notify 24 hours before each pour date.
- B. Records: The contractor shall keep a record of the time, temperature and date of placing the concrete in each portion of the structures. Such report shall be kept until the completion of the structure and shall be available for review by the Owner's testing laboratory/Architect.
- C. Preparation
  - 1. Remove loose dirt, mud, standing water, and foreign matter from excavations or cavities.
  - 2. For concrete on metal decking, thoroughly clean decking. Do not wet deck surface just prior to placement of concrete.
  - 3. Thoroughly clean reinforcement and other embedded items from loose rust and other matter. Assure reinforcing is held securely in place.
  - 4. Thoroughly wet wood forms, (except coated plywood) and bottom and sides of trenches, base under slab, adjacent concrete or masonry, sand beads and all reinforcing at least one in advance of placing concrete; repeat wetting as necessary to keep damp and cool.
  - 5. Equipment shall be maintained and of sufficient quantity and capacity to efficiently execute the work required.
  - 6. Check all embedded items for location, position and inclusion.
  - 7. Dampen materials on which concrete is to be placed. Do not saturate.
- D. Transporting
  - 1. Concrete shall be transported from the mixer to the place of final deposit as rapidly as practical, by methods that will prevent the separation or loss of the ingredients.
  - 2. Prevent penetration of vapor barriers and/or waterproofing membranes.

E. Placing

1. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and extent is completed. Construction joints must be as detailed on the drawings, or as otherwise approved.
2. When structural concrete is to be placed on elevated structural systems that are not to be shored, such as structural steel beams and metal decking, screed lines shall be located on primary structural members such that deflections of intermediate structural members and decking is compensated for by placement of additional concrete. The Contractor shall review proposed screed line locations with the Architect. Screed lines shall be placed to match any camber of primary girders that are other than "dead level".
3. Concrete shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. It shall be deposited as neatly as practical in its final position to avoid rehandling or flowing. No concrete shall be deposited that has started to set or stiffen. The remixing of concrete or grout which has begun to set will not be permitted. For concrete with specified water cement ratio (WCR), no water will be added on site.
4. Concrete, when placed in columns or walls, shall not be placed in layers exceeding ten feet in depth. Schedule of pouring shall be such that no concrete shall take initial set before the next concrete is poured. No horizontal cold joints will be allowed in columns or walls. Concrete in walls shall be placed in 32" horizontal lifts, minimum.
5. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped more than four feet. Spouts, elephant trunks or other approved means shall be used to prevent segregation as necessary.
6. Any concrete spilled on forms or reinforcing steel, in portions of structure not immediately concreted, shall be removed before concrete sets.
7. Any interruption in placing of more than 60 minutes will be cause for shutting down the work and the wasting of any remaining mixed concrete, concrete in hoppers, or in mixers. In case such interruption occurs, the Contractor shall provide construction joints where and as directed, and cut concrete back to such line, cleaning forms and reinforcing as herein specified.

F. Consolidation

1. Concrete shall be thoroughly compacted by puddling with suitable tools during placing, and thoroughly worked around the reinforcement, around embedded fixtures, and into the corners of forms. In addition to manual spading and tamping, all concrete shall be internally vibrated with high speed mechanical vibrators.
  - a. Vibrators shall have sufficient amplitude for adequate consolidation.
  - b. Vibrators shall be used at each point of concrete placement. Spare vibrators, not in use, shall be kept at the site for standby service.
2. Consolidate each layer of concrete as placed. Insert vibrators vertically at points 18" to 30" apart; work into top area of previously placed layer to reconsolidate and slowly withdraw to surface. Keep vibrator heads free from form surface.
3. Systematically double back to consolidate concrete to maximum density and reconsolidate whenever possible.

### 3.03 CONCRETE JOINTS

#### A. Structural Joints (Construction/Cold Joints)

1. Joint locations shall be where shown or approved. Joints not indicated on the plans shall be made and located so as not to impair the strength of the structure, shall be located to meet the minimum requirements below, and shall be submitted to Architect for review prior to placement of concrete.
2. All surfaces of previously placed concrete at construction joint shall be cleaned, washed, and roughened by sandblasting per CBC 1906A.4. Horizontal construction joints at the bottom of walls (unless not allowed otherwise) shall be 2" slurry placed at beginning of pour unless it can be demonstrated with a "test" section that segregation of aggregate will not occur.
3. Length of continuous placement for walls, formed slabs, joists, beams, etc. shall not exceed a length (feet) equal to three times the slab thickness (inches) unless reviewed by the Architect. Pour sections shall be alternated or staggered. Submit proposed location of construction/cold/expansion joints for review prior to placing concrete. Foundations may be placed in up to 200-foot increments. Shut off locations shall be "keyed" with form boards and reinforcing extended through one lap length or more.
4. All reinforcement shall be continuous through unless lap splices are provided at each side of joint.

#### B. Expansion/Construction Joints (Dowel Joints and Control Joints)

1. Exterior walkways, patios and other non-structural concrete flatwork shall have expansion/construction joints formed by a 2" deep trowelled groove, or by asphalt impregnated joint material embedded 50% of the slab depth at 12' on center maximum. No section shall be placed with a length larger than two times its width. Additionally, place joints at all inside corners, and at intersections with other work.
2. Interior and Exterior Floor/work Area Slabs
  - a. Provide dowel joints or control joints at a maximum dimension (in feet) of three times the slab thickness (in inches) in each direction, unless noted otherwise. Install joints to match slab level and in straight lines.

#### C. Joint Types:

1. Dowel Joint: A keyed joint with smooth dowels passing through to allow unrestricted movement due to contraction and expansion. Joints are as shown on the drawings. Joint shall have a 3/8" wide by 3/4" deep void at top for flexible sealant.
2. Control Joint(s): Shrinkage crack control joints may be of the following types when shown on the drawings. Joints to be installed in a straight line between end points, and joint edges to be finished appropriate to type. Joints are as shown on the drawings, filled with sealant or as required by other finishes.
  - a. 2" deep x 1/4" wide trowelled joint.
  - b. A pre-manufactured plastic joint such as "Zip Strip" may be provided where covered by other finishes.
  - c. 1/8" x 2" masonite strip where covered by or finishes.

- d. 1/8" x 2" deep saw cut installed within eight hours of completion of finishing. Saw cuts shall not be made if aggregate separates from cement paste during the saw cut operation. Equipment shall be maintained such that surface finish is not marred. Saw cut joints not covered by other finishes shall be filled with sealant.

### 3.04 FLATWORK (All Concrete Formed & Finished Flat)

#### A. General

1. Edge forms and screeds: Edge forms and intermediate screed strips shall be set accurately to produce the design elevations and contours in the finished surface, and shall be sufficiently strong to support the type of screed to be used.
2. Jointing: Joints shall be located and detailed as indicated on the project drawings and specifications. Flatwork on ground may be cast in checkerboard patterns or in strips.
3. Consolidation: Concrete in slabs shall be thoroughly consolidated. Slab concrete shall be compacted and tamped with a grid tamper so that the coarse aggregate is pushed below the surface, but without working paste and fines to the surface. Screed the surface uniformly to grades. As soon as the surface becomes workable, it shall be wood or magnesium floated.
4. Evaporation retardant shall be placed on tamped and/or floated surface as necessary to retain surface moisture for finishing and to avoid plastic shrinkage cracking

#### B. Flatwork on Ground

1. Unless noted otherwise, sub-base for all concrete floor slabs shall consist of 4" minimum thickness of clean, free-draining rounded, thoroughly compacted baserock.
2. Over baserock material under interior concrete floor slabs, where called for on the drawings, apply a vapor barrier in widest practicable widths. All joints shall be lapped not less than 12 inches with the top lap in the direction of the pour and sealed with an approved cold plastic cement. Approved tape may be substituted for cement. Patch holes in vapor barrier similar to laps. Over membrane provide 2" thick layer of damp compacted concrete sand. Dampen sand prior to placing concrete. In winter months, do not place concrete unless sand layer is dried to a damp condition.

#### C. Finishes

1. Flatwork: All flatwork finishing must be performed by experienced operators. Flatwork shall be brought to grade for sloped slabs or to level grades as shown on drawings, and care shall be taken to insure full thickness in all cases. All floor surfaces shall be finished monolithically. Surfaces shall be uniform and level or sloped evenly to drains where they occur. Do not use liquid curing compounds or other coatings that may prevent bonding of tile-setting materials to slabs.
  - a. Flatwork which receives a surface applied membrane, ceramic tile or wood frame for raised floors for finish, shall be wood floated.
  - b. Flatwork requiring a finish surface is to be steel trowel finished (two min.).
  - c. Broom Texture Finish:
    - 1) For exterior surfaces where shown or not otherwise specified.

2) Finish as for steel trowel finish, except immediately following first trowelling (depending on conditions of concrete and nature of finish required), texture surfaces to a uniform condition using a medium or coarse fiber broom as directed by the Architect.

2. Lines and Levels:

a. Exterior surfaces not otherwise shown or required shall be transversely sloped to drain 1/8" minimum per foot. Exterior surfaces not required to be sloped shall be level within 3/4" overall, tolerance (+3/8", -3/8").

b. Interior surfaces:

1) Interior flatwork shall be level throughout within 1/2", tolerance (+1/4", -1/4") inch, as defined by the form work. Optionally, levelness shall meet or exceed the requirements of ACI 302  $F_L = 20$ , unless otherwise noted.

c. Maximum Allowable Deviations in Trueness of Surfaces: Deviation in elevation of surfaces shall be as shown or approved, and deviations shall not exceed the following tolerances.

1) Deviation in trueness of surfaces may be measured using a 10-foot straight edge and shall not exceed the following tolerances, plus or minus, unless otherwise noted:

1/4-inch for wood float finishes and exterior surfaces.

1/8-inch for steel trowelled and other interior finishes.

2) Optionally, deviations in trueness shall meet or exceed minimum limits set by ACI 302 with  $F_F$  not less than 30, unless otherwise noted.

3. Defective Finishes: For defects in concrete finishes see Section 3.07 Defective Concrete.

### 3.5 FORMED SURFACES

A. Lines and Levels:

1. General: All concrete members shall be formed level and/or plumb. Maximum deviation is 1/8" end to end of any one member. All concrete shall be finished to match forms.

B. Finishes:

1. Intermediate joint and score marks and edges shall be tooled smooth where indicated, or as directed by the Architect.

2. Use steel radius tools of standard patterns or as required to achieve details shown or specified. All exposed corners not specified to be chamfered shall have radiused edges.

3. All finishes to be as required to achieve appearance specified on structural and architectural drawings and specifications.

C. Permanently Exposed Joints and Surfaces:

1. After removal of forms, inspect all exposed surfaces for defects and repair defective concrete per paragraph 3.07.

2. Maximum differential height within two feet and across construction joints is 1/16".

3. For curled edges at cracks and joints see Section 3.07 Defective Concrete.

3.06 CURING AND PROTECTION

A. General

1. Curing is intended to maintain water content for proper hydration and to minimize temperature ranges. Procedures shall be consistent therewith, as far as practical, and within scope of work specified.
2. Wheeling, working and walking on concrete shall be avoided for at least 24 hours after placement. Protect concrete from sun and rain.
3. All concrete shall be kept at or above 50 degrees F. during and for the first seven (7) days after placement. See paragraph 1.05 - Cold and Hot Weather Requirements.
4. Concrete shall not be subjected to any design loads until it is completely cured, and has attained its 28-day strength (21 days minimum).
5. Protect concrete from damage during subsequent building construction operations, during and after curing. The General Contractor is responsible for the protection of the finished slab from damage due to construction loads. Submit engineering analysis for point or wheel loads in excess of 10,000 lbs. on slabs on grade and 5,000 lbs. for slabs above grade.
6. Keep finished areas free from all traffic for four days minimum, or as necessary until surfaces have set sufficiently to prevent damage, or cover traffic areas with plywood sheets; maintain paper and plywood in place and in good repair for as long as necessary to protect against damage by any or all other construction operations.

B. Curing: Curing shall immediately follow finishing.

1. Flatwork on grade: Cure by one of the following methods:
  - a. Waterproof curing paper: While in thoroughly damp condition, cover with curing paper; lap seams 6" minimum and extend beyond slab or paving perimeters 6' minimum; seal all laps and edges with continuous reinforcing plastic tape.  
Do not remove for 7 days minimum.
  - b. Cure/Sealer: Immediately upon completion of finishing, apply an approved cure/sealer to flatwork. Additionally, during hot and/or windy weather, flatwork shall be kept wet by a continuous fog spray, or wetted and covered with Polyethylene similar to B.1.a, for a minimum of 48 hours after application of cure/sealer. Curing shall continue beyond the minimum of 48 hours as necessary to insure proper curing. This method may be employed only when other concrete treatment or finishes will not be affected by the cure/sealer applied, unless product is removed prior to installation of other finishes. Cure shall be applied at the maximum recommended application rate.
  - c. Water curing: Flatwork may be continuously water cured with a fog spray or flooded, for a period of seven (7) days minimum (including holidays and weekends). Alternatively cover with non-staining water-retaining materials and keep saturated for same period.
2. Elevated Flatwork
  - a. Waterproof curing paper per (1a) above or water cure per (1c) above for 14 days' period minimum.

- b. Apply cure/sealer per (1b) above after initial curing period.
  - 3. Flatwork on metal decking cure per (1b) above.
  - 4. Formed Concrete Members
    - a. Beams, walls, columns, etc. shall be adequately protected from cold and hot weather.
    - b. Forms shall be kept tight for a minimum of 7 days utilizing cloth materials as a complete cover, unless exposed surfaces are kept continuously damp.
  - 5. Foundations
    - a. Wet trenches prior to placing concrete. Apply approved cure/sealer immediately after floating.
- C. Hardener: After 30 days minimum curing, apply hardener to all floor slabs not receiving other finishes. Apply to clean, residue- (bond breakers, cure sealers, etc.) free surface in strict accordance with the manufacturer's directions.

### 3.07 DEFECTIVE CONCRETE AND DEFECTIVE FINISHES

- A. Defective materials and execution of construction:
  - 1. Concrete that does not meet specifications may be required to be removed and replaced by the Owner.
    - a. Low strength concrete: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
    - b. Excessive shrinkage, cracking, crazing or curling: Removal and replacement may be required by the Owner if repairs acceptable to the Owner cannot be made.
- B. Defective concrete shall be repaired or replaced as directed by the Architect, at no added expense to the Owner.
  - 1. In general, minor defective work may be repaired by use of dry-pack and surface grinding of high spots, with permission of the Architect. If defective work is serious or affects the strength of the structure or the appearance, the Architect may require the removal and replacement of that portion of the concrete.
  - 2. Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie-holes, etc., except as specified, shall be patched at once, but not until the surfaces have first been reviewed by the Architect. Prior to commencing work, submit for review the patching mixture and proposed method for use.
  - 3. Slabs on grade and on metal deck shall be reviewed by Contractor for "curled" slab edges and joints and shrinkage cracks just prior to installation of other floor finishes. Curled edges shall be ground flush, and cracks of 1/16" and more filled with cementitious grout as a filler.

4. High spots or protrusions caused by formwork, etc. shall be ground flush with surrounding concrete.
5. Slab sections not meeting trueness/flatness or lines/levels/levelness shall be removed and replaced unless otherwise directed by the Architect. The minimum section for removal is a 15' square area unless directed otherwise by the Architect.

### 3.08 GROUTING AND DRY-PACK

- A. Provide for setting steel plates and sill plates on concrete or masonry. Prepare using approved non-shrink grout aggregate to produce mortar 5,000 psi minimum at 28 days. Completely fill all voids; thoroughly compact in place.
- B. Bolts or inserts which have been dry-packed or grouted in place shall not be tensioned sooner than 7 days after packing.

### 3.09 CONDUITS AND PIPES IN CONCRETE

- A. Slabs on Grade: No conduit shall be embedded within the depth of the slab. No pipe, etc. exceeding 1" o.d. shall be embedded within the slab. All pipe within slab shall be laid on grade. Do not stack; separate pipe lines by 6" minimum. If it is required to embed larger pipe, thicken slab to meet that requirement.
- B. All individual pipes through concrete shall be sleeved, with 1" minimum clear all around from sleeve to reinforcing. Wrapped pipes shall have 1-1/2" clear to reinforcing all around. Pipe wrap shall be from 1/8" ± sheet foam with three wraps minimum.
- C. Groups of pipes and conduits shall be spaced at least 3 sleeve diameters apart such that concrete and reinforcement as specified is uninterrupted. When grouping of pipe and conduit is such that spacing is not possible, block outs in the foundation or other structural member shall be installed. The reinforcement specified shall be provided both top and bottom of the block out. Foundation depth at each side of block out shall match the specified footing depth, unless otherwise noted on the structural drawings. Other structural members affected by block outs shall be sized and reinforced as directed by the Architect. Pipes and conduits embedded in foundations, beams, columns, elevated slabs, and walls shall be centered through the depth and/or thickness. Maximum size to be imbedded shall not exceed the least dimension divided by 3. No conduit or pipes shall be imbedded in slab on metal deck.
- D. Where plumbing passes directly beneath foundations, thicken foundation as shown on the drawings and meet requirements of B above.

### 3.10 PROTECTION OF DRAINAGE SYSTEMS

- A. Care shall be taken not to introduce any foreign material into any specified drainage, piping or duct system. Cost of work required to repair or clean the drainage system as a result of failure to comply with this requirement will be back charged to the Contractor.

### 3.11 CLEAN UP

- A. Contractor shall keep the buildings free of debris at all times. At the completion of his work, he shall remove all materials from the premises and streets, scrape all drippings, and leave the entire work clean and free of debris.

*END OF SECTION*

**SECTION 31 30 00**

**EARTHWORK**

**PART 1 - GENERAL**

1.01 DESCRIPTION:

- A. Site inspection prior to bidding.
- B. Site preparation including setting grades, identifying utilities, and protecting site features and landscaping.
- C. Excavation for site structures, slabs-on-grade, and paving.
- D. Fill under slabs-on-grade and paving.
- E. Fill for over-excavation.
- F. Consolidation and compaction.
- G. Excavation, backfill, and compaction relating to mechanical, electrical, and under slabs-on-grades.
- H. Provide and implement the requirements of SWPPP which shall be followed throughout the length of the contract.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Asphalt Paving 32 12 16.
- B. Concrete Paving 32 13 13.
- C. Cast in Place Concrete 03 30 00 (See PC Specifications)
- D. Mechanical and Electrical Sections.

1.03 REFERENCES:

- A. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 SUBMITTALS:

- A. Submit under provisions of Section 01 33 00.
- B. Submit for approval of Architect/Engineer and Geotechnical Engineer, prior to any deliveries to site, samples of any proposed imported fill materials.

## **PART 2 - PRODUCTS**

### 2.01 SOILS:

- A. See site-specific geotechnical engineering study for suitability of on-site soils to be used as engineered fill, for moisture conditioning, and for over excavation requirements.
- B. Import material, if required, shall meet the requirements as specified and approved by the Geotechnical Engineer.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION:

- A. Complete Work in strict accordance with Geotechnical Engineer's requirements.
- B. Protect adjacent properties from damage due to earthwork operations. Protect open excavations and trenches with fences, covers, or railings as required to maintain safe pedestrian and vehicular traffic.
- C. Identify required lines, levels, contours, and datum.
- D. Employ a competent instrument operator to properly lay out grades and stakes, using a professional type instrument, and to be present on site during grading, excavating and filling operations.
- E. Establish elevations, and set and protect stakes during earthwork operations.
- F. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- G. Notify utility company to remove and relocate utilities when required.
- H. Protect above and below grade utilities which are to remain.
- I. Protect trees, plant life, lawns, and other features remaining as a portion of final landscaping.
- J. Protect bench marks, sidewalks, paving, and curbs, either on-site or off-site, from damage due to construction, excavation equipment and vehicular traffic.

### 3.02 EXCAVATION:

- A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate trenching, slabs-on-grade, import fill, paving, and construction operations.
- C. Control drainage in the vicinity of the Work to prevent water from accumulating or running into the excavation or into adjacent property. Provide shoring and bulk-heading necessary to hold the earth back.
- D. When dust conditions exist, dampen the areas to prevent seepage of dust and transportation of debris into the buildings and onto adjacent property.
- E. Prevent standing water from developing in excavated portions of the Work at all times.

- F. Stockpile excavated material in areas designated on site or as directed by the Engineer. Remove all excess material not being used, from site.

3.03 TRENCHING:

- A. Footing Trenches: After completion of rough grading and acceptance of engineered fills, excavate to widths and depths shown on the Drawings. Excavations are subject to foundation inspection.
- B. Notify the Geotechnical Engineer two days prior to foundation trench completion and before placement of steel or forms. Foundation inspection must be completed before reinforcing steel or any form work is set. Forming of footing sidewalls shall be done only when approved by the Architect/Engineer.
- C. Hand trim trenches. Remove loose matter.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Correct areas over-excavated by error or damaged by movement of the sides of the trench in accordance with this Section at no additional cost to the Owner.

3.04 BACKFILLING:

- A. Use only engineered or approved fill materials for required backfill. Compact in accordance with soil report.
- B. Backfill areas to contours and elevations with unfrozen materials.
- C. Maintain optimum moisture content of backfill materials to attain required compaction densities stipulated in soil report.
- D. Slope grade away from building minimum ¼” per foot, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.

3.05 COMPACTION:

- A. Preparation of engineered fill areas, selection and placing of engineered fill materials, shall be in conformance with the soils report, and will be observed and tested by the Soils Engineer.
- B. Notify Geotechnical Engineer two working days in advance of filling operations to permit required testing.
- C. Generally, compact subgrade to density requirements for subsequent backfill materials.

3.06 TOLERANCES:

- A. Rough Grade: Plus or minus .05 feet of design rough grade.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus .05 feet.

- C. Top Surface of General Backfilling: Plus or minus .05 feet.

3.07 FIELD QUALITY CONTROL:

- A. Field Density Test: The Geotechnical Engineer will observe and test earthwork and compacted areas, at least one test per each 600 cubic yards or fraction thereof; minimum of two tests per layer in isolated areas. Where sheepsfoot rollers are used, tests will be taken in compacted materials below the disturbed surface.
- B. When the relative compaction is below the percentage specified in the Soils Report, recompaction will be required until the stipulated percentage level is achieved.
- C. Laboratory tests will be based on ASTM D1557 to determine conformance with the recommendations of the Soils Report.

3.08 ADJUSTING:

- A. Restore, to the satisfaction of the Architect/Engineer, street pavements, walks, curbs, gutters, and trees, which become damaged in the performance of the Work.
- B. After completion of the Work, remove rubbish and equipment from the site.

3.09 PROTECTION:

- A. Protect finished work.
- B. Recompact fills subjected to vehicular traffic.
- C. Leave fill material stockpile areas completely free of excess fill materials.
- D. Before working over backfill, verify that such work has been properly backfilled and compacted. Promptly notify the Architect/Engineer, in writing, of contrary conditions.

*END OF SECTION*

**SECTION 32 1 2 16**

**ASPHALT PAVING**

**PART 1 - GENERAL**

1.01 DESCRIPTION:

- A. Work Included: Perform all asphalt paving work required for the project including patching in the Public Right of Way. Such work includes but is not limited to:
  - 1. Proper preparation of subgrade to receive aggregate base.
  - 2. Aggregate base for paved surfaces.
  - 3. Asphalt concrete surfacing.
  - 4. Seal coat.
- B. Related Work Specified Elsewhere:
  - 1. Earthwork 31 30 00.
  - 2. Concrete Paving 32 13 13.

1.2 REFERENCES, CODES AND STANDARDS:

The following references, codes and standards are hereby made a part of this Section and asphalt paving work shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting or requiring work that is contrary to codes, rules and regulations of any local or State agency having jurisdiction.

- A. "Standard Specifications" as referred to herein are the Standard Specifications of the State of California, Business & Transportation Agency, Department of Transportation, latest publication.
- B. All work in public property shall conform to the requirements of and be subject to inspection by the local authorities have jurisdiction.

1.03 PROTECTION:

- A. Avoid all damage and asphalt stains to adjoining buildings and surfaces. Take special precautions to prevent stains on adjacent building walls, concrete paving, curbs, etc.
- B. Permit no traffic on finished paving until surfaces have cured sufficiently to resist marking.

**PART 2 - PRODUCTS**

2.1 MATERIALS:

(Section designations refer to "State of California Standard Specifications").

- A. Asphalts:
  - 1. Prime Coat: Liquid -asphalt conforming to Section 93-1.01, medium curing MC-70.

2. Tackcoat: Slow setting type asphalt emulsion (SSlh) conforming to Section 94, or as approved.
  3. Paving Asphalt: Steam refined asphalt conforming to Section 92-1.02, AR-4000.
  4. Seal Coat: Slow setting type asphalt emulsion (SSI) conforming to Section 94.
- B. Aggregate for Asphalt Concrete: Type B aggregate conforming to Section 39-2.02, 1/2" maximum size, medium grading.
  - C. Aggregate for Base Course: Class 2 Aggregate Base conforming to Section 26-1.02B, 3/4" maximum size.

## 2.2 PROPORTIONING AND MIXING:

Proportion and mix asphalt concrete as per Section 39-3.

## PART 3 - EXECUTION

### 3.01 CONDITION OF SURFACES:

- A. Subgrade shall be at proper elevation.
- B. Utility trenches shall be complete including satisfactory backfill and compaction, approved by Soil Engineer.
- C. Drainage structures, gratings and frames shall be in place, complete and at proper elevation.
- D. Commencement of paving work implies acceptance of surfaces as satisfactory.

### 3.2 PREPARATION:

The upper 6" of final subgrade in areas to receive paving shall be scarified (if necessary) and uniformly compacted to not less than 95% (ASTM D 1557-78 method). Comply with applicable requirements of Earthwork Section governing compaction. Immediately prior to placing aggregate base, the grading plane at any point shall not vary more than 0.10' above or below the grade established. After compaction and trimming, subgrade shall be firm, hard and unyielding. All work in accordance with the subsurface investigation for the project.

### 3.03 INSTALLATION

- A. Cutting for Patching work shall be saw cut.
- B. Aggregate Base: Construct aggregate base as per Section 26 of Standard Specifications for Class 2 base, minimum compacted thickness as noted on Drawings. Finished surface shall not vary more than 0.05' above or below the established grade. Compact to a density not less than 95 percent (ASTM D 1557-78 method). 6" at exterior parking and 8" in drive aisles.
- C. Prime Coat: Apply prime coat at an approximate total rate of 0.25 gallons per square yard to areas receiving asphalt concrete except surfaces specified for tackcoat. Conform to Section 39-4.02 of Standard Specifications.

- D. Tackcoat: Apply tackcoat to vertical surfaces such as curbs, construction joints, etc., against which asphalt concrete is to be placed. Apply at a rate of from 0.02 gallon to 0.10 gallon per square yard. Conform to Section 39-4.02 (Paint Binder) of Standard Specifications.
- E. Asphalt Concrete: Spread and compact asphalt concrete as per Section 39-5 and 39-6 of the Standard Specifications. Minimum compacted thickness shall be as noted on Drawings. Compact to a density not less than 95 percent (California Test Method No. 304). 2-1/2" at auto parking; 3-1/2" at aisles and driveways.
- F. Seal Coat: Apply fog seal coat to thoroughly cleaned and finished surfaces of asphalt concrete paving in accord with Section 37. Apply at a rate of .10 gallon (emulsion rate not including water) per square yard. "Construction" seal coat shall be applied immediately after pavement placement and a final seal coat shall be applied to asphalt surfaces immediately prior to acceptance of entire project (regardless of time of completion of paving).
- G. Install paving and base so that surface conforms to finish grades indicated.
- H. Make minor revisions in grades as required to meet existing surface elevations. Make variations in slope and grade gradual subject to approval of Civil Engineer.
- I. Provide paving with positive drainage so that water does not pond. In general, slope of asphalt surfaces shall not be less than 1/4" in 1'-0" where possible.

### 3.04 ASPHALT SURFACING

Contractor's scope includes but is not necessarily limited to the following:

1. Spreading and compacting aggregate sub-base material, aggregate base material and asphalt concrete pavement and surfacing and shall conform to this specification.
2. Liquid asphalt for prime coat shall be Grade SS-1.
3. Asphaltic emulsion for tack coat (paint binder) shall be emulsified asphalt, Type SS-1h.
4. Asphalt to be mixed with aggregate to form asphalt concrete shall be steam-refined paving asphalt, grade PG-64-10.
5. Aggregate for asphalt concrete shall be Type A with the following special provisions:
  - a. Grading of combined aggregates for new asphalt concrete pavement, walkways, and overlays two (2) inches or more in thickness shall be three-quarter (3/4) inch maximum size, medium grading.
  - b. Grading of combined aggregate for asphalt concrete pavement, walkways and overlays less than two (2) inches in thickness shall be one half (1/2) inch maximum size, medium grading.
6. Grinding existing pavement at conforms and for overlaying.
7. Replacing asphalt concrete surfacing (spot reconstruction).
8. Shoulder backing where necessary.
9. Applying prime coat and tack coat.
10. Suppliers' certification showing conformance shall be delivered with each shipment of materials to the job site.
11. Weed killer as required.
12. Permanent striping per current Greenbook Standards
13. Onsite coordination with shade structure subcontractors as required.
14. All backfill for own work.

15. Any dirt spoils generated by own work to be stockpiled in a location determined by the construction manager and then hauled off.
16. Erosion control set up and maintenance.
17. Include additional mobilization as required for phasing.
18. Finish surface of asphalt concrete when measured with a twelve-foot straight edge shall not vary more than 0.01 feet in the longitudinal direction and 0.02 feet transversely below the lower edge of the straight -edge.
19. For aggregate bases and sub-bases, the contractor shall arrange and provide for the following acceptance tests to be performed on samples taken at the job site, based on a frequency of one series of tests per 3000 tons of material placed:
  - a. "R" value, per California Test Method 301;
  - b. Sieve Analysis, per California Test Method 202;
  - c. Sand equivalency, per California Test Method 217;
  - d. For aggregate bases, the durability index, per California Test Method 229.

*END OF SECTION*

**SECTION 32 13 13**  
**CONCRETE PAVING**

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Sidewalks, sign bases and fence/gateposts.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Subsurface Investigation 02 30 00.
- B. Earthwork 31 30 00.
- C. Concrete Forms 03 11 00.
- D. Concrete Reinforcement 03 20 00.
- E. Concrete 03 30 00.

1.03 REFERENCES

- A. ANSI/ASTM A185 - Welded Steel Wire Fabric or Concrete Reinforcement.
- B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- D. ASTM C260 - Air-Entraining Admixtures for Concrete.
- E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- F. ASTM C494 - Chemical Admixtures for Concrete.
- G. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.04 SUBMITTALS: Comply with requirements of Shop Drawings, Product Data and Samples Section 01 33 00.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with Section 01 40 00.
- B. Obtain cementitious materials from same source throughout.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is saturated or frozen.

## **PART 2 - PRODUCTS**

### 2.01 CONCRETE MATERIALS

- A. Concrete Paving.
  - 1. Compressive strength of 2500 psi for paving concrete.

### 2.02 FORM MATERIALS

- A. Concrete Forms 03 11 00.

### 2.03 REINFORCEMENT

- A. Reinforcing Steel.
  - 1. Welded Steel Wire Fabric: 6 x 6 – w1 .4 x w1 .4 w/f flat sheets; unfinished.
  - 2. Dowels: ASTM A615; smooth plain steel, unfinished finish.

### 2.04 SUB-GRADE:

- A. Provide 4” AB with 90% relative compaction over 8” non-expansive material with 90% relative compaction (refer to site preparation, grading and compaction requirements given in the soil investigation report).

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Verify gradients and elevations of substrate are correct.
- B. Verify that substrate is level, smooth, and capable of supporting curbs, and curb and gutter sections.
- C. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

### 3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole, catch basin, and other metal frames with oil to prevent bond with concrete.

### 3.03 FORMING

- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble form work to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to form work during concrete placement.

3.04 REINFORCEMENT

- A. Place reinforcement as indicated.
  - B. Place reinforcement at mid-height of slabs-on-grade.
  - C. Interrupt reinforcement at expansion joints, per plans.
- D. Reinforcement for on grade slabs shall be held at correct elevation with masonry blocks at a minimum of 4 feet on center in each direction.

3.05 PLACING CONCRETE

- A. Place concrete in accordance with State Standard Specifications.
  - B. Ensure reinforcement, inserts, embedded parts, formed joints and subgrade are not disturbed during concrete placement.
  - C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- A. Place concrete to pattern indicated.

3.06 JOINTS

- A. Place expansion joints at maximum of 20-foot intervals where not specified. Align curb, gutter, and sidewalk joints.
- B. Provide 1/4" deep scored joints in sidewalks at 5 feet intervals.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

*END OF SECTION*