

TECHNICAL SPECIFICATIONS

NEW AUTO LIFTS (RENOVATION PACKAGE)

AT

CYPRESS COLLEGE

9200 Valley View Street
Cypress, CA 90630

NORTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT

1830 Romneya Drive
Anaheim, CA 92801-1819
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WW Project No. 18029.00

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SUMMARY OF WORK

PART 1 GENERAL

1.01 PROJECT DESCRIPTION

- A. Project consists of construction of new concrete paving and thickened concrete pads, reinstallation of existing vehicle lifts and installation of new vehicle lifts at Cypress College, Cypress, CA, for North Orange County Community College District, Anaheim, California, as shown on Contract Documents prepared by WestbergWhite, Inc., Architects.
- B. Work includes:
 - 1. New Construction Consisting of:
 - a. Thickened concrete pads for support of vehicle lifts provided under separate contract.
 - b. Installation of new vehicle lifts furnished under separate contract.
 - c. Connection of electrical power and compressed air lines to lifts.
 - 2. Site Improvement Work Consisting of:
 - a. Concrete paving and base course.
 - b. Pavement markings.
- C. Related Requirements:
 - 1. Refer to Civil Drawings and notes for related site work, including, but not necessarily limited to:
 - a. Removal and replacement of asphalt paving where indicated.
 - b. New trench drain and piping.

1.02 PROCUREMENT AND CONTRACTING DOCUMENTS

- A. Use Division 00 Procurement and Contracting Requirements provided by North Orange County Community College District for installation of vehicle lifts at Cypress College.

1.03 RELATED DOCUMENTS

- A. Refer to District's Division 00 Documents, including General Conditions, and other Division 01 Sections, for additional requirements.
- B. Comply with requirements of these specifications and District's Division 00 documents.
 - 1. Where differences may occur between specifications and District 00 documents, requirements of District's 00 documents govern, unless otherwise directed.
 - 2. Changes to approved documents will be made by addenda or change order approved by Owner/Architect.
- C. Contract Documents are complementary and what is required by one is as binding as when required by all.

1. Report errors, inconsistencies, or omissions discovered by Contractor promptly to Owner/Architect as request for information.

1.04 CONSTRUCTION REQUIREMENTS

- A. Construct Work conforming to requirements of California Code of Regulations (CCR), Title 24, Part 2, 2016 California Building Code (CBC), Volumes 1 and 2.

1.05 CONTRACTS

- A. Construct Work under single fixed-price contract.

1.06 WORK SEQUENCE

- A. Conform to construction schedule as specified.
 1. Construction Time: Starts as of date specified in initial "Notice to Proceed" from Architect to Contractor and ends with date of acceptance of Work by Owner.
- B. Construction Schedule:
 1. Work will be conducted in three phases and provide least possible interference with activities of Owner's personnel and to permit orderly transfer of personnel and equipment to new facilities.
 2. Phase 1 consists of selective demolition of Site as indicated on Drawings.
 3. **Phase 2 consists of new construction and installation of vehicle lifts and begins immediately upon completion of Work of Phase 1.**
- C. Liquidated Damages:
 1. Liquidated damages will be assessed under conditions provided in Agreement.

1.07 CONTRACTOR'S USE OF PREMISES

- A. General: During construction period, limit use of premises to immediate area required for construction operations.
 1. Use of premises is also limited by Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of Project.
- B. Limit use of premises for Work and for storage as directed, to allow for:
 1. Work by other Contractors.
 2. Owner occupancy.
 3. Use by Public.
- C. Coordinate use of premises under direction of Architect and Owner.
- D. Assume full responsibility for protection and safekeeping of products under this contract, stored on Project Site.
- E. Move stored products under Contractor's control, which interfere with operations of Owner or separate contractor.
- F. Obtain and pay for use of additional storage or work areas needed for operations.

1.08 WORK DURING COLLEGE SESSIONS

- A. Work under this contract will be executed in part during regular sessions of School.
 - 1. Cooperate with College authorities in every way to minimize disturbance.

- B. In entrance and exit of workers, and in bringing in, storing, and removal of equipment, cooperate with those in authority and prevent interference with functioning of College.
 - 1. Observe rules and regulations in force and avoid unnecessary dust, mud or accumulated debris, or undue interference with convenience, sanitation or routine of departmental activities.

- C. In connecting new utilities to existing, and similar operations, time and coordinate such operations so that there will be no interference with College activities.

PART 2 PRODUCTS *(Not Applicable)*

PART 3 EXECUTION *(Not Applicable)*

END OF SECTION 01 1100

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SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Temporary facilities required for this Work include, but are not necessarily limited to:
 - a. Temporary utilities such as water and electricity.
 - b. Sanitary facilities.
 - c. Construction aids.
 - d. Barriers.
 - e. Temporary controls.
 - f. Temporary informational signs.
- B. Related Requirements:
 - 1. Refer to District's Division 00 Documents, including General Conditions, and other Division 01 Sections, for additional requirements.
 - 2. Refer to Division 32 Sections for additional traffic control requirements.
 - 3. Permanent installation and hook-up of various utility lines are described in other pertinent sections.
 - 4. Comply with requirements of pertinent safety regulations for equipment furnished by subcontractors.
- C. Work Not Part of This Section:
 - 1. Ladders, planks, hoists, and similar items normally furnished by individual trades in execution of their own portions of Work.

1.02 PROJECT CONDITIONS

- A. Use means necessary to maintain temporary facilities in proper and safe condition throughout progress of Work.

PART 2 PRODUCTS

2.01 UTILITIES

- A. Water:
 - 1. Provide necessary temporary water lines and water supply and upon completion of Work, remove such temporary facility.
 - 2. Provide and pay for water needed for construction.
- B. Electricity:
 - 1. Provide necessary temporary wiring and upon completion of Work, remove such temporary facility.
 - 2. Provide area distribution boxes so located that individual trades may furnish and use 100 foot maximum length extension cords to obtain adequate power and artificial lighting at points where needed for work, inspection, and safety.
 - 3. Provide and pay for electricity needed for construction.

2.02 SANITARY FACILITIES

- A. Sanitary facilities include temporary toilets, wash facilities, and drinking water fixtures.
 - 1. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
 - 2. Install where facilities will best serve Project's needs.
 - 3. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility.
 - 4. Provide covered waste containers for used material.

- B. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of chemical, aerated recirculation, or combustion type.
 - 1. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
 - 2. Provide separate facilities for male and female personnel.
 - 3. Maintain in sanitary condition.

- C. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for healthy and sanitary condition.
 - 1. Dispose of drainage properly.
 - 2. Supply cleaning compounds appropriate for each condition.
 - 3. Provide safety showers, eyewash fountains , and similar facilities for convenience, safety, and sanitation of personnel.

- D. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled water drinking water units, including paper supply.

2.03 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate execution of Work
 - 1. Scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.

- B. Provide necessary facilities and means of access to structure so that Building Inspectors, Special Inspectors, Architect and Structural Engineer may inspect structure or portions of structure as necessary.
 - 1. Means of access includes, but is not necessarily limited to, ladders, scaffolds, and similar items.

2.04 BARRIERS

- A. Temporary Fencing: Provide temporary fence around entire construction area as required for safety and protection.
 - 1. Construction: Provide chain link fencing not less than six feet in height, complete with metal or wood posts and required bracing, and with suitably locked truck and pedestrian gates as required.
 - 2. Provide opaque, fabric or plastic windscreen material, full height and run of fencing, including gates.

2.05 TEMPORARY CONTROLS

- A. Contractor Responsibility: Specific safety requirements by governmental authorities, including requirements of latest Occupational Safety and Health Act (OSHA) and Cal/OSHA.
- B. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at construction site and related areas under Contractor's control.
 - 1. Remove physical evidence of temporary facilities at completion of Work.
 - 2. Comply with requirements of authorities having jurisdiction.
- C. Dust Control: Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into atmosphere.
- D. Water Control: Provide methods to control surface water to prevent damage to Project, Site, or adjoining properties.
 - 1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff.
 - 2. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.
 - 3. Dispose of drainage water in manner to prevent flooding, erosion, or other damage to Project Site or to adjoining areas.
 - 4. Comply with requirements specified in Section 01 5713.
- E. Debris Control: Maintain areas under Contractor's control free of extraneous debris.
 - 1. Prevent accumulation of debris at construction site, storage and parking areas, or along access roads.
 - 2. Provide containers for deposit of debris as specified in Section 01 7419.
- F. Pollution Control:
 - 1. Provide methods, means and facilities required to prevent contamination of soil, water and atmosphere by discharge of noxious substances from construction operations.
 - 2. Provide equipment and personnel to perform emergency measures required to contain spillage, and to remove contaminated soils and liquids.
 - 3. Take special measures to prevent harmful substances from entering public waters.
 - a. Prevent disposal of wastes, effluents, chemicals, and other such substances in sanitary or storm sewers.
- G. Temporary Fire Protection: Install and maintain temporary fire protection facilities of types needed to protect against reasonably predictable and controllable fire losses.
 - 1. Comply with NFPA 241 .
 - 2. Prohibit smoking in construction areas.
 - 3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 4. Develop and supervise overall fire prevention and protection program for personnel at Project Site.

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- a. Review needs with local fire department and establish procedures to be followed.
- b. Instruct personnel in methods and procedures.
- c. Post warnings and information.

2.06 TEMPORARY INFORMATIONAL SIGNS

- A. Provide temporary informational signs as follows:
 1. As required by codes, laws and regulatory agencies and to:
 - a. Inform public and persons seeking entrance to Project.
 - b. Identify key elements of construction facilities.
 - c. Direct traffic.
- B. Prepare temporary signs of sizes indicated.
 1. Erect on Project Site as approved by Architect.
 2. Support on posts or framing of preservative treated wood or steel.
 1. Do not permit installation of unauthorized signs..

2.07 OWNERSHIP OF TEMPORARY FACILITIES AND CONTROLS

- A. Items provided by Contractor under this Section remain property of Contractor
 1. Remove such items from job site immediately upon completion of Work..

PART 3 EXECUTION

3.01 MAINTENANCE AND REMOVAL

- A. Maintain temporary facilities as long as needed for safe and proper completion of Work.
- B. Remove such temporary facilities as rapidly as progress of Work will permit, or as directed by Architect.

END OF SECTION 01 5000

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Formwork for cast-in-place concrete and installation of embedded items.
 - a. Work includes thickened concrete pads for support of vehicle lifts provided under separate contract.
 2. Formwork and accessories.
 3. Reinforcing steel for concrete unless specifically noted otherwise.
 4. Reinforced concrete with compressive strengths as shown.
 5. Concrete finishing:
 6. Concrete sealers.
 7. Testing and Inspection of formwork, reinforcing, and concrete.
- B. Related Sections:
1. Section 14 4500: Vehicle Lifts
 2. Section 31 2300: Excavation and Fill; base course for concrete slabs.
 3. Section 32 1313: Concrete Paving.
- C. Products Installed But Not Furnished Under This Section:
1. Built-in anchors, inserts, bolts and other embedded items for connection of other Work.

1.02 REFERENCES

- A. California Code of Regulations (CCR), Title 24, Part 2, California Building Code (CBC), Volumes 1 and 2, 2016 edition.
1. Chapter 19A – Concrete
- B. ASTM International (ASTM):
1. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 2. ASTM A 706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
 3. ASTM A 1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 4. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
 5. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 6. ASTM C 42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams
 7. ASTM C 88 – Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 8. ASTM C 94 – Standard Specification for Ready-Mixed Concrete
 9. ASTM C 143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
 10. ASTM C150 – Standard Specification for Portland Cement

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11. ASTM C 595 – Standard Specification for Blended Hydraulic Cements
 12. ASTM C 685 – Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing
 13. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- C. American Concrete Institute (ACI):
1. ACI 301 – Specification for Structural Concrete for Buildings.
 2. ACI 302.1R – Guide to Concrete Floor and Slab Construction
 3. ACI 304 – Recommended Practice for Measuring, Mixing and Placing Concrete.
 4. ACI 305 – Recommended Practice for Hot Weather Concreting.
 5. ACI 306 – Recommended Practice for Cold Weather Concreting.
 6. ACI 318 – Building Code Requirements for Reinforced Concrete.
 7. ACI 347 – Recommended Practice for Concrete Formwork
- D. California Department of Transportation (Caltrans):
1. Office of Materials Engineering and Testing Services:
 - a. California Test Methods (CTM):
 - 1) CTM 217 – Method of Test for Sand Equivalent.
 - 2) CTM 227 – Method of Test for Evaluating Cleanliness of Coarse Aggregate
- E. The Engineered Wood Association (APA):
1. Voluntary Product Standard Structural Plywood (PS 1-09)
 2. Guide to Plywood Grades
- F. West Coast Lumber Inspection Bureau (WCLIB):
1. Standard Grading Rules No. 17, current edition.
- G. South Coast Air Quality Management District (SCAQMD):
1. Rule 1113 – Architectural Coatings

1.03 QUALITY ASSURANCE

- A. Formwork and Accessories:
1. Design Criteria: Formwork conforming to ACI 347.
 - a. Design Formwork to:
 - 1) Prevent leakage or washing out of cement mortar.
 - 2) Resist spread, shifting, and settling.
 - 3) Reproduce accurately required lines, grades, and surfaces within tolerances specified.
 - b. Safety:
 - 1) Responsibility for adequate strength and safety of formwork including falsework, and shoring rests with Contractor.
 2. Allowable Tolerances:
 - a. Construct Formwork to produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.
- B. Reinforcing:
1. Welders' Qualifications:
 - a. Qualify welders in accordance with AWS D1.4 and AWS D1.

2. Do not permit reinforcing steel to rust where there is danger of staining exposed surfaces of adjacent concrete.
 - a. Replace rust-stained concrete at Contractor's expense.
 3. Allowable Tolerances:
 - a. Place reinforcing steel within tolerances permitted by ACI 318, Section 26.6.2, unless otherwise approved by Architect.
 4. Owner's Testing Agency will provide tests in accordance with CBC Chapter 17A.
 - a. Collect mill test reports for reinforcement.
 - b. Take samples from bundles at fabricators.
 - 1) When bundles are identified by heat number and accompanied by mill analysis, take two specimens from each ten tons, or fraction thereof, of each size and grade.
 - 2) When reinforcement is not positively identified by heat numbers or when random sampling is intended, take two specimens from each 2 tons, or fraction thereof, of each size and grade.
 5. Test for Tensile and Bending Strengths:
 - a. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4 and AWS D1.8
 - b. Perform chemical analysis sufficient to determine carbon equivalent and minimum preheat temperature when reinforcement does not conform to low-alloy steel requirements of CBC Section 1903A.8.
- C. Concrete:
1. Testing Laboratory Qualifications:
 - a. Testing Laboratory under direction of registered Civil Engineer licensed in State of California, having operated successfully for four years prior to this Work, conforming to requirements of ASTM E 329.
 2. Requirements of ACI 301 govern Work, materials, and equipment related to this Section.
 - a. Specifications set minimum results required, and references to procedures are intended to establish minimal guides.
 3. Responsibility for quality of concrete in place rests with Contractor who also bears burden of proof that concrete meets minimum requirements.
 4. Placing of concrete by means of pumping will be acceptable method of placement providing that Contractor can demonstrate that:
 - a. Specified concrete strengths will be met.
 - b. Equipment has record of satisfactory performance under similar conditions and using similar mix.
 - c. Trial batches have been made.

1.04 SUBMITTALS

- A. Product Data:
 1. Manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, form coatings, admixtures, joint materials, sealers/hardeners, curing materials (when permitted), and others as requested by Architect.
- B. Mix Designs:
 1. Prepare mix designs for Architect's review and include following information in mix design data:

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- a. Design:
 - 1) Project name, address, Site location, and location of design usage.
 - 2) Contractor, Sub-Contractor, Supplier and Plant Location.
 - 3) Mix Number.
 - 4) Specified compressive strength, maximum aggregate size, slump, and placement method.
 - 5) Application and location in structure.
 - 6) Signature and stamp of licensed civil engineer responsible for mix design.
 2. Materials:
 - a. Design Method.
 - b. Water-Cement Ratio.
 - c. Cement:
 - 1) Type, amount, and compliance with specified criteria statement.
 - d. Aggregates:
 - 1) Source(s), gradations (Individual and combined).
 - e. Admixtures:
 - 1) Brand, classification, dosage, addition method.
 - 2) Obtain specified approvals for admixtures prior to including in mix designs.
 - f. Water source.
 - g. Test Results, Batch Quantities, Yield (calculations).
 3. Special Considerations:
 - a. Unit Weight.
 - b. Other considerations relative to placement, curing, finish, and testing.
- C. Shop Drawings:
1. Cast-in-place Concrete:
 - a. Show construction joint locations and details.
 2. Reinforcing Steel:
 - a. No submittals are required.
 - b. Providing steel reinforcing as indicated on Drawings and as specified herein is responsibility of Contractor.
 - c. Prepared Shop Drawings are solely for use by Contractor and will not be reviewed or approved by Architect or Structural Engineer.
- D. Batch Plant Certificates:
1. Accompany each load of materials or concrete with signed copy of batch plant certificate stating quantity of each material, amount of water, admixtures, departure time and date.
 2. When continuous batch plant inspection is waived, provide affidavit in accordance with Title 24, CBC, Part 2, Section 1704A.3.3 to Owner's Testing Laboratory.
- E. Testing and Inspection Reports:
1. Owner's Testing Agency:
 - a. Laboratory Reports:
 - 1) Laboratory test or evaluation reports for concrete materials and mix designs, performed in accordance with Section 01 4500, to Owner, Architect, Contractor, and Division of the State Architect.
 - 2) Do not begin concrete production until mix designs have been reviewed and accepted by Architect.

2. Reinforcing Steel Reports:
 - a. Certified mill test reports (tensile and bending) for each heat or melt of steel prior to delivery of material to Project Site.
 - b. Where reinforcing is to be welded, furnish mill test reports verifying weldability of steel.

- F. Contractor's Certifications:
 1. Testing Laboratory's Certificate of Compliance.
 2. Certified copies of mix designs for each concrete class specified including compressive strength test reports.
 3. Certification that materials meet requirements specified.
 4. Certification from vendor that samples originate from and are representative of each lot proposed for use.

- G. Schedule of placing for Architect's review before starting Work.

- H. Samples:
 1. Upon request of Architect
 - a. Furnish formwork and accessories, including expansion joint fillers.
 - b. Concrete sealer/harder products as required for application to slab.

1.05 PROJECT CONDITIONS

- A. Sequencing Schedule for Formwork:
 1. Ensure timely delivery of embedded items.
 2. Be responsible for cutting and patching necessitated by failure to place embedded items.
 3. Plan erection and removal to permit proper sequence of concrete placing without damage to concrete.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General:
 1. Ensure storage facilities are weather tight and dry.
 2. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

- B. Reinforcing:
 1. Deliver reinforcement and accessories to Project Site not more than 48 hours before placement.
 2. Store in manner to prevent excessive rusting and fouling with grease, dirt, or other bond-weakening coatings.
 3. Take precautions to maintain identification after bundles are broken.

- C. Cast-in-Place Concrete:
 1. Store bulk cement in bins capable of preventing exposure to moisture.
 2. Use sacked cement in chronological order of delivery.
 - a. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Formwork and Accessories:
 - 1. Forming Materials:
 - a. Panel or board forms at Contractor's option.
 - 1) Panel Forms:
 - a) Minimum 5/8 inch thick exterior grade plywood with sealed edges, PS 1 grade Plyform Class I and II B-B Exterior or HDO Exterior.
 - 2. Wood:
 - a. WCLIB standard grade or better Douglas Fir.
 - 3. Form Ties and Spreaders:
 - a. Metal type acting as spreaders, leaving no metal within one inch of concrete face and no fractures, spalls, depressions or other surface disfigurations greater than 3/4 inch in diameter.
 - 4. Expansion Joint Filler:
 - a. Fiber Type:
 - 1) Premolded non-extruding preformed bituminous saturated fiberboard units, ASTM D 1751, 1/4 inch thick unless otherwise noted.
 - 2) Provide one of following, or approved equal:
 - a) W. R. Meadows, Inc. - Sealtight Fibre Expansion Joint (Basis-of-Design)
 - b) J.D. Russell Company – Fiberflex Fiber Expansion Joint
 - c) Right / Pointe Company – Fibre Expansion Joint
 - d) SpecChem Fiber Expansion Joint
 - 5. Form Release Agent:
 - a. Must not stain or otherwise adversely affect architectural concrete surfaces.
 - b. Provide one of following, or approved equal:
 - 1) Atlas Construction Supply, Inc. – Atlas Premium Gold Release
 - 2) Nox-Crete Co. – Nox-Crete Form Coating
 - 3) Right / Pointe Company – Right Release Water Base
- B. Reinforcing:
 - 1. Bars:
 - a. New billet steel, ASTM A615 Grade 60, and ASTM A706.
 - 1) Grade 60, where welded.
 - 2) Refer to Structural Drawings for use of Grade 40 bars.
 - 2. Tie Wires and Spirals: ASTM A 1064.
 - 3. Bar Supports:
 - a. As required for assembling and supporting reinforcement in place.
 - b. Typical: CRSI Class B, pregalvanized.
 - c. Concrete adobes for foundations and slabs on grade.
 - 4. Threaded Coupler:
 - a. Lenton Standard coupler by ERICO, or approved equal.
 - b. Coupler is to develop 125 percent of specified yield strength reinforcement.

C. Concrete:

1. General Requirements:
 - a. Furnish cement and aggregates with proven history of successful use with one another.
 - 1) Sources of cement and aggregate are to remain unchanged throughout Work, unless Architect approves request for change made at least 10 days prior to anticipated date of casting.
 - b. Ready-mixed concrete meeting requirements of ASTM C 94.
 - c. Deviations in properties of materials tested by Owner's Testing Agency is cause for their rejection pending additional test results and redesign of mix by Contractor's Testing Laboratory.
 - d. Use of frozen aggregates is not permitted.
2. Cement:
 - a. Conforming to ASTM C150, Type II / V, low alkali.
 - b. Use one brand of cement throughout Project, unless otherwise acceptable to Architect.
3. Aggregates:
 - a. Conform to Chapter 19A, Concrete, CCR, Title 24, Part 2 CBC Sections 1705A.3.2, 1903A.5, and following:
 - b. Coarse Aggregate:
 - 1) Conforming to ASTM C 33.
 - 2) Consisting of clean, hard, fine grained, sound crushed rock, or washed gravel, or combination of both.
 - 3) Free from oil, organic matter or other deleterious substances and not contain more than two percent by weight of shale or cherty material.
 - c. Fines:
 - 1) Conforming to ASTM C 33.
 - 2) Sand Equivalent:
 - a) Not less than 75 when tested per ASTM D 2419.
 - d. Provide aggregates from single source for exposed concrete.

D. Water:

1. Clean and potable, free from impurities detrimental to concrete.

E. Admixtures:

1. Use of admixtures is not permitted unless request is submitted to Architect and Structural Engineer for review and Structural Engineer's approval.
2. Use of calcium chloride or admixtures containing calcium chloride is prohibited.
3. Upon receipt of Structural Engineer approval, Contractor modifies mix designs as necessary, and submits modifications to Owner's Testing Agency for testing and acceptance
4. When approved, following types of admixtures may be used, conforming to manufacturer's recommendations for use:
 - a. Water Reducing: Conforming to ASTM C 494, Type A.
 - b. Accelerating or Retarding: Conforming to ASTM C 494
 - c. Air Entraining: Conforming to ASTM C 260.
5. Do not use admixtures which have not been incorporated and tested in accepted mix designs.

F. Fly Ash:

1. Fly ash conforming to ASTM C 618, Class N or F may be used at Contractor's option.

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- a. Use of Class C is not permitted.
 2. Do not substitute more than 15 percent by weight of fly ash or other pozzolan, for ASTM C 150, Portland Cement.
- G. Non-Shrink, Non-Metallic Grout:
1. Premixed high strength grout requiring only addition of water at Project Site.
 - a. BASF Corporation, Construction Chemicals – MasterFlow 928
 - b. Five Star Products, Inc. – Five Star Grout.
 - c. Sika Corporation – SikaGrout 428 FS
- H. Curing Materials:
1. Concrete Curing Paper:
 - a. Conforming to ASTM C 171, non-staining, reinforced type.
 - 1) Orange Label Sisalkraft by Fortifiber Building Systems Group.
 - 2) Approved equal.

2.02 SOURCE QUALITY CONTROL

- A. Furnish Plywood bearing APA grade-trademark.
- B. Owner's Testing Agency will:
1. Review mix designs, certificates of compliance, and samples of materials Contractor proposes to use.
 2. Test and inspect materials, as necessary, in accordance with ACI 318 and CBC Sections 1705A, 1903A, and 1910A for compliance with requirements.
 3. Take samples as required from Contractor's designated sources.
 4. Take one grab sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pretested cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples when required by Architect who may be so advised by DSA.
 5. Test coarse, intermediate, and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in judgment of Architect such tests are necessary to determine quality of material.
 - a. Perform such tests in accordance with ASTM C 88.
 - b. Loss not to exceed 6 percent of either fine intermediate or coarse aggregate.
 - c. Aggregate failing to comply with this requirement may be used in Work provided it contains less than 2 percent of shale and other deleterious particles and shows loss in soundness test of not more than 10 percent when tested in sodium sulphate solution.
 - d. Test aggregates as required by CBC Sections 1705A.3.2 and 1903A.5.
 6. Test for sand equivalent of fine aggregate in accordance with California Test 217.
 7. Test for cleanness value of coarse and intermediate aggregate in accordance with California Test 227.
 8. Inspect plant prior to starting Work to verify following:
 - a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.
 - b. Other plant quality controls are adequate.

9. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location per CBC Sections 1705A.3, 1905A.1.16, 1910A.1, and ACI 318 Section 26.12 as modified, where other materials are measured.
- C. Waiver of Batch Plant Inspection:
1. Continuous batch plant inspection may be waived in accordance with CBC Section 1705A.3.3.1
 2. Following requirements apply when batch plant inspection is waived:
 - a. Qualified technician of Testing Agency to perform check of first batch at start of day.
 - b. Licensed weighmaster to positively identify materials as to quantity and certify to each load by batch ticket.
 - c. Batch tickets, including material quantities and weights, are to:
 - 1) Accompany load
 - 2) Be transmitted to Project Inspector by truck driver with load identified thereon.
 - 3) Do not place load without batch ticket identifying mix.
 - 4) Inspector will keep daily record of placements, identifying each truck, its load, time of receipt, and approximate location of deposit in structure, and will transmit copy of daily record to enforcement agency.

2.03 MIXES

- A. General Requirements:
1. Perform tests or assemble necessary data indicating conformance with Specifications.
 2. For each mix submit data showing that proposed mix will attain required strength in accordance with requirements of CBC Sections 1705A.3 and 1905A.1.16 per ACI 318 Section 26.12.2 (a) as modified
 3. Instruct Laboratory to base mix design on use of materials tested and approved by Owner's Testing Agency.
 4. Include compression strength test reports with mix design per CBC Section 1904A and 1905A.1.9
 5. Design Mix, test, and adjust when necessary in ample time before first concrete is scheduled to be placed.
 - a. Submit laboratory data and strength test results for revised mix design to Architect prior to using Mix in Project.
 6. Ensure mix designs will produce concrete to strengths specified and of uniform density without segregation.
 7. When mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard without changing cement content.
 8. Contractor's mix designs are subject to review by Architect and Owner's Testing Agency.
 9. Introduction of calcium chloride will not be permitted.
- B. Admixtures:
1. Where use of admixtures has been approved, provide admixtures produced by establish reputable manufacturers.
 - a. Conform to types of admixtures specified under "Materials" Article.
 - b. Use in compliance with manufacturer's printed directions.

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- c. Do not use admixtures which have not been incorporated and tested in accepted mix designs.
 - d. Refer to CBC Section 1903A.6 and ACI 318 Section 26.4.2.2(b) as modified.
- C. Patching Mortar:
- 1. Mix in proportions by volume of one part cement to two parts fine sand.
- D. Non-Shrink, Non-Metallic Grout:
- 1. Follow approved manufacturer's printed instructions and recommendations.

2.04 MIXING

- A. Batching Plant Conditions:
- 1. Ensure equipment and plant will afford accurate weighing, minimize segregation and will efficiently handle materials to satisfaction of Architect and Owner's Testing Agency.
 - 2. Use approved moisture meter capable of determining moisture content of sand.
- B. General Requirements:
- 1. Thoroughly clean concrete equipment before use for architectural concrete mixes to avoid contamination.
 - 2. Mix cement, fine and coarse aggregates, admixtures and water to exact proportions of mix designs.
 - a. Use method of mixing complying with ACI 318, Section 26.4
 - 3. Measure fine and coarse aggregates separately according to approved method which provides accurate control and easy checking.
 - 4. Adjust grading to improve workability; do not add water unless otherwise directed.
 - 5. Maintain proportions, values, or factors of approved mixes throughout Work.
 - 6. Mix concrete in transit mixers five minutes immediately prior to discharge in addition to mixing as called for by ACI 304 and ASTM C 94.
- C. Admixtures:
- 1. Use automatic metering dispenser to introduce admixture into mix.
 - 2. Use Dispenser recommended and calibrated by admixture manufacturer.

2.05 FINISH MATERIALS

- A. General:
- 1. Provide concrete sealer materials complying with requirements of SCAQMD Rule 1113.
- B. Concrete Sealer:
- 1. Lithium-Silicate sealer, hardener, and densifier.
 - 2. Use for concrete slabs where indicated in Finish Schedule:
 - 3. Products:
 - a. Subject to compliance with specified requirements, provide following, or approved equal:
 - 1) Conslideck LS by Prosoco, Inc.
 - b. Comply with SCAQMD Rule 1113 and requirements for low-emitting materials as specified in Section 01 3329.
 - c. Comply with ANSI/NFSI B101.3 for slip-resistance.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas where formwork will be constructed and verify that:
 - 1. Excavations are sufficient to permit placement, inspection and removal of forms.
 - 2. Excavations for earth forms have been neatly and accurately cut.
 - 3. Conditions are otherwise proper for formwork construction.
 - 4. Do not start Work until unsatisfactory conditions have been corrected.

- B. Examine units of Work to be cast and verify that:
 - 1. Construction of formwork is complete.
 - 2. Required reinforcement, inserts, and embedded items are in place.
 - 3. Form ties at construction joints are tight.
 - 4. Concrete-receiving places are free of debris.
 - 5. Depths of depressed slab conditions are correct for delayed finish noted and for its proper bonding to concrete.
 - 6. Conveying equipment is clean and properly operating.
 - 7. Architect has reviewed formwork and reinforcing steel and that preparations have been checked with Project Inspector.

- C. Do not begin placement of concrete before unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Obtain necessary information for coordination of formwork with items to be embedded in concrete and other related work.

- B. Ensure availability of sufficient labor, equipment and materials to place concrete correctly in accordance with scheduled casting.

- C. Protect finished surfaces adjacent to concrete-receiving places.

- D. Clean transportation and handling equipment at frequent intervals and flush thoroughly with water before each day's run.
 - 1. Do not discharge wash water into concrete form.

- E. Construction Joints:
 - 1. Clean and roughen construction joint contact surfaces by removing surface laitance and exposing sound mortar.
 - 2. Sandblasting and bush-hammering are acceptable methods.

3.03 FORMWORK CONSTRUCTION

- A. General:
 - 1. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until concrete structure can support such loads.
 - a. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
 - b. Maintain formwork construction tolerances complying with ACI 347.

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2. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb Work in finished structures.
 - a. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in Work.
 - b. Use selected materials to obtain required finishes.
 - c. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
 3. Frame openings where indicated on Architectural, Structural, Mechanical, Plumbing and Electrical Drawings.
- B. Formed Elements:
1. Carefully align inside and outside forms before tightening ties.
 2. Plywood Forms: Insure vertical joints are plumb and horizontal joints are level; arrange joints and ties in geometrical pattern as approved by Architect.
 3. Form inside corners at exposed conditions with mitered boards or plywood so that no concrete is placed against form ends.
 4. After erection, seal cracks, holes, slits, gaps, and apertures in forms so that they will withstand the pressure and will remain completely watertight.
 5. Provide means to seal bottom of forms at construction joints such as foam tape or other gasket devices.
 6. Apply coating of release agent prior to erection of formwork following approved manufacturer's recommendations.
- C. Expansion Joints:
1. Provide in exterior concrete on grade at maximum 24 feet on center or as noted and at intersections with vertical surfaces, curbs, manholes or other penetrations through slabs.
 2. Use fiber type expansion joint fillers typically and depress 1/4 inch unless otherwise noted.
 3. Use cork type expansion joint fillers at conditions with non-bituminous waterproofing, liquid waterproofing, or sealant systems.
- E. Construction Joints:
1. Provide where shown on Drawings as directed by Architect and per ACI 318, Section 26.5.6.
 2. Provide key indentations at joints.
 3. Provide pour strips on inside face of forms at horizontal joints, but remove strips and thoroughly clean out reglets before placing subsequent portions of wall.
 4. Prevent formations of shoulders and ledges.
 5. Provide means for drawing forms into firm contact with concrete before placing additional concrete over previous pours where shrinking and warping has separated concrete from forms.
- F. Embedded Items:
1. Properly locate, unless locating is specified elsewhere, and place inserts and embedded items required by other trades prior to casting concrete.

3.04 REINFORCING PLACEMENT

- A. General:
 - 1. Place bars as noted.
 - 2. Reinforcement to be continuous.
 - a. Refer to Structural Drawings for lap splice schedule.
 - b. Stagger splices where possible.
 - c. Securely wire contact lap splices together to maintain alignment.
 - 3. Ensure placement will permit concrete protection in conformance with CRSI or to extent shown.
 - 4. Support and fasten bars securely with spacers, chairs or ties to permit their being walked upon without displacement or movement both before and during placement of concrete.
 - a. Wire-tie bar intersections.
 - 5. Do not bend bars around openings or sleeves.
 - a. Wherever conduits, piping, inserts, or sleeves, and like items interfere with placing of reinforcement, obtain Architect's approval of placing before concreting.
 - 6. Do not field bend bars unless expressly noted in Contract Documents.
- B. Prior to placing concrete, verify reinforcement has been bent, positioned, and secured in accordance with Drawings; ensure removal of oil, grease, dirt, or other bond-weakening coatings; replace severely rust-pitted reinforcing bars.
- C. Quality Assurance:
 - 1. Project Inspector will inspect placement of reinforcement and notify Structural Engineer of discrepancies in placement.
 - 2. Owner's Testing Agency will inspect shop and field welding of reinforcing bars in accordance with CBC Section 1903A.8; 1705A.3.1 - Table 1705A.3, Item 2 and Table 1705A.2.1, Item 5b

3.05 CONCRETE PLACEMENT

- A. Notify Architect and Testing Laboratory at least 48 hours before placing concrete.
- B. Place concrete in accordance with CBC Section 1705A and ACI 318.
- C. Place concrete in cycles as continuous operation to permit proper and thorough integration and to complete scheduled placement.
 - 1. Do not place concrete where sun, wind, heat, or facilities prevent proper finishing and curing.
- D. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from re-handling and flowing.
 - 1. Do not deposit concrete initially set.
 - 2. Place concrete within ninety minutes after adding water unless otherwise noted.
 - 3. Re-tempering of concrete which has partially set will not be permitted.
- E. Take precautions to avoid damage to under-slab moisture barrier and displacement of reinforcement and formwork.

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- F. Deposit concrete vertically in its final position.
 - 1. Avoid free falls in excess of six feet where reinforcement will cause segregation and in typical conditions unless Architect approves otherwise.
- G. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before placing next lift.
 - 1. Remove leakage through forms.
- H. Interruption in placement longer than 60-minutes will be cause for discontinuing placement for remainder of day.
 - 1. In this event, cut back concrete and provide construction joints as Architect directs
 - 2. Clean forms and reinforcement as necessary to receive concrete at later time.
- I. Hot Weather Concreting: Conform to ACI 305 and following requirements when mean daily temperature rises above 75 degrees F.
 - 1. Establish upper temperature limit of concrete mixes for each class of concrete.
 - a. Ensure that concrete temperature during placing are not so high as to cause difficulty from loss of slump, flash set, or cold joints, and do not exceed 90 degrees F.
 - b. Consider other project climatic conditions detrimental to concrete quality such as relative humidity, wind velocity, and solar radiation.
 - 2. Make trial batches of concrete for each mix design at limiting mix temperature selected.
 - a. In lieu of trial batches, submit compression strength test reports (20 minimum) at limiting temperature for each proposed mix to Owners testing laboratory for review.
 - 3. Employ practices to maintain concrete below maximum limiting temperature in accordance with ACI 305.
 - a. Concrete ingredients may be cooled before mixing, or flake ice or well-crushed ice of size that will melt completely during mixing may be substituted for part of mixing water.
 - 4. Employ practices to avoid potential problems of hot weather concreting in accordance with ACI 305.
 - 5. When temperature of reinforcing steel or steel deck forms is greater than 120 degrees F, spray reinforcing and forms with water just prior to placing concrete.
- J. Cold Weather Concreting:
 - 1. No placement of concrete will be allowed at temperatures below 20 degrees Fahrenheit or when mean daily temperature for curing period is anticipated to be below 20 degrees Fahrenheit.
 - 2. No concrete placement will be allowed on frozen sub-grade.
 - 3. Conform to ACI 306 and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
 - a. Ensure that reinforcement, forms, or ground to receive concrete are completely free from frost.
 - b. Temperature of concrete at time of placement for footings not to be lower than 50 degrees Fahrenheit.
 - 1) Minimum temperature at time of placement for other concrete to be 60 degrees Fahrenheit.
 - 2) Maximum temperature at time of placement to be 90 degrees Fahrenheit.

- c. Maintain concrete at temperature no lower than 50 degrees Fahrenheit for minimum 7 day period after placement by means of blanket insulation, heaters, or other methods as approved by Architect.
 - d. Keep record of concrete surface temperature for first 7 days after each pour.
 - 1) Make Record open to inspection by Architect.
- K. Consolidating:
- 1. Use vibrators for thorough consolidation of concrete.
 - 2. Provide vibrators for each location during simultaneous placing to ensure timely consolidation around reinforcement, embedded items and into corners of forms; ensure availability of spare vibrators in case of failures.
 - a. Vibrate through full depth of freshly placed concrete.
 - 3. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
 - 4. Exposed Concrete:
 - a. Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate.
- L. Construction Joints:
- 1. Verify location and conformance with typical details
 - a. Provide only where designated or approved by Architect.
 - b. Comply with ACI 318, Section 26.5.6
 - 2. Horizontal and vertical construction joints to be thoroughly sandblasted to clean and roughen entire surface to minimum 1/4-inch relief exposing clean coarse aggregate solidly embedded in mortar matrix.
 - 3. Just prior to depositing concrete, wet surface of construction joint thoroughly.
- M. Contraction (Control) Joints in Slabs-on-Grade:
- 1. Construct contraction joints in slabs-on-ground to form panels of patterns indicated on Shop Drawings.
 - a. Use saw cuts 1/8 inch x 1/4 slab depth, unless otherwise indicated.
 - 2. Time saw cutting to allow sufficient curing of concrete to prevent raveled or broken edges.
 - 3. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate, maximum 24 hours after pouring.
 - 4. When joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible; at column centerlines, half bays, third-bays
- N. Formed Elements:
- 1. Space points of deposit to eliminate need for lateral flow.
 - a. Placing procedures of concrete in forms permitting escape of mortar, or flow of concrete itself, will not be permitted.
 - 2. Level top surface upon stopping Work.
 - 3. Take special care to fill each part of forms by depositing concrete directly as near final position as possible, and to force concrete under and around reinforcement, embedded items, without displacement.
 - 4. After concrete has taken its initial set, exercise care to avoid jarring forms or placing strain on ends of projecting reinforcement.

3.06 CURING

- A. General Requirements:
 - 1. Deploy curing measures immediately after placement and for measures other than application of curing compound, extend for seven days.
 - a. Architect may recommend longer periods based upon prevailing temperature, wind and relative humidity.
 - b. Comply with ACI 318, Section 26.5.3.
 - 2. Avoid alternate wetting and drying and fluctuations of concrete temperature.
 - 3. Protect fresh concrete from direct rays of sun, rain, freezing, drying winds, soiling, and damage.
 - 4. Do not permit curing method to affect adversely finishes or treatments applied to finish concrete.

- B. Curing Method, Typical:
 - 1. Keep forms and concrete surfaces moist during period forms are required to remain in place.
 - 2. Obtain Architect's approval of alternate measures.

3.07 FORM REMOVAL

- A. Secure Architect's approval for time and sequence of form removal.

- B. Form Removal:
 - 1. Remove forms carefully to avoid damaging corners and edges of exposed concrete.
 - 2. Remove forms after concrete has developed sufficient strength to sustain its own weight and superimposed loads, but not less than 7 days.
 - 3. Estimated curing time required to obtain desired strength.
 - a. Present results of 7 day test cylinder break to Architect to demonstrate compliance with above specified strength requirements prior to form removal.
 - b. Where 7 day test cylinder break demonstrates strength that is less than that specified, Contractor may elect to take additional cylinders at time of next pour to demonstrate strength requirements.
 - c. Cost of taking and testing additional sample will be borne by Contractor.

3.08 CLEANING, PATCHING, AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing, or is otherwise defective, and, in Architect's judgment, these defects impair proper strength or appearance of Work, Architect will require its removal and replacement at Contractor's expense.

- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, and similar areas, with patching mortar.
 - 1. Install patch to match finish of adjacent surface unless otherwise noted.
 - 2. Remove ledges and bulges.

- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes.
 - 1. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.

- D. Rock Pockets:
 - 1. Cut out to full solid surface and form key.
 - 2. Thoroughly wet before placing mortar.
 - 3. Where Architect deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, key and pack solid with concrete to produce firm bond and match adjacent surface.

- E. Cleaning
 - 1. Ensure removal of bituminous materials, form release agents, bond breakers, curing compounds when permitted, and other materials employed in concrete work which would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
 - 2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.09 CONCRETE FINISHING – GENERAL

- A. Finish of Formed Surfaces:
 - 1. Smooth formed.

3.10 CONCRETE SLAB FINISHES

- A. General:
 - 1. Comply with recommendations in ACI 302.1 R for screeding, restraightening, and finishing operations for concrete surfaces.
 - 2. Do not wet concrete surfaces.

- B. Broom Finishes:
 - 1. Light Textured Broom Finish:
 - a. Provide light texture by drawing soft bristle broom lightly across concrete surface in one directions, as indicated on Drawings, to provide uniform fine line texture finish.

3.11 CONCRETE SEALER APPLICATION

- A. Apply specified sealers only to concrete surfaces where scheduled in Finish Schedule.

- B. Apply sealers only to surfaces that are sound, properly troweled and finished, and that are clean, dry, and free of form release agents, retarders, alkali, curing compounds, oil, grease and other contaminants.
 - 1. Acid-clean and etch discolored or stained slabs before sealer is applied when, in Architect's judgment, satisfactory uniform finish cannot be otherwise achieved.

- C. Apply Sealer only to concrete slabs where scheduled or indicated.

3.12 CLEAN UP

- A. Perform Work to keep affected portions of Project Site neat, clean, and orderly.
 - 1. Remove, immediately upon completion of Work, surplus materials, rubbish, and equipment associated with or used in performance.
 - 2. Be aware that failure to perform clean-up operations within 24 hours of notice by Architect will be considered adequate grounds for having work done by others at no added expense to Owner.

3.13 FIELD QUALITY CONTROL

- A. Owner's Testing Agency will:
 - 1. Perform testing in accordance with ACI 318 and CBC Section 1903A and 1905A.
 - 2. Review concrete mix designs.
 - 3. Inspect concrete and grout placement continuously.
 - 4. Test concrete to control slumps according to ASTM C143.
 - 5. Continuously monitor concrete temperature as it arrives on Project Site.
 - 6. Test concrete for required compressive strength in accordance with CBC Section 1705A.3 – Table 1705A.3, Item 6; 1905A.1.16; and ACI 318 – Section 26.12 as modified:
 - a. Make and cure three specimen cylinders according to ASTM C 31 for each 50 cubic yards, or fraction thereof, of each class poured at Project Site each day.
 - b. Retain one cylinder for 7 day test and two for 28-day test.
 - c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, and so on.
 - 1) Date each set; and keep accurate record of pour each set represents.
 - d. Transport specimen cylinders from Project to laboratory after cylinders have cured for 24 hours on Project Site.
 - e. Cover cylinders and keep at air temperatures between 60 and 80 degrees Fahrenheit.
 - f. Test specimen cylinders at age 7 days and age 28 days for specified strength according to ASTM C 39.
 - g. Base strength value on average of two cylinders taken for 28 day test.
 - 7. Test and inspect materials, as necessary, in accordance with ACI 318, MM Test Method 227 (Coarse and Intermediate Aggregates) and MM Test Method 217 (Fine Aggregates), for compliance with requirements specified in this Section.
- B. Submit ticket for each batch of concrete delivered to Project Site.
 - 1. Provide following information on Ticket:
 - a. Design mix number.
 - b. Signature or initials of ready mix representative.
 - c. Time of batching.
 - d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.
 - e. Total volume of concrete in each batch.
 - f. Notation to indicate equipment was checked for contaminants prior to batching.
 - 2. Pay Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C 88 and C 42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

3.14 SCHEDULE OF TESTS, INSPECTIONS, AND METHODS

- A. References:
 - 1. Chapters and Articles refer to California Code of Regulations (CCR), Title 24, Part 2, California Building Code (CBC), Volumes 1 and 2, 2016 Edition.
 - 2. American Concrete Institute (ACI):
 - a. ACI 318 – Building Code Requirements for Structural Concrete and Commentary, current edition.

- B. Required Tests and Inspections:
 - 1. Following Tests and Inspections are required, as set forth in California Building Code and ACI 318, as referenced. :

- C. Concrete (Chapters 17A and 19A):
 - 1. Materials:
 - a. Portland Cement: 1705A.3.2; 1910A.1
 - b. Concrete Aggregates: 1705A.3.2; 1903A.5
 - c. Reinforcing Bars: 1705A.3.2; 1910A.2
 - 2. Quality:
 - a. Proportions of Concrete: 1705A.3 – Table 1705A.3, Item 5; 1910A.1, and ACI 318 – Section 26.4.3
 - b. Strength Tests of Concrete: 1705A.3 – Table 1705A.3, Item 6; 1905A.1.16; and ACI 318 – Section 26.12 as modified.
 - c. Mixing: 1903A, 1904A
 - d. Placing Record: 1705A.3.6
 - 3. Inspection:
 - a. Job Site: ACI 318 – Sections 26.5.1, 26.5.2.1 (A) and (B), 26.6.1.2 (D), 26.11.1.1 (A)
 - b. Batch Plant: 1705A.3.3
 - c. Waiver of Batch Plant: 1705A.3.3.1
 - d. Preplacement and Placing 1705A.3.5; 1705A.3.6
 - e. Post Installed Anchors: 1705A.3 – Table 1705A.3, Items 4a and 4b; 1910A.5 b.
 - f. Reinforcing Bar Welding: 1705A.3.1 – Table 1705A.3, Item 2, Table 1705A.2.1, Item 5b, 1903A.8

3.15 PROTECTION

- A. Protect concrete from injurious action of elements and defacement during construction operations.

- B. Protect exposed corners of concrete from traffic or use which will damage them.

- C. Make provisions to keep exposed concrete free from laitance caused by spillage or leaking forms or other contaminants.
 - 1. Do not allow laitance to penetrate, stain, or harden on surfaces which have been textured.

END OF SECTION 03 3000

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**CAST-IN-PLACE CONCRETE
03 3000-20**

SECTION 14 4500

VEHICLE LIFTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Reinstallation of existing lifts removed during demolition phase.
 - 2. Installation of new vehicle lifts furnished by Owner.
 - 3. Work includes:
 - a. Connection of power and wiring to each lift.
 - b. Connection of pneumatic (compressed air) piping to each lift area.

- B. Related Sections:
 - 1. Section 01 1100: Summary of Work
 - 2. Section 03 3000: Cast-in-Place Concrete

- C. Related Requirements:
 - 1. Refer to Architectural Drawings for related pneumatic (compressed air) piping.
 - 2. Refer to Electrical Drawings for related electrical power and wiring.

1.02 REFERENCES

- A. California Code of Regulations (CCR), 2016 edition:
 - 1. Title 8 – Industrial Relations:
 - a. Subchapter 7. General Industry Safety Orders.
 - 1) Group 3. General Plant Equipment and Special Operations.
 - 2) Article 19. Automotive Lifts
 - 2. Title 24 – Part 2, California Building Code (CBC), Volumes 1 and 2,

- B. American National Standards Institute / Automotive Lift Institute (ANSI/ALI):
 - 1. ANSI/ALI ACTV – Standard for Automotive Lifts – Safety Requirements for Construction, Testing, and Validation.
 - 2. ANSI/ALI ALOIM – Standard for Automotive Lifts – Safety Requirements for Operation, Inspection and Maintenance.
 - 3. ANSI/ALI ALIS – Standard for Automotive Lifts – Safety Requirements for Installation and Service.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Factory trained authorized company.
 - 2. Company insured for completed operations of installing lift.

- B. Lift Manufacturer who is ISO9001 certified.

- C. Lift Certification:
 - 1. Third party certified by ETL testing laboratory and labeled with ETL/Automotive Lift Institute (ALI) label that affirms lifts conformance to applicable provisions of American National Standard ANSI/ALI ALCTV.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's data sheets for each installed product, including, but not necessarily limited to:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation manual.
 - d. Operations manual.
 - e. Maintenance manual.
 - f. Safety manual.
- B. Shop Drawings:
 - 2. Show location and layout of lifts.
 - 3. Template drawings of anchor bolt locations for installation of lifts.
 - 4. Electrical wiring diagrams
 - 5. Diagrams of pneumatic (compressed air) system lines.

1.05 PROJECT CONDITIONS

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery Requirements:
 - 1. Receive and unload Products at Site.
 - 2. Promptly inspect Products jointly with Owner and installation contractor.
 - a. Record shortages, damaged or defective items.
- B. Storage and Handling Requirements:
 - 1. Handle Products at Site, including uncrating and storage.
 - 2. Protect Products from exposure to elements and from damage.
 - 3. Repair or replace items damaged by Contractor or installation contractor..

1.07 REGULATORY REQUIREMENTS

- A. Comply with requirements of state and local authorities having jurisdiction for installation and operation of vehicle lifts.
 - 1. CCR, Title 8, Subchapter 7, Group 3, Article 9.

1.08 MAINTENANCE

- A. Replacement Parts:
 - 1. Furnish documentation to Owner that replacement parts are available from nationwide network of factory designated parts distributors.
 - a. Include names, addresses, and phone numbers of distributors closest to this installation.

- B. Repairs:
1. Furnish to Owner, names, addresses, and phone numbers of local factory authorized/trained service representatives closest to this installation, to perform maintenance and repairs on lifts.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to installation of vehicle lifts, inspect Site with installer present and verify following:
1. Areas scheduled to receive lifts are ready for installation.
 2. Field measurements are as shown on approved shop drawings.
 3. Correct location of anchor bolts.
 4. Correct location and installation of electrical wiring and compressed air piping
 5. Do not begin installation until supporting structures have been properly prepared.
 6. Notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Vehicle Lifts:
1. Install in strict accordance with manufacturer instructions and in proper relationship with adjacent construction.
 2. Install plumb, level, rigid, square, and flush at locations indicated.
 3. Anchor securely to concrete slab.
 4. Install accessories including, but not necessarily limited to, those furnish by lift manufacturer.
 - a. Include components and accessories as required for complete installation.
- B. Upon completion of installation:
1. Lubricate components.
 2. Test for proper operation and adjust lifts to operate easily, free from twist or distortion.
 - a. Retest when necessary until satisfactory results are achieved.

3.03 DEMONSTRATION

- A. Startup Services:
1. Engage factory authorized service representative to train Owner's maintenance personnel as follows:
 - a. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - b. Review data in maintenance manuals.
 - c. Schedule training with Owner with at least 7 days' advance notice.

3.04 PROTECTION

- A. Touch-up, repair or replace products damaged during installation.

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- B. Protect installed products until date of Substantial Completion.

END OF SECTION 14 4500

SECTION 31 2300

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Materials, equipment, and labor required to provide grading and fine grading as indicated on Drawings and as specified.
 2. Work includes, but is not necessarily limited to:
 - a. Excavation, compacted engineered fill, and preparing of subgrade for building footings, slabs, walks, and pavements.
 - b. Excavating and backfilling of trenches and excavations..
 - c. Testing and Inspection of soils and backfill.
- B. Related Sections:
1. Section 01 5000: Temporary Facilities and Controls; barriers and temporary controls.
- C. Related Requirements:
1. Refer to Civil Drawings for additional requirements, including, but not necessarily limited to, temporary erosion and sedimentation controls.
 2. Excavating and Backfilling for Utility Work:
 - a. Refer to Division 26 Sections for excavation and backfill required for underground electrical utilities and related buried appurtenances.
 - b. Refer to Division 31 Sections for additional trenching and backfilling requirements for underground site utilities piping and related buried appurtenances.

1.02 REFERENCES

- A. California Code of Regulations (CCR), Title 24, 2016 edition of California Building Code (CBC), Part 2, Volumes 1 and 2.
- B. ASTM International (ASTM):
1. ASTM D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 2. ASTM D 2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 3. ASTM E 699 – Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
- C. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO – Standard Specifications for Highway Materials and Methods of Sampling and Testing.
- D. Public Works Standards, Inc.:
1. Standard Specifications for Public Works Construction (SSPWC):
 - a. The "Greenbook"; current edition.
 2. Standard Plans for Public Works Construction (SPPWC); current edition.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- B. Testing and Inspection Service:
 - 1. Owner will employ and pay for qualified independent geotechnical testing laboratory to perform soil testing and inspection service during earthwork operations.
- C. Testing Laboratory Qualifications:
 - 1. To qualify for acceptance, geotechnical testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has experience and capability to conduct required field and laboratory geotechnical testing without delaying progress of Work.
- D. Foundation Soils:
 - 1. Excavate for foundations to sizes indicated, clean and leave in condition recommended by [Civil Engineer] [Geotechnical Engineer].
 - 2. Prior to placement of forms, reinforcing or concrete, obtain approval of [Civil Engineer] [Geotechnical Engineer] as required, for proper conditions and suitable bearing materials.

1.04 SUBMITTALS

- A. Test Reports:
 - 1. Submit following reports directly to Architect from testing services, with copy to Contractor:
 - a. Test reports on borrow material.
 - b. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
 - c. Field reports for in-place soil density tests.

1.05 DEFINITIONS

- A. Excavation:
 - 1. Consists of removal of material encountered to subgrade elevations indicated and subsequent use of excavated material as fill, disposal off-site, or stockpiled for future use of materials removed.
- B. Unauthorized Excavation:
 - 1. Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect.
 - 2. Costs associated with unauthorized excavation will be at Contractor's expense.
 - a. Includes remedial work as directed by [Civil Engineer] [Geotechnical Engineer], upon receipt of written authorization from Architect.
 - 3. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation.
 - a. Lean concrete fill may be used to bring elevations to proper position, when acceptable to [Civil Engineer] [Geotechnical Engineer].

4. In locations other than those indicated:
 - a. Backfill and compact unauthorized excavations as specified by [Civil Engineer] [Geotechnical Engineer] same as for authorized excavations of same classification, unless otherwise directed by Architect.
- C. Additional Excavation:
 1. When excavation has reached required subgrade elevations, notify Architect, who will notify [Civil Engineer] [Geotechnical Engineer] to make inspection of conditions.
 2. Should [Civil Engineer] [Geotechnical Engineer] determine that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material specified by [Civil Engineer] [Geotechnical Engineer] and as directed by Architect.
 3. Contract Sum may be adjusted by appropriate Contract modification.
 4. Removal of unsuitable material and its replacement as directed will be paid on basis of General Conditions of the Contract relative to changes in Work.
- D. Subgrade:
 1. Undisturbed earth or compacted soil layer immediately below granular sub-base or drainage fill.

1.06 PROJECT CONDITIONS

- A. Protection of Subgrade:
 1. Do not allow equipment to pump, rut or disturb subgrade, stripped areas, or other areas prepared for backfill or paving operations.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. Imported Soil Materials:
 1. Fill Soil Imported to Project Site:
 - a. Granular, having expansion index of less than twenty and classified as SM, SW, and SP in accordance with ASTM D 2487.
 - b. Free of rock and lumps of soil larger than three inches in diameter.
 - c. Be at least sixty percent finer than 1/4 inch sieve.
- B. Utility Trench Backfill:
 1. Material for Use in Backfilling Trenches:
 - a. Consist of hard, durable, clean sand, gravel, or crushed stone.
 - b. Be free from organic material, clay balls, or other deleterious substances.
- C. Base Material:
 1. Base Material Under Concrete Slabs:
 - a. Compactible, easy to trim, granular fill that will remain stable and support construction traffic.
 - b. Building slab base course consists of placement of 4 inch thick gravel material with less than 10 percent passing No.4 Sieve, over sub grade surface to support concrete slabs.
 2. Base Material Under Paving:
 - a. Refer to requirements in Section 32 1100.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Scarifying:
 - 1. Scarify portion of Site where asphalt paving has been removed, to depth of at least [6] inches below existing grade or below new grades established by cut.
- B. Compaction:
 - 1. Bring to near optimum moisture content and compact with heavy equipment, to [] percent of maximum density.
 - 2. Where disturbed areas appear to be too deep to be compacted by above treatment, excavate and backfill with compacted fill.
- C. Filling:
 - 1. Place fill as required to complete Work as indicated.
 - 2. Place fill in 6 inch lifts.
 - 3. Compact to [] percent of maximum density.

3.02 EXCAVATION – GENERAL

- A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations.
- B. Excavation Classifications:
 - 1. Following classifications of excavation will be made when rock is encountered:
 - a. Earth excavation includes earth and other materials encountered that are not classified as rock or unauthorized excavation.
- C. Stability of Excavations:
 - 1. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction.
 - 2. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 - 3. Provide not less than minimum requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
 - 4. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- D. Material Storage:
 - 1. Stockpile excavated materials acceptable for backfill and fill where directed.
 - a. Place, grade and shape stockpiles for proper drainage.
 - b. Locate and retain soil materials horizontally away from edge of excavations equal to depth of excavation.

3.03 EXCAVATION FOR SLABS

- A. Conform to elevations and dimensions shown within tolerance of plus or minus 0.10 foot, and extending sufficient distance from footings to permit placing and removal of concrete formwork, installation of services, other construction required, and for inspection.

- B. In excavating for slabs, take care not to disturb bottom of excavation.
 - 1. Excavate by hand to final grade just before concrete is placed.
 - 2. Trim bottoms to required lines and grades to leave solid base to receive base course.

3.04 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

3.05 EXCAVATION FOR TRENCHES

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and minimum of six to nine inches of clearance on both sides of pipe or conduit.
- B. Excavate trenches and conduit to depth indicated or required to:
 - 1. Establish indicated slope and invert elevations.
 - 2. Support bottom of pipe or conduit on undisturbed soil.
- C. For pipes or conduit less than six inches in nominal size:
 - 1. Do not excavate beyond indicated depths.
 - 2. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
- D. For pipes and equipment six inches or larger in nominal size:
 - 1. Shape bottom of trench to fit bottom of pipe for ninety degrees (bottom 1/4 of circumference).
 - 2. Fill depressions with tamped sand backfill.
 - a. At each pipe joint, dig bell holes to relieve pipe bell of loads to ensure continuous bearing of pipe barrel on bearing surface.
- E. Should rock be encountered, carry excavation [6] inches below required elevation and backfill with [6] inch layer of crushed stone or gravel prior to installation of pipe.

3.06 BACKFILL AND FILL

- A. Provide fill material and backfill material consisting of satisfactory soil material or imported soil materials as specified in Part 2 of this Section
 - 1. Place in maximum six inch thick compacted layers to required subgrade elevations, except as follows:
 - a. Under Walks:
 - 1) Upper four inches of fill consisting of as defined by Article 2.01 C 2.
 - b. Under Exterior Building Slabs:
 - 1) Upper four inches of fill consisting of compactible sand or rock as specified in Article 2.01 C 1.
 - c. Under Piping, Conduit, and Equipment:
 - 1) Use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 - 2) Shape excavation bottom to fit bottom ninety degrees of cylinder.
 - d. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Architect.
 - e. Use care in backfilling to avoid damage or displacement of pipe systems.

- B. Backfill excavations as promptly as Work permits, but not until completion of following:
 - 1. Acceptance of construction below finish grade.
 - 2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 - 5. Removal of trash and debris from excavation.

3.07 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation:
 - 1. When existing ground surface has density less than that specified for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content or slightly above, and compact to required depth and percentage of maximum density.
 - 2. Where unsuitable material as described is greater than twelve inches thick, remove material and recompact as directed by [Civil Engineer] [Geotechnical Engineer].
- B. Place backfill and fill materials in layers not more than eight inches in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content or slightly above.
 - 1. Compact each layer to 90 percent of maximum dry density or relative dry density for each area classification.
- D. Place backfill and fill materials evenly adjacent to piping, or conduit to required elevations.
 - 1. Place backfill materials evenly adjacent to structures, piping, or conduit to required elevations.
 - 2. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.
 - 3. Do not compact backfill by flooding or puddling methods.
- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below.
 - 1. Correct improperly compacted areas or lifts as directed by Architect when soil density tests indicate inadequate compaction.
 - 2. Percentage of Maximum Density Requirements:
 - a. Compact soil to not less than following percentages of maximum density, in accordance with ASTM D 1557:
 - 1) Under Slabs:
 - a) Compact top eighteen inches of subgrade and each layer of backfill or fill material at ninety percent maximum density.
 - 2) Under Pavements:
 - a) Compact top twelve inches of subgrade and each layer of backfill or fill material at ninety percent maximum density.

- 3) Under Walkways:
 - a) Compact top twelve inches of subgrade and each layer of backfill or fill material at ninety percent maximum density.
- F. Moisture Control:
1. Perform under direction of [Civil Engineer] [Geotechnical Engineer]:
 - a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material.
 - b. Apply water in minimum quantity necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - c. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - d. Stockpile or spread soil material that has been removed because it is too wet to permit compaction.
 - e. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to satisfactory value.

3.08 GRADING

- A. Uniformly grade areas within limits of grading under this Section:
1. Include adjacent transition areas.
 2. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grading Outside Building Lines:
1. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
 2. Finish surfaces free from irregular surface changes and as follows:
 - a. Walks:
 - 1) Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 - b. Pavements:
 - 1) Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

3.09 BUILDING SLAB BASE COURSE

- A. General:
1. Building slab base course consists of placement of crushed rock material, in layers of indicated thickness, over subgrade surface to support concrete slabs.
- B. Placing:
1. Place crushed rock material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness.
 2. Maintain optimum moisture content for compacting material during placement operations.
- C. When compacted crushed rock base course is shown to be 6 inches thick or less, place material in single layer.

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1. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.10 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction:
 1. Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.
 2. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), or ASTM D 2922 (Nuclear Method) as applicable.
- B. When in opinion of Architect, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional cost to Owner.
- C. Cracking or settlement of paving or other finish materials over utility trench locations is to be considered conclusive proof of trench failure.
 1. Remove and recompact trench backfill material and replace damaged paving or other finish material as required at no additional cost to Owner.

3.11 SCHEDULE OF TESTS, INSPECTIONS, AND METHODS

- A. References:
 1. Chapters and Articles refer to California Code of Regulations (CCR), Title 24, Part 2, California Building Code (CBC), Volumes 1 and 2, 2016 Edition.
- B. Required Tests and Inspections:
 1. Following Tests and Inspections are required, as set forth in California Building Code, as referenced. :
- C. Excavations, Foundations and Retaining Walls (Chapter 18A):
 1. Site Grading: 1803A.4
 2. Compacted Fill Material: 1803A.6
- D. Inspection (Chapter 17A):
 1. Site Soil and Backfill: 1705A.6 – Table 1705A.6

3.12 EROSION CONTROL

- A. Maintain erosion control methods put in place as part of selective site demolition work, in accordance with requirements indicated on Civil Drawings..

3.13 MAINTENANCE

- A. Protection of Graded Areas:
 1. Protect newly graded areas from traffic and erosion and keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

- C. Reconditioning Compacted Areas:
 - 1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property:
 - 1. Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Project Site.

END OF SECTION 31 2300

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SECTION 32 1100

BASE COURSE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Furnishing and installing base course material under paving.
- B. Related Sections:
 - 1. Section 31 2300: Excavation and Fill
 - 2. Section 32 1313: Concrete Paving

1.02 REFERENCES

- A. State of California Department of Transportation (Caltrans):
 - 1. Standard Specifications:
 - a. Division IV – Subbases and Bases
 - 1) Section 26 – Aggregate Bases.

1.03 QUALITY ASSURANCE

- A. Comply with Caltrans Standard Specifications as minimum requirement, except where indicated otherwise.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Include material source, technical information, and test data for base materials.
 - 2. Gradation and quality certifications: Dated within 30 days of submittal.
- B. Samples:
 - 1. Minimum 5 pound container of proposed base course material.

PART 2 PRODUCTS

2.01 BASE COURSE MATERIAL

- A. Aggregate:
 - 1. Clean aggregate base conforming to Caltrans Class 2.

2.02 MATERIAL APPROVAL

- A. Provide Base material as inspected by Project Inspector prior to installation.
 - 1. Owner may choose to have additional tests performed by geotechnical engineer, retained by Owner before installation.

PART 3 EXECUTION

3.01 BASE COURSE INSTALLATION

- A. Install base course material in layers not exceeding 3 inches in thickness, unless required otherwise.
 - 1. Grade and compact to indicated levels or grades
 - a. Cut and fill.
 - b. Water and roll until surface is hard and true to line, grade and required section.
 - c. Provide relative compaction of at least 95 percent, unless otherwise required.
 - 2. Grade base course to elevations indicated on Drawings, ready to receive specified surfacing.

3.02 CLEANUP

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

3.03 PROTECTION

- A. Protect Work until Substantial Completion.

END OF SECTION 32 1100

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Exterior concrete paving.

- B. Related Sections
 - 1. Section 03 3000: Cast-in-Place Concrete; testing and inspection.
 - 2. Section 31 2300: Excavation and Fill; for excavation, backfilling, and grading requirements.
 - 3. Section 32 1100: Base Course
 - 4. Section 32 1723: Pavement Markings

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 2. ASTM A 1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - 3. ASTM C 33 – Standard Specification for Concrete Aggregates
 - 4. ASTM C 94 – Standard Specification for Ready-Mixed Concrete
 - 5. ASTM C150 – Standard Specification for Portland Cement
 - 6. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete
 - 7. ASTM C 260 – Standard Specification for Air-Entraining Admixtures for Concrete
 - 8. ASTM C 494 – Standard Specification for Chemical Admixtures for Concrete

- B. American Concrete Institute (ACI):
 - 1. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 - 2. ACI 301 – Specifications for Structural Concrete for Buildings
 - 3. ACI 305R – Specification for Hot Weather Concreting
 - 4. ACI 306R – Guide to Cold Weather Concreting
 - 5. ACI 318 – Building Code Requirements for Reinforced Concrete

- C. Concrete Reinforcing Steel Institute (CRSI):
 - 1. CRSI Manual of Standard Practice.
 - 2. CRSI Placing Reinforcing Bars

- D. West Coast Lumber Inspection Bureau (WCLIB):
 - 1. Standard Grading Rules No. 17, 2004.

- E. South Coast Air Quality Management District (SCAQMD):
 - 1. Rule 1113 – Architectural Coatings

1.03 QUALITY ASSURANCE

- A. Concrete Standards:
 - 1. Comply with provisions of referenced standards, except where more stringent requirements are indicated.
- B. Concrete Manufacturer Qualifications:
 - 1. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Installer Qualifications:
 - 1. Experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Concrete Testing Service:
 - 1. Engage qualified independent testing agency to design concrete mixes.
- E. Preinstallation Conference:
 - 1. Conduct conference at Project Site.
 - 2. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials.
 - a. Require representatives of each entity directly concerned with concrete pavement to attend, including following:
 - 1) Contractor's superintendent.
 - 2) Independent testing agency responsible for concrete design mixes.
 - 3) Ready-mix concrete producer.
 - 4) Concrete subcontractor.

1.04 SUBMITTALS

- A. Product Data:
 - 1. For each type of manufactured material and product indicated.
- B. Design Mixes:
 - 1. For each concrete pavement mix.
 - 2. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 PROJECT CONDITIONS

- A. Traffic Control:
 - 1. Maintain access for vehicular and pedestrian traffic as required for other construction activities.
 - 2. Comply with other requirements specified in Section 01 5000.

PART 2 PRODUCTS

2.01 GENERAL

- A. Batch concrete in certified plant capable of achieving Waiver of Continuous Batch Plant and Materials Tests.
- B. Produce each type and color of concrete in same batch plant.

2.02 FORMWORK

- A. Forms:
 - 1. Metal, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal and to provide full depth, continuous straight, smooth exposed surfaces.
 - 2. Use flexible or curved forms to form radius bends as required.
 - a. Do not use notched and bent forms.
- B. Form Release Agent:
 - 1. Provide commercial formulation form-release agent complying with local Volatile Organic Compound (VOC) limitations that will not bond with stain. or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.03 REINFORCING MATERIALS

- A. Reinforcing Bars:
 - 1. Conforming to ASTM A 615, Grade 40, deformed.
- B. Joint Dowel Bars:
 - 1. Plain Steel Bars:
 - a. Conforming to ASTM A 615, Grade 60.
 - 2. Zinc coated (galvanized) after fabrication according to ASTM A 767, Class I coating
 - 3. Cut bars to length with ends square and free of burrs.
 - 4. Provide polyethylene closed-end sleeve or approved alternate at expansion joint dowels
- C. Bar Supports:
 - 1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and dowels in place.
 - 2. Manufacture bar supports, according to CRSI Manual, from steel wire, plastic, or precast concrete or fiber reinforced concrete of greater compressive strength than concrete, and as follows:
 - a. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.04 CONCRETE MATERIALS

- A. Use same brand and type of cementitious material from same manufacturer throughout Project.
- B. Portland Cement:
 - 1. Conforming to ASTM C 150, Type II
- C. Aggregate:
 - 1. Normal-Weight:
 - a. Conforming to ASTM C 33 and C 227, uniformly graded, from single source, with coarse aggregate as follows:
 - 1) Class: 1N.
 - 2. Maximum Aggregate Size: 1 inch nominal.

3. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. Water:
1. Conforming to ASTM C 94.

2.05 ADMIXTURES

- A. Certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture:
1. Conforming to ASTM C 260.
- C. Water-Reducing Admixture:
1. Conforming to ASTM C 494, Type A..

2.06 CURING MATERIALS

- A. Moisture-Retaining Cover:
1. Conforming to ASTM C 171
 - a. Non-staining, reinforced, waterproof sheet.
- B. Water: Potable..

2.07 RELATED MATERIALS

- A. Control Joint Material:
1. Preformed Fiber Joint Filler:
 - a. ASTM D 1751 non-extruding preformed bituminous saturated fiberboard units.
 2. Plain or punched for dowels as required.

2.08 PAVING SEALANT

- A. Sealant Standards – General:
1. Elastomeric Sealant: Manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated, complying with requirements of ASTM C 920, including those referenced for Type, Grade, and Class.
- B. Sealant:
1. Construction sealant, certified by manufacturer to meet following criteria:
 - a. Has physical properties required for both structural and non-structural uses under installed conditions
 - b. Has appropriate movement capability for installation conditions
 - c. Is suitable for interior and exterior application in joint conditions shown
 - d. Will produce watertight bond and watertight joints
 - e. Is compatible with other materials which sealant will contact
 2. Primer, backup, and bond breaker-products recommended by sealant manufacturer
 - a. Primer is required unless manufacturer's installation instructions specifically advise to contrary for certain materials
 3. Sealant manufacturer is to recommend use of products which will perform satisfactorily under installation conditions on Work.

- a. Product recommendation is to include sealant, primer, backup, bond breaker, surface preparation, installation methods, and evaluation of tests performed under Article 3.04 A

- C. Sealant for Paving Joints:
 - 1. Self-leveling polyurethane, pouring grade, for gun application.
 - 2. Suitable for traffic service
 - 3. Primer, backup, and bond breaker-products recommended by manufacturer

- D. Sealant: Two-Component Polyurethane Sealant; Type M, Grade P, Class 25.
 - 1. Provide one of following products:
 - a. Pacific Polymers Elasto-Thane 227/227R by ITW Polymers Sealants North America, Inc.
 - b. MasterSeal SL 2 Sealant by BASF Corporation, Construction Systems
 - c. Urexpan NR-200 by Pecora, Corp.
 - d. Sikaflex-2C SL by Sika Corporation
 - 2. Apply Sealant No.2 to following exterior joints:
 - a. Horizontal control and expansion joints in concrete slabs and concrete paving
 - 3. Apply Sealant to following interior joints:
 - a. Horizontal control and expansion joints in concrete paving.

2.09 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301.
 - 1. For trial batch method, use qualified independent testing agency for preparing and reporting proposed mix designs.
 - 2. Do not use Owner's field quality-control testing agency as independent testing agency.
 - 3. Limit use of fly ash to 15 percent of cement content by weight.

- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with following properties:
 - 1. Compressive Strength (28 day): 3,000 psi.
 - 2. Slump Range: 3 inches to 4 inches.

- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content of 2.5 percent to 4.5 percent.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete:
 - 1. Comply with specified requirements and ASTM C 94 and following:
 - a. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes
 - b. When air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction.
 - 1. Do not begin paving work until such conditions have been corrected and subbase is ready to receive paving.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations.
 - 1. Install forms to allow continuous progress of Work and so forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms:
 - a. Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis:
 - a. Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.03 PLACING REINFORCEMENT

- A. Follow CRSI recommended practice for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. When specified or indicated, install welded wire fabric in lengths as long as practicable:
 - 1. Lap adjoining pieces at least one full mesh and lace splices with wire.
 - 2. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

- A. Construct control, construction, and expansion joints and tool edgings true to line with faces perpendicular to surface plane of concrete.
 - 1. Construct transverse joints at right angles to centerline, unless indicated otherwise.
 - 2. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

- B. **Tooled Control Joints (CJ):**
1. Form tooled control joints after initial floating by grooving and finishing each edge of joint with groover tool to radius as indicated or specified.
 - a. Repeat grooving of control joints after applying surface finishes.
 - b. Eliminate tool marks on concrete surfaces.
 2. **Jointer Tool:**
 - a. 1/4 inch wide at surface, tapered, with top edges rounded to 1/4 inch radius.
 3. **Location:**
 - a. As shown on Drawings, but not more than 15 feet on center both ways.
 - b. **Typical Sidewalk Joints:**
 - 1) Make joints 5 feet on center, or as directed by Architect.
- C. **Sawed Joints:**
1. Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades.
 2. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 3. Prior approval of Architect is required for sawed joints.
- D. **Edging:**
1. Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with edging tool to specified radius.
 2. Repeat tooling of edges after applying surface finishes.
 - a. Eliminate tool marks on concrete surfaces.
 3. **Radius:**
 - a. 1/4 inch, unless indicated otherwise.
- E. **Construction Joints (CJ):**
1. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 2. Continue reinforcement across construction joints unless indicated otherwise.
 3. Do not continue reinforcement through sides of strip paving unless indicated.
 4. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- F. **Expansion Joints (EJ):**
1. Provide in exterior concrete paving on grade at maximum interval of 30 feet on center or as noted.
 2. Form expansion joints of preformed joint filler strips as follows:
 - a. At intersections with vertical surfaces.
 - b. At surfaces abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated
 - c. At other penetrations through paving.
 3. **Joint Fillers:**
 - a. Use fiber type expansion joint fillers typically and depress 1/4 inch unless otherwise noted.
 - b. Use cork type expansion joint fillers at conditions with non-bituminous waterproofing, liquid waterproofing, or sealant systems.
 - c. Where more than one length is required, lace or clip joint filler sections together.

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- d. Do not leave gaps between ends of joint filler units.
 - e. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap.
 - 1) Remove protective cap after concrete has been placed on both sides of joint.
 - 4. Install dowel bars and support assemblies at joints where indicated.
 - a. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.
- G. Installation of Sealants:
- 1. Comply with requirements of Section 07 9200 and following:
 - a. Install sealant to depths recommended by sealant manufacturer but within following general limitations, measured at center section of bead:
 - 1) For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 1/2 inch deep or less than 3/8 inch deep.
 - b. Tool joints to form smooth, uniform beads with slightly concave surfaces, with finished joints straight, uniform, smooth and neatly finished.
 - c. Remove excess sealant from adjacent surfaces of joint, leaving Work in neat, clean condition.
 - d. Do not use tooling agents unless recommended by sealant manufacturer.

3.05 CONCRETE PLACEMENT

- A. Inspection:
 - 1. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in.
 - 2. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide uniform dampened condition at time concrete is placed.
 - 1. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Comply with requirements and ACI 304R for measuring, mixing, transporting, and placing concrete.
- D. Deposit and spread concrete in continuous operation between transverse joints.
 - 1. Do not push or drag concrete into place or use vibrators to move concrete into place.
 - 2. When concrete placing is interrupted for more than 1/2 hour, place construction joint.
- E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping.
 - 1. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 - 2. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator.
 - 3. Keep vibrator away from joint assemblies, reinforcement, or side forms.
 - 4. Use only square-faced shovels for hand-spreading and consolidation.
 - 5. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

- F. Screed paved surfaces with straightedge and strike off.
 - 1. Use bull floats or darbies to form smooth surface plane before excess moisture or bleed water appears on surface.
 - 2. Do not further disturb concrete surfaces prior to beginning finishing operations.

- G. Hot-Weather Placement:
 - 1. Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - a. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F.
 - 1) Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
 - 2) Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete.
 - 4. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.06 CONCRETE FINISHING

- A. Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

- B. Float Finish:
 - 1. Begin floating when bleed water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations.
 - 2. Float surface with power-driven floats, or by hand floating, where area is small or inaccessible to power units.
 - 3. Finish surfaces to true planes within tolerance of 1/4 inch in 10 feet as determined by 10 foot long straightedge placed anywhere on surface in any direction.
 - 4. Cut down high spots and fill low spots.
 - 5. Refloat surface immediately to uniform granular texture.

- C. Light Textured Broom Finish:
 - 1. Provide light texture by drawing soft bristle broom lightly across concrete surface in one directions, as indicated on Drawings, to provide uniform fine line texture finish.

3.07 CURING AND PROTECTION

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

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- B. Evaporation Retarder:
 - 1. Apply evaporation retarder to concrete surfaces when hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations.
 - 2. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods:
 - 1. Cure concrete by moisture curing, moisture-retaining-cover curing, curing compounds, or combination of following:
 - a. Moisture Curing:
 - 1) Keep surfaces continuously moist for not less than seven days with following materials:
 - a) Water.
 - b) Continuous water-fog spray.
 - c) Absorptive cover, water saturated, and kept continuously wet.
 - 2) Cover concrete surfaces and edges with 12 inch lap over adjacent absorptive covers.
 - b. Moisture-Retaining-Cover Curing:
 - 1) Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive.
 - 2) Immediately repair any holes or tears during curing period using cover material and waterproof tape. .

3.08 FIELD QUALITY CONTROL

- A. Testing Services:
 - 1. Perform testing according to following requirements:
 - a. Sampling Fresh Concrete:
 - 1) Obtain representative samples of fresh concrete according to ASTM C 172, except as modified for slump to comply with ASTM C 94.
 - b. Slump Tests:
 - 1) Conforming to ASTM C 143:
 - a) One test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete.
 - 2) Additional tests will be required when concrete consistency changes.
 - c. Compression Test Specimens:
 - 1) Conforming to ASTM C 31:
 - a) One set of four standard cylinders for each compressive-strength test, unless directed otherwise.
 - 2) Mold and store cylinders for laboratory cured test specimens except when field-cured test specimens are required.
 - d. Air Content:
 - 1) Conforming to ASTM C 231 – Pressure Method:

- a) One test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 - e. Concrete Temperature:
 - 1) Conforming to ASTM C 1064:
 - a) One test hourly when air temperature is 40 degrees F, and below and when 80 degrees F and above.
 - b) One test for each set of compressive strength specimens.
 - f. Compressive-Strength Tests:
 - 1) Conforming to ASTM C 39:
 - a) One set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.
 - 2) Test one specimen at 7 days and two specimens at 28 days
 - 3) Retain one specimen in reserve for later testing when required.
 - g. When frequency of testing will provide fewer than five compressive-strength tests for given class of concrete, conduct testing from at least five randomly selected batches or from each batch when fewer than five are used.
 - h. When total quantity of given class of concrete is less than 50 cu. yd., Architect may waive compressive-strength testing when adequate evidence of satisfactory strength is provided.
 - i. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide for corrective procedures for:
 - 1) Protecting and curing in-place concrete.
 - j. Strength level of concrete will be considered satisfactory when averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
2. Report test results in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing.
- a. Submit Reports of compressive-strength tests containing following:
 - 1) Project identification name and number
 - 2) Date of concrete placement
 - 3) Name of concrete testing agency
 - 4) Concrete type and class
 - 5) Location of concrete batch in pavement
 - 6) Design compressive strength at 28 days
 - 7) Concrete mix proportions and materials
 - 8) Compressive breaking strength
 - 9) Type of break for both 7 and 28 day tests.
3. Nondestructive Testing:
- a. Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection.
4. Additional Tests by Testing Agency:
- a. Make additional tests of concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect.

- b. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.09 REPAIRS AND PROTECTIONS

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas.
 - 1. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage.
 - 1. Exclude traffic from paving for at least 14 days after placement.
 - 2. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

END OF SECTION 32 1313

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Parking lot striping:
- B. Related Sections:
 - 1. Section 03 3000: Cast-in-Place Concrete

1.02 REFERENCES

- A. California Code of Regulations, Title 24, 2016 edition, Part 2, California Building Code (CBC), Volumes 1 and 2.
- B. Federal Specifications (FS):
 - 1. FS TT-P-1952 – Paint, Traffic and Airfield Marking, Waterborne, current version.
- C. Federal Standards (FED-STD):
 - 1. FED-STD 595 – Colors Used in Government Procurement, current version.
- D. South Coast Air Quality Management District (SCAQMD):
 - 1. Rule 1113 – Architectural Coatings

1.03 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product data on traffic paint products and material.
- B. Shop Drawings:
 - 1. Indicating location, extent, color, and texture of markings.
- C. Samples:
 - 1. Color samples of paint products.

1.04 PROJECT CONDITIONS

- A. In-Service Surface Temperature Limits:
 - 1. Dry: 50 degrees F minimum.
 - 2. Do not apply when air, surface, or product temperatures are below 50 degrees F, or when adverse weather conditions are forecast.
- B. Dry Time at 77 degrees F and 50 percent Relative Humidity:
 - 1. Drying times will vary depending on temperature, air circulation, and humidity.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Traffic Marking Paint:
 - 1. 100 percent Acrylic Resin System:
 - a. Ready-mixed, one-component, waterborne acrylic traffic line paint.
 - b. High Solids formulated for hot and cold application to either asphalt concrete or Portland cement concrete pavements.
 - 2. Meets performance standards of FS TT-P-1952, Type II.
 - 3. VOC Content: Less than 100g/L
 - 4. Colors:
 - a. Specified colors conforming to FED-STD 595.
 - 5. Product and Manufacturer:
 - a. Fast Dry Paint Series by American Traffic Products, Rialto, CA, or approved equal.

PART 3 EXECUTION

3.01 PAVEMENT MARKINGS

- A. Application of Paint:
 - 1. Prior to application of paint, allow pavement to properly cure.
 - a. Clean and prepare in accordance with paint manufacturer's written recommendations.
 - 2. Provide mechanical equipment to install paint in a uniform, straight or curved pattern, without holidays and other defects.
 - 3. Do not permit traffic until paint has completely cured.
 - 4. Install 2 coats in thickness recommended by manufacturer.
- B. Marking Width and Color:
 - 1. Unless indicated otherwise, marking width and color are as follows:

	<u>Width</u>	<u>Color</u>
a. Parking stall lines	4 inches	
1) General		White

3.02 PROTECTION

- A. Protect Work until Substantial Completion.

3.03 CLEANUP

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

END OF SECTION 32 1723