



ADDENDUM #2
DSA # 01-119706
DSA File #- 21-39

February 4, 2022

Project: **Venetia Valley School Field Restoration Project**
177 N San Pedro Road
San Rafael, CA 94903

Owner: **San Rafael City Schools**
320 Nova Albion Way,
San Rafael, CA 94903

Architect: **SVA Architects**
2335 Broadway, Suite 301
Oakland, Ca 94612

Construction Manager: **Cumming**
505 14th Street, Suite 900
Oakland, CA 94612

Note: The following revisions and clarifications to the Bid Documents (plans and specifications) shall become a part of the Contract Documents prior to Bid. The narrative descriptions listed for the changes are provided for general reference as to the revisions, and each revised drawing/specification included shall be reviewed for the full extent of revisions.

1. PROJECT MANUAL

- A. Section 02 40 00 Demolition
 - i. Add the attached Addendum 2 section 02 40 00.

- B. Section 31 11 00 Clearing and Grubbing
 - i. Add the attached Addendum 2 section 31 11 00.

- C. Section 31 13 00 Selective Tree Removal and Trimming
 - i. Add the attached Addendum 2 section 31 13 00.

- D. Section 31 20 00 Earthwork
 - i. Add the attached Addendum 2 section 31 20 00.

Venetia Valley School Field Restoration

Addendum 2

February 4, 2022

Page 2 of 5



- E. Section 31 23 00 Excavation and Fill
 - i. Add the attached Addendum 2 section 31 23 00.
 - F. Section 32 05 23 Concrete for Exterior Improvements
 - i. Add the attached Addendum 2 section 32 05 23.
 - G. Section 32 11 00 Base Course
 - i. Add the attached Addendum 2 section 32 11 00.
 - H. Section 32 12 00 Flexible Paving
 - i. Add the attached Addendum 2 section 32 12 00.
 - I. Section 32 13 00 Rigid Paving
 - i. Add the attached Addendum 2 section 32 13 00.
 - J. Section 32 16 13 Concrete Curbs and Gutters
 - i. Add the attached Addendum 2 section 32 16 13.
 - K. Section 32 17 23 Pavement Markings
 - i. Add the attached Addendum 2 section 32 17 23.
- 2. CIVIL**
- A. Sheet C2.0
 - i. Replace sheet C2.0 with the attached Addendum 2 sheet C2.0.
Description of changes:
 - Added 5 keynotes (10-14).
 - Added and modified callouts for several utility features and one site feature to remain.
 - Added callouts for 2 utility features to be removed.
 - B. Sheet C3.0
 - i. Replace sheet C3.0 with the attached Addendum 2 sheet C3.0.
Description of changes:
 - Added 3 keynotes (11-13).
 - Called out one storm drain catch basin to be adjusted to match grade.
 - Called out 2 utility boxes to be adjusted to match grade and for boxes to be replaced with concrete Christy boxes
 - Called out 1 utility box to be adjusted to match grade and to be relocated outside pavement area.
- 3. LANDSCAPE**
- A. Sheet IR2.01
 - i. Replace sheet IR2.01 with the attached Addendum 2 sheet IR2.01.



4. Pre-Bid Questions and Responses

- A. Question 7: Legend sheet IR1.01 shows Mainline is Schedule 40. However, specification 2.04 sheet IR3.00 shows Class 315 and Class 200. Please clarify.
Response: Schedule 40 PVC Pipe is to be used.
- B. Question 8: Please provide detail for pressure reducing valve and flush valve that are shown on IR1.01.
Response: Pressure regulator detail has been added to Addendum 2 sheet IR2.01. Dripline flush valve is on Addendum 2 sheet IR2.01, detail 2.
- C. Question 9: Please provide an applicable geotechnical report for the site improvements or confirm that none is available for review.
Response: Geotechnical investigation for the Venetia Valley K-8 School completed April 27, 2017 is available at [Solicitations / Open Solicitations \(srscsbondprogram.org\)](https://www.srscsbondprogram.org)
- D. Question 10: Please provide any analytical soil testing applicable to the site soils to be expected or confirm that contractors are to assume 100% clean soils.
Response: For the bid, assume 100% clean soils. Testing will be provided prior to soil removal as required by the receiver of the soils.
- E. Question 11: Legend icons do not match for planting area. Please confirm that LA1.00 correctly depicts the sod and hydroseed areas.
Response: The legend icons on C3.1 for the landscape area and the new field direct the contractor to refer to the landscape plans.
- F. Question 12: Please confirm the only contract time constraints are that the project must be completed by June 19, 2022.
Response: Per Addendum #1 2.A, the project is to be completed by June 19, 2022. It is anticipated to receive BOE approval February 15, 2022.
- G. Question 13: Legend shows new AC paving 3.5" AC/11" AB as shaded regions. Drawing shows AC paving as hammer shaped boundary with parallel lines, NW corner, parking rea. Are both areas included or just the shaded regions?
Response: The hammer shaped area is for denoting fire access. Areas shown with dark / solid hatching in the parking lot are to be repaved.
- H. Question 14: Please provide location of existing storm drain and storm drain box to be removed. Please include depth, diameter, details, and back fill instructions.
Response: For the location, depth, and diameter of the storm drain(s) and storm drain box(s) to be removed please refer to sheet C2.0. For backfill instructions, see specifications section 31 23 33.
- I. Question 15: Please include asphalt concrete specification to include aggregate size for both the track and parking lot area.

Venetia Valley School Field Restoration

Addendum 2

February 4, 2022

Page 4 of 5



Response: See specifications sections 31 11 00 – Base Courses and 32 12 00 - Flexible Paving.

- J. Question 16: We would like to provide a subcontractor proposal for the above-mentioned project that is bidding on February 9th. I would like to request the Sign-in sheet. We are looking General Contractors who attended the pre-bid and are eligible to bid to provide our numbers.

Response: The a. Pre-Bid Conference Sign-in Sheet is available at [Solicitations / Open Solicitations \(srcsbondprogram.org\)](https://www.srcsbondprogram.org)

- K. Question 17: I am reviewing the project, and would like to know what is the estimated project duration and/or start and end dates?

Response: Per Addendum #1 2.A, the project is to be completed by June 19, 2022. It is anticipated to receive BOE approval February 15, 2022.

- L. Question 18: Will you be willing to hold a second (or waive) the pre-bid site visit requirement?

Response: The mandatory pre-bid site visit is not going to be waived. A second visit is not being planned.

- M. Question 19: Please provide an applicable geotechnical report for the site improvements or confirm that none is available for review.

Response: Geotechnical investigation for the Venetia Valley K-8 School completed April 27, 2017 is available at [Solicitations / Open Solicitations \(srcsbondprogram.org\)](https://www.srcsbondprogram.org)

- N. Question 20: DIVISION 01 - GENERAL REQUIREMENTS; SPECIFICATION SECTION: 01 50 00, ITEM 1, 9 & 1.10 - The specifications require a 4' x 8' project sign. Please provide sign graphics details, where it shall be placed, and how it shall be mounted. The specifications require we provide a Temporary Field Office with power, a land-line telephone, 6 person meeting space, and a multifunction copy machine. Please provide a location for this office, and the location of the point of connection for the power and telephone lines.

Response: Disregard Document 01 50 00 1.07 Job Sign. Job signage is not required by the District. Per Document 01 50 00 1.02.H Field Office, this is an option for the contractor and is not required by the District. Temporary Facilities (Document 01 50 00 1.02.I) are not applicable to this project.

- O. Question 21: Please clarify the fencing on the site plan A1.0. The plans show a gate and fence on the path of travel, but it is not clear if that fence is supposed to extend to P4 as well.

Response: The fence is to extend to provide a secured campus.

- P. Question 22: Per our grading takeoffs, it appears that there is a significant amount of fill that will be required on this project, almost 6,500CY of fill. Would the district consider lowering the field and surrounding areas by 2 feet to help create a better site balance? If

Venetia Valley School Field Restoration

Addendum 2

February 4, 2022

Page 5 of 5



not, please provide a spec on the fill to be imported in order to make sure all bids are using the same material for fill?

Response: It is not feasible to lower the site. Imported soil shall meet the following criteria:

- Be free of organic material
- A silt/clay (material passing the #200 sieve) fraction less than 50%
- A maximum particle size of 4-inches
- A liquid limit less than 40
- A plasticity index less than 15

Attachments:

Section 02 40 00 Demolition

Section 31 11 00 Clearing and Grubbing

Section 31 13 00 Selective Tree Removal and Trimming

Section 31 20 00 Earthwork

Section 31 23 00 Excavation and Fill

Section 32 05 23 Concrete for Exterior Improvements

Section 32 11 00 Base Course

Section 32 12 00 Flexible Paving

Section 32 13 00 Rigid Paving

Section 32 16 13 Concrete Curbs and Gutters

Section 32 17 23 Pavement Markings

Sheet C2.0

Sheet C3.0

Sheet IR2.01

Distribution:

Bidders

Owner

Construction Manager

END OF ADDENDUM #2

CB

SECTION 02 40 00

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Removing above-grade site improvements within limits indicated.
- B. Disconnecting, capping or sealing, and abandoning site utilities in place.
- C. Disconnecting, capping or sealing, and removing site utilities.
- D. Disposing of objectionable material.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.
- B. Section 31 23 33 – Trenching and Backfill.

1.03 RELATED DOCUMENTS

- A. California Building Code: Chapter 33 – Site Work, Demolition and Construction.
- B. California Building Code: Section 1809A.14 – Pipes and Trenches.

1.04 DEFINITIONS

- A. ANSI: American National Standards Institute.
- B. CAL-OSHA: California Occupational Safety and Health Administration.

1.05 SUBMITTALS

- A. Follow Submittal procedure outlined in Section 01 33 00 – Submittal Procedures.

1.06 PROJECT CONDITIONS

- A. Except for materials indicated to be stockpiled or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the Owner. Avoid damaging materials designated for salvage.
- C. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner. If necessary, the Owner

will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 00 – Excavation and Fill.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points during construction.
- B. Protect existing site improvements to remain during construction.

3.02 RESTORATION

- A. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.03 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
- B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.
- D. Coordinate utility interruptions with utility company affected.
- E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.
- F. Excavate and remove underground utilities that are indicated to be removed.
- G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

3.04 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.
- C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
- D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.

3.05 BACKFILL

- A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 33 – Trenching and Backfill.

3.06 DISPOSAL

- A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SUMMARY

- A. Clearing vegetation, debris, trash and other materials within limits indicated.
- B. Grubbing of vegetation within limits indicated.

1.02 RELATED DOCUMENTS

- A. Caltrans Standard Specifications.
 - 1. Section 17-2, Clearing and Grubbing.
- B. California Building Code: Chapter 33 – Site Work, Demolition and Construction.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Locate and clearly flag vegetation to remain or to be relocated.

3.02 RESTORATION

- A. Repair or replace vegetation indicated to remain that is damaged by construction operations, as directed by the Owner.
- B. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to shrubs.

3.03 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
- B. Remove trash, debris, logs, concrete, masonry and other waste materials.
- C. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

- D. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18-inches below subgrade.
- E. Use only hand methods for grubbing within drip line of remaining trees.

END OF SECTION

SECTION 31 13 00

SELECTIVE TREE REMOVAL AND TRIMMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Protecting existing trees and vegetation to remain.
- B. Trimming tree limbs and roots.
- C. Removing trees as designated.

1.02 DEFINITIONS

- A. ANSI: American National Standards Institute.
- B. CAL-OSHA: California Occupational Safety and Health Administration.

1.03 QUALITY ASSURANCE

- A. Do not remove or prune trees without first securing a permit from the appropriate agency.
- B. Prune to the standards of the International Society of Arborists and to ANSI A300.

PART 2 - PRODUCTS

- A. NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Locate and clearly flag trees to remain or to be relocated.

3.02 TREE PROTECTION

- A. Erect and maintain temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
- B. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
- C. Do not permit vehicles or equipment within drip line of remaining trees.
- D. Do not excavate within drip line of remaining trees, unless otherwise indicated.

- E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation edge as possible.
- F. Cover exposed roots with burlap and water regularly.
- G. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- H. Coat cut faces of roots more than 1 ½ inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
- I. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

3.03 TREE PRUNING

- A. Prune trees to balance the crown, and eliminate hazards. Perform main work to reduce sail effect through thinning, reducing end weights, shortening long heavy limbs, removing deadwood, weak limbs and sucker growth. Prune limbs back to an appropriate lateral branch.
- B. Make final cuts at the outer edge of the branch collar in accordance with the arborist's recommendations.
- C. Perform pruning work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

3.04 ROOT PRUNING

- A. Do not cut tree roots greater than 3-inch in diameter and less than 12-inches below ground level without approval of the Owner.
- B. Cut tree roots cleanly, as far from the trunk as possible, and not underneath any area where walkways are to be constructed. Root pruning shall be to a depth of 18-inches.
- C. Tree root prune using a Vermeer root-cutting machine. Obtain the Owner's approval before using alternate equipment or techniques.
- D. Complete tree root pruning prior to any excavation adjacent to the tree.
- E. Do not expose tree roots to drying out. Cover root ends with soil or burlap and keep moist until the final backfill is completed.

3.05 TREE REMOVAL

- A. Remove trees designated for removal prior to the construction of new improvements.
- B. Perform tree removal work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

- C. Remove or grind stumps to a minimum of 18-inches below finish subgrade. Remove surface roots to this depth within 24-inches of the tree trunk.

3.06 RESTORATION

- A. Repair or replace trees indicated to remain that are damaged by construction operations, as directed by the Owner.
- B. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to trees.
- C. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Owner.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. Work of this section includes all required excavation, grading, preparation of subgrade for fills, proper placement of fills, including backfilling and compaction, the watering, rolling and compacting of fill material in place and the finish grading all as required by the drawings and as specified herein.
- B. All grading work shall be performed in accordance with:
 - 1. Title 24, Part 2, C.C.R., 2016 C.B.C., 2015 I.B.C. with California Amendments & Supplements
 - 2. The grading code of the County and any special requirements of the permit.
 - 3. The Geotechnical Investigation report for the project site
 - 4. Provide special inspection for engineered fill and compaction, Title 24, Part 2, C.C.R., 2016 C.B.C., 2015 I.B.C. with California Amendments & Supplements
 - 5. Applicable General and Special Conditions of these specifications herein after set forth in full or by reference.
 - 6. A final grading report shall be submitted by the Geotechnical Consultant in accordance with Title 24, Part 2, C.C.R., 2016 C.B.C. Appendix J

1.02 PRINCIPAL ITEMS OR WORK INCLUDED HEREIN.

- A. Excavation
- B. Filling
- C. Backfilling
- D. Geotechnical Consultant and Tests
- E. Grading
- F. Miscellaneous related work necessary for a complete job.
- G. Special Requirements.

1.03 SCHEDULING

- A. PAD GRADING: It is imperative that Building construction commence as quickly as possible, therefore, contractor shall submit a schedule of grading that clearly establishes the construction of the Building Pad area as a priority of grading construction along with providing appropriate or required reports and certifications from the Geotechnical Consultant, Civil Engineer, and governmental authority necessary to commence foundation excavation and building construction.

1.04 RELATED WORK SPECIFIED IN OTHER SECTIONS.

- A. Clearing and Grubbing: Section 31 11 00

- B. Final subgrade preparation for asphalt paving: Section 32 12 00. Flexible Paving.
- C. Aggregate base beneath asphalt paving is specified under Flexible Paving, Section 32 12 00.
- D. Excavation and backfill for utility lines specified under Mechanical and Electrical Sections, shall be performed as specified in this Section.

PART 2 - PROTECTION

- 2.01 Contractor shall protect adjacent properties, roads, right-of-ways, easements and existing improvements from damage during the life of the grading operation and prevent caving, sloughing or the placing of materials or stock piles on adjacent properties.
- 2.02 Provide cribbing, sheathing, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavating, together with suitable forms of protection against bodily injury to personnel employed on the work and the general public. The responsibility for the design, installation, and maintenance of required cribbing and shoring shall be entirely that of the Contractor and shall meet the approval of the State Division of Industrial Safety and local governing agencies' requirements.
- 2.03 Utility lines and structures shown shall be protected and treated as indicated. Where work not shown is encountered, report it to the Architect before proceeding with excavation. The Contractor shall bear the costs for all repairs to damaged or broken utilities and any damages related thereto.
- 2.04 It shall be the Contractor's full responsibility to take all measures necessary during grading to protect slope areas, both cut and fill, existing improvements and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed slopes until all slopes are in satisfactory compliance with the job specifications, all berms have been properly constructed, and all associated drainage devices have met the requirements of the Architect. It shall also be the Contractor's responsibility to prevent silt run-off from the limits of work.

PART 3 - GEOTECHNICAL CONSULTANT, TESTS, AND REPORTS

- 3.01 A Geotechnical Consultant designated by the Owner will be engaged to perform continuous inspection of the placing and compacting of all fills and backfills within the limits of grading of this project. All work shall be done in accordance with these specifications and as recommended and approved by the Geotechnical Consultant. Costs for all such inspections and tests shall be paid by the Owner. The Contractor shall be responsible for notifying the Geotechnical Consultant in advance so that he may be present to perform his services as needed. The Geotechnical Consultant shall approve all subgrades prior to placement of fill or placement of forms and reinforcing.

- 3.02 The Geotechnical Consultant shall also make an investigation of the fill material to establish the ability of the soil to sustain the vertical loads to be imposed on the fill by the proposed structure.
- 3.03 The Geotechnical Consultant shall submit compaction reports to the Architect and the Civil Engineer at the completion of the work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Consultant shall keep the Architect informed on the progress of the grading work.
- 3.04 No clearing, demolitions, filling and backfilling, or grading operations shall be performed without the presence of a representative of the Geotechnical Consulting firm. Operations undertaken at the site without the Geotechnical Consultant present may result in exclusions of affected areas from the final compaction report for the project. The presence of the Geotechnical Consultant will be for the purpose of providing observation and field testing, and will not include any supervising or directing of the actual work of the Contractor, directing his/her employees or agents. Neither the presence of the field representative nor the observations and testing by the Geotechnical Consulting firm shall excuse the Contractor in any way for defects discovered in the Contractor's work. The Geotechnical Consulting firm shall not be responsible for job or site safety on this project, which shall be the sole responsibility of the Contractor.
- 3.05 The existing soil conditions at this site have been investigated, and a report of findings is on file at the Owners office for review by the Contractors during the bidding period. This information is offered as supplemental information only, and no guarantee of existing soil or other conditions is intended.

PART 4 - MATERIALS

- 4.01 All imported material and sources for import material shall be approved by the Geotechnical Consultant prior to hauling on site. Contractor shall be responsible for communicating the necessary information to the Geotechnical Consultant in a timely manner so the Geotechnical Consultant may perform appropriate testing and reporting.
- 4.02 The Contractor shall import any and all additional fill material required to complete the grading on this project. Imported fill soils shall be non-expansive, granular soils meeting the USCS classifications of SM, SP-SM or SW-SM with a maximum rock size of 3 inches and 5 to 35% passing the No. 200 sieve. The Geotechnical Consultant shall evaluate the import fill soils before hauling to the site. The imported fill shall be placed in lifts no greater than 8 inches in loose thickness and compacted to at least 90% relative compaction (ASTM D1557) near optimum moisture content.
- 4.03 Fill material within new building and paved areas shall be clean, well-pulverized soil free of vegetation matter, rocks larger than 3 inches in any dimension, and other debris, and shall be subject to approval by the Geotechnical Consultant.
- 4.4 Backfill material for storm drain and utility lines shall be non-expansive granular materials, such as clean sand, and shall be placed in a minimum thickness of 6 inches for bedding and backfilled to 12 inches above top of pipe. Bedding sand shall have a sand equivalent value of 30 or greater determined in accordance with Cal-Trans Test Method # 217.

PART 5 - SURPLUS EARTH MATERIAL

- 5.01 All surplus earth material not needed for the completion of the grading shall be removed from the site by the Contractor and disposed of in a legal manner.

PART 6 - INADEQUATE SOIL CONDITIONS

- 6.01 Should soil of inadequate density and bearing capability be encountered at the elevations indicated on the drawings, or where new fill is to be placed upon existing loose fill material exposed by excavation, the excavation shall be carried to the depth required to attain soil of bearing quality as determined by the Geotechnical Consultant. The adequacy of all soil bearing value shall be determined by the Geotechnical Consultant.

PART 7 - EXECUTION

7.01 PRE JOB CONFERENCE

An onsite pre job meeting with Architect, the Construction Manager, the Geotechnical Consultant, Civil Engineer, Inspector, and the Utility Line and Earthwork Subcontractor(s) is required prior to all grading related operations. ATTENDANCE IS MANDATORY.

7.02 PREPARATION

- A. Protect adjacent property and existing improvements and structures as necessary to prevent undermining, caving of cuts, and miscellaneous damage, or sloughing of material onto adjacent property.
- B. Provide cribbing, sheathing, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavation together with suitable forms of protection against bodily injury to personnel employed on the work and the general public. Be responsible for the design, installation, and maintenance of required cribbing and shoring and same shall meet the approval of the State Division of Industrial Safety and local governing agencies' requirements.
- C. Protect existing improvements and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. Prevent silt runoff from the limits of work in accordance with governmental requirements, and the S.W.P.P.P.
- D. Borrow pits, if any, shall meet all requirements of these Specifications for over-excavation and backfill.

7.03 DUST CONTROL

During all grading operations, water shall be applied to the surfaces in the working area at frequent intervals and in sufficient quantities to allay the dust and for proper compaction. No other method will be permitted.

7.04 CLEAN-UP

Upon completion of work in this Section, remove rubbish, trash, and debris resulting from operations. Remove disused equipment and implements of service, and leave entire area involved in a neat, clean, and acceptable condition.

7.05 EXCAVATION

- A. Prior to any excavation or filling operation, the entire area within the limits of work containing vegetation shall be excavated to a minimum depth to ensure removal of all vegetation. This material shall be disposed of off the site in a legal manner.
- B. Excavate to the depths, lines, and grades indicated. Excavate sufficiently over-size to permit installation and removal of concrete forms and all other required work.
- C. Footing pads, if poured neatly, may be excavated to the net pad widths plus two inches if approved by the Architect. Approval will not be given until the completed excavation has been inspected.
- D. Should footing excavations exceed reburied dimensions or should sloughing occur, fill such extra space with concrete at no additional cost to the contract. If unsuitable material is found at the indicated depths, immediately notify the Architect.
- E. Sequencing of the work to ensure that one part of the excavating does not interfere with another part rests with the Contractor.
- F. Notify the Engineer 48 hours before foundation excavations are ready for inspection.
- G. The bottoms of footings shall be free of loose material, debris, and water before concrete is placed.
- H. Cut banks shall be neatly trimmed to the required finish surface as the cut progresses, or the Contractor shall have the option of leaving the cuts full and finish grading by mechanical equipment which will produce the finish surfaces as shown on the drawings.
- I. All cut or "at grade" building, concrete and asphalt pavement areas shall be scarified to a minimum depth of 8 inches below subgrade brought to an optimum moisture content, and compacted to a density of not less than 90% of maximum dry density.

7.06 FILLING

- A. Prior to placing new fill in all other areas, the exposed cleared surface should be plowed, scarified, or otherwise processed to a depth of at least 24 inches, watered and/or aerated, as required, thoroughly mixed to a uniform, near optimum moisture condition, and recompacted to at least 90 percent of the ASTM D1557 test standard.
- B. All recompacted and new fill required to secure final subgrade elevations should be spread, water and/or aerated as required, thoroughly mixed to a uniform near optimum moisture condition, and compacted in approximated 8-inch thick lifts to at least 90 percent. Backfilling of excavations made for removal of any existing buried elements during site clearing should also be performed in this manner.
- C. Imported fill materials should consist of clean soils, free from vegetation, debris, or rocks larger than 3 inches. The Expansion Index value should not exceed a maximum of 50 ("Low" expansive per UBC Table 18-1-B.)
- D. Where fills are placed on existing slopes exceeding a slope of five horizontal to one vertical, the slopes shall be benched in accordance with the Geotechnical Consultant's requirements and local governing public agencies' requirements, and compacted as herein specified before placing fill material on same, so that all fills shall be placed in horizontal layers as specified. Widths of benches shall be as directed by the Geotechnical Consultant.
- E. Rock encountered in the excavation on this site may, at the option of the Contractor, be broken up into pieces not larger than three inches in maximum dimension, and be incorporated in the fill material if spread as directed by the Geotechnical Consultant. Otherwise, all rocks larger than three inches in maximum dimensions shall be removed from the site. Rocks and stones larger than one inch in maximum dimension will not be permitted within the top 12 inches of finished grade in non-paved areas.
- F. Fill banks shall be graded full and compacted beyond the grade of the finish bank. After the banks have been filled, they shall be trimmed to the finish grades and limits shown on the drawings.

7.07 BACKFILLING

- A. Place no backfill until work in excavations has been approved. Remove cave-ins and loose soil to permit inspection.
- B. Place backfill in layers which will compact to six inches maximum, concurrently on both sides of footings and walls. Thoroughly compact each layer with mechanical tampers, adding water as required to obtain optimum moisture content, and compact as set forth in paragraph 7.9 herein.
- C. Backfill placed in narrow, restricted areas, such as along utility trenches, may possibly be placed in up to 12-inch thick lifts, depending on the materials, procedures and equipment being employed. Backfill consolidation by flooding or jetting is prohibited unless approved by the Geotechnical Consultant. In any case,

all backfill should be mechanically compacted to at least 90 percent of the aforementioned test standard.

7.08 FINISH GRADING

- A. The entire area within the limits of grading as indicated on the Drawings shall be constructed to the lines, grades, elevations, slopes, and cross sections indicated on the Drawings. When the grading has been completed, the areas shall be rolled smooth with a steel tandem roller or equal.
- B. Fine grade to bring areas to required lines and grades. The subgrade elevation within the building area for slabs on grade (without a base course) shall be within 0.50 inch along a 10-foot straight edge.
- C. Slope finish grades to drain surface water away from buildings, walks, paving, and other structures. Generally, grade with uniform slope between points where elevations are given, or between such points and existing grades. Excavate and grade swales to provide drainage away from and around buildings.
- D. Areas to Receive Paving or Surfacing: Review plans and details for each area. See plans for paving and base course thickness. Review Drawings for site work details.
- E. Areas to Receive Interior Building Slab-on-Grade: Review plans and details for thickness of slabs and granular fill under slabs.
- F. Areas to receive Topsoil and/or Planting: Where not otherwise indicated, areas outside of buildings shall be given uniform slopes between points for which finish grades are shown, or between such points and existing established grade, except that vertical curves or roundings shall be provided at abrupt changes in slope.
- G. Rocks or cobbles larger than 1-inch in diameter shall not be placed in the upper 12-inches of planting area fill, rocks, or cobbles larger than 3/4 inch shall not appear on the finish graded surface.
- H. It shall be the Contractor's full responsibility to take all measures necessary during grading to protect slope areas, both cut and fill, and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed slopes until all slopes are in satisfactory compliance with the job specifications.

7.09 COMPACTION

- A. All fills shall be compacted to at least 90 percent of maximum density obtainable using the ASTM test procedure D1557. All areas, which are scarified, shall be recompacted to these same requirements.
- B. All earthwork operations should be subject to compaction monitoring field observation and testing by the Geotechnical Consultant. The Geotechnical Consultant should be notified at least two days in advance of the start of grading. A joint meeting between a representative of the Client, the Contractor and the

Geotechnical Consultant is recommended prior to grading to discuss specific procedures and scheduling.

- C. Compaction by flooding or jetting is prohibited unless approved by the Geotechnical Consultant.

7.10 SPECIAL REQUIREMENTS

A. REMEDIAL GRADING

1. Building slabs and Footings

Overexcavate to a depth of 2 feet below existing grade or the bottom of building footings, whichever is greater, to extend a minimum of 5 feet beyond the outer edge of the building slabs or footings (including column supports).

2. Garden and Retaining walls

Overexcavate to a depth of 2 feet below existing grade or the bottom of footings, whichever is greater, to extend a minimum of 2 feet beyond the face of the footing.

3. Areas to receive fill, pavements or hardscape

The top 18 inches of the native subgrade shall be overexcavated. The bottom of overexcavation shall be scarified an additional 6 inches, moisture conditioned and compacted to 90% relative compaction per ASTM D1557.

- B. A representative of the Geotechnical Consultant's firm shall observe the bottom of all excavations. Artificial fill, soft soils, organic soils, or other unsuitable material remaining in the bottom of the excavations shall be overexcavated until competent natural material is encountered. Competent natural soil is defined as undisturbed material exhibiting a relative compaction of at least 85 percent.

- C. Prior to replacing compacted fill in over-cut building, concrete flatwork and A.C. paved areas, the exposed over-cut surface should be plowed, scarified, or otherwise processed to an additional depth of at least 12 inches, water and/or aerated as required, thoroughly mixed to an uniform, near optimum moisture condition, and recompacted to at least 90 percent of maximum dry density obtainable using the ASTM D1557 test standard.

- D. All recompacted and new fill should be spread, watered, mixed and compacted by mechanical means in approximate 8 inch thick lifts to at least 90 percent of the aforementioned standard.

- E. Completed building, exterior concrete pavement, and A.C. pavement subgrades should be trimmed and rolled to a firm smooth surface. Final watering and rolling should be performed immediately prior to placing concrete or paving.

- F. Prior to placing backfill within the remaining excavation behind new retaining walls, these areas should first be cleared of all significant vegetation, construction debris, loose and/or disturbed soils, etc. All new backfill should be spread, watered or

aerated as required, thoroughly mixed to a uniform near optimum moisture condition and compacted by mechanical means in approximate 6 to 8 inch thick lifts. The degree of compaction obtained should be at least 90 percent of maximum dry density per the ASTM D1557 laboratory test standard.

- G. The top 12 inches of soil within all designated planted areas shall be imported topsoil or stockpiled existing site soil capable of supporting plant growth. The 12-inch layer shall be measured down from the finish grade shown on the project drawings.
- H At the completion of grading operations and prior to building, A.C. pavement and concrete paving construction, Contractor shall provide an as-built grading plan at his own expense. As-built grading plan shall be prepared, signed and dated by a licensed land surveyor or Registered Civil Engineer licensed to practice land surveying.
- I. The upper 6 inches of subgrade soils shall be compacted to 95% of maximum dry density when no aggregate base material is specified for asphalt paving.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, walks, paths, or trails and any other site improvements called for on the Plans.

1.02 SECTION EXCLUDES

- A. Earthwork related to underground utility installation, see Section 31 23 33 – Trenching and Backfilling.

1.03 RELATED DOCUMENTS

A. ASTM:

1. D 1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
2. D 1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.
3. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
4. D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
5. D 4318. Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
6. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing or special Inspection.

B. California Code of Regulation Title 24, Part 2, California Building Code:

1. Chapter 11B – Accessibility to Public Buildings.
2. Chapter 33 – Safeguards During Construction.

C. Caltrans Standard Specifications:

1. Section 10-6, Watering.
2. Section 19, Earthwork.

D. CAL/OSHA, Title 8.

1.04 DEFINITIONS

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.
- B. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans.
 - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions. Unauthorized excavation shall be without additional compensation.
- C. Structural Backfill: Soil materials used to fill excavations resulting from removal of existing below grade facilities, including trees. Any fill soil or aggregate base or crush rock under the building shall not contain recycled asphalt, asphalt grindings, or soil with petroleum products. See Section 31 23 33 – Trenching and Backfilling.
- D. Structural Fill: Soil materials used to raise existing grades.
- E. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material $\frac{3}{4}$ -cubic yards or more in volume that, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- H. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project.
- I. Utilities: onsite underground pipes, conduits, ducts and cables.

1.05 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

1.06 QUALITY ASSURANCE

- A. Conform all work to the appropriate portion(s) of the California Code of Regulations, Title 24 and Caltrans Standard Specifications, Sections 10-6 and 19.

- B. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- C. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces.
- D. Finish soil grade tolerance at completion of grading:
 - 1. Building and paved areas: +0.05
 - 2. Other areas: ± 0.10 feet.
- E. The project geotechnical engineer shall be notified of the construction schedule at least one week prior to the beginning of major site construction, and notified at least 48 hours (working days) before being required to perform field observation and testing.

1.07 PROJECT CONDITIONS

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the construction documents. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents will be allowed unless the Contractor has notified the Owner in writing of differing conditions prior to the Contractor starting work on affected items.
- B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.
- D. Temporarily stockpile fill material in an orderly and safe manner and in a location approved by the Owner.
- E. Provide dust and noise control in conformance with Division 1 General Requirements for Cleaning and Waste Management.
- F. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.
- B. On-Site Structural Fill and Structural Backfill: Soil or soil-rock mixture from on site excavations, free from organic matter or other deleterious substances. On-site structural fill and backfill shall not contain rocks or rock fragments over 4 inches in greatest dimension and not more than 15 percent shall be over 2-1/2 inches in greatest dimension and with an organic content less than 3.0 percent by weight.
- C. Imported Structural Fill and Structural Backfill: Conform to the requirements of on-site structural fill. Material shall also be a non-expansive and predominantly granular soil or soil-rock mixture with plasticity index of 15 or less in accordance with ASTM D 4318 and an R-Value of 25 or greater.

PART 3 - EXECUTION

3.01 GENERAL

- A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.
- B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- C. The use of explosives will not be permitted.

3.02 CONTROL OF WATER AND DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Owner's approval for proposed control of water and dewatering methods.
- D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
- F. Maintain dewatering system in place until dewatering is no longer required.

3.03 WET WEATHER CONDITIONS

- A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.

3.04 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.05 EXCAVATION

- A. Excavate earth and rock to lines and grades shown on drawings and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

3.06 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL

- A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading.
- B. Compensation for increased removal widths and depths that are not required will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Owner.

3.07 GRADING

- A. Uniformly grade the Project to the elevations shown on plans.
- B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

3.08 SUBGRADE PREPARATION

- A. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- B. Prepare subgrades under paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.
- C. Prepare subgrades for paved areas, curbs and gutters by plowing or scarifying surface at least 6 inches below final subgrade elevations and 5-feet beyond edge of pavement. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.
- D. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.

3.09 PLACEMENT OF STRUCTURAL FILL

- A. Place structural fill on prepared subgrade.
- B. Spread structural fill material in uniform lifts not more than 8-inches in un-compacted thickness and compact.
- C. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.
- D. Overbuild fill slopes to obtain required compaction. Remove excess material to lines and grades indicated.
- E. Do not drop fill on structures. Do not backfill around, against, upon concrete, or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.
- F. Backfill in uniform lifts not exceeding 8 inches in uncompacted thickness. Each lift should be brought to a uniform moisture content of at least 1 percent above optimum prior to compacting by either spraying the soil with water if it is too dry or aerating the material if it is too wet.

3.10 KEYWAYS AND BENCHES

- A. Provide keyways as indicated for fill slopes steeper than 6 horizontal to 1 vertical. Extend keyway -feet minimum into competent, undisturbed soil or 3-feet minimum into competent, undisturbed rock.
- B. Place subsurface drains in bottom of keyway in conformance with Section 33 46 00 – Subdrainage.
- C. Bench subgrade as indicated above toe of fill.
- D. Place subsurface drains at benches every 20 vertical feet.

3.11 LOT FINISH GRADING

- A. Blade finish lots to lines and grades indicated.

3.12 COMPACTION AND TESTING

- A. Do not compact by ponding, flooding or jetting.
- B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution.
- C. Perform compaction using rollers, pneumatic or vibratory compactors.
- D. Compaction requirements:
 - 1. Compact structural fills less than 5-feet thick to 90 percent compaction.
 - 2. Compact structural fill 5-feet thick or greater to 95 percent compaction.
 - 3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 5-feet beyond pavement.
 - 4. Compact the upper 6-inches of subgrade soils to the following percentage of compaction: 95 percent under walks and pavements; 93 percent for foundations; and 90 percent for areas to receive structural fill.”

3.13 DISPOSAL

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping and associated structures.

1.02 SECTION EXCLUDES

- A. Drainage fill material and placement around subdrains.
- B. Trenching and backfill for other utilities such as underground HVAC piping, electrical conduit, telephone conduit, gas piping, cable TV conduit, etc.

1.03 RELATED DOCUMENTS

A. ASTM:

1. C 33, Standard Specification for Concrete Aggregates.
2. C 150, Standard Specification for Portland Cement.
3. C 260, Standard Specification for Air-Entraining Admixtures for Concrete.
4. C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
5. D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
6. D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
7. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
8. D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
9. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

B. California Code of Regulation Title 24, Part 2, California Building Code:

1. Chapter 11B – Accessibility to Public Buildings.

2. Chapter 33 – Safeguards During Construction.

C. Caltrans Standard Specifications:

1. Section 19, Earthwork.
2. Section 26, Aggregate Bases.
3. Section 68, Subsurface Drains.
4. Section 96, Geosynthetics.

D. CAL/OSHA, Title 8.

1.04 DEFINITIONS

A. AC: Asphalt Concrete.

B. ASTM: American Society for Testing and Materials.

C. Bedding: Material from bottom of trench to bottom of pipe.

D. CDF: Controlled Density Fill.

E. DIP: Ductile Iron Pipe.

F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.

G. PCC: Portland Cement Concrete.

H. RCP: Reinforced Concrete Pipe.

I. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of $\frac{1}{2}$ the outside diameter measured from the top or bottom of the pipe.

J. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.

K. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.

1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans.

2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions. Unauthorized excavation shall be without additional compensation.

L. Utility Structures:

1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
2. Sanitary sewer manholes, vaults, etc.

3. Water vaults, etc.

1.05 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Product Data:
 1. Grading and quality characteristics showing compliance with requirements for the Work.
 2. Certify that material meets requirements of the Project.
- C. Samples:
 1. If required, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material.
 2. Provide materials from same source throughout work. Change of source requires approval of the Owner.

1.06 QUALITY ASSURANCE

- A. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.
- B. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- C. Conform work to the requirements of the California Building Code.
 1. Section 1809A.14 – Pipe and Trenches.

1.07 PROJECT CONDITIONS

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the construction documents. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents will be allowed unless Contractor has notified the Owner in writing of differing conditions prior to contractor starting work on affected items.
- B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.

- D. Provide dust and noise control in conformance with Division 1 General Requirements for Cleaning and Waste Management.

PART 2 - PRODUCTS

2.01 PIPE BEDDING AND INITIAL BACKFILL

- A. ASTM D 2321, Class IA, IB or II.
 - 1. Clean and free of clay, silt or organic matter.
- B. Permeable Material: Conform to Section 68-2.02F(3) of Caltrans Standard Specifications, Class 2 permeable.
- C. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, ¾-inch maximum. Material shall also be non-expansive and predominantly granular soil or soil-rock mixture "(percent of passing #200: 50 maximum, 5 minimum)" with plasticity index of 15 or less.
- D. Sand: Conform to Section 19-3.02F(2) of Caltrans Standard Specifications.

2.02 WARNING TAPE

- A. See Section 33 10 00 – Water Utilities.

2.03 SUBSEQUENT BACKFILL

- A. Conform to on-site or imported structural backfill in Section 31 23 00 – Excavation and Fill.

2.04 CONTROLLED DENSITY FILL (CDF) (IN TRENCHES)

- A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8-inch top size. The 3/8-inch aggregate shall not comprise more than 30% of the total aggregate content.
- B. Cement: Conform to the standards as set forth in ASTM C-150, Type II Cement.
- C. Fly Ash: Conform to the standards as set forth in ASTM C-618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.
- D. Air Entraining Agent: Conform to the standards as set forth in ASTM C-260.
- E. Aggregates need not meet the standards as set forth in ASTM C-33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.

- F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.
- G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.

2.05 CONCRETE STRUCTURE BEDDING AND BACKFILL

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill.
- B. Poured-in-Place Structures:
 - 1. Bedding: In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.
 - 2. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 31 23 00 – Excavation and Fill.

2.06 FILTER FABRIC

- A. Filter Fabric:
 - 1. Filter Fabric: Section 96-1.02B of Caltrans Standard Specifications.
 - 2. Mirafi 140N (Mirafi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.

PART 3 - EXECUTION

3.01 TRENCHING AND EXCAVATION

- A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.
- B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.
- C. Excavation Depth for Bedding: Minimum of 4-inches below bottom, except that bedding is not required for nominal pipe diameters of 2-inches or less.
- D. Excavation Width at Springline of Pipe:

1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter.
 2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet.
 3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet.
- E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.
- F. Comply with the Owner's limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Owner.
- G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
- H. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

3.02 CONTROL OF WATER AND DEWATERING

- A. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- D. Maintain dewatering system in place until dewatering is no longer required.

3.03 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and

specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Owner.

- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

3.04 PIPE BEDDING

- A. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 95% relative compaction unless specified otherwise on the. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of bedding material will not be permitted.

3.05 WARNING TAPE

- A. Install in accordance with Section 33 10 00 – Water Utilities.

3.06 BACKFILLING

- A. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of initial backfill material will not be permitted.
- B. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction, unless specified otherwise on the Plans. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of subsequent backfill material will not be permitted.
- C. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe.

3.07 CLEANUP

- A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.
- B. See Section 01 74 00 – Refer to Division 1 General Requirements for Cleaning and Waste Management for further cleanup requirements.

END OF SECTION

SECTION 32 05 23

CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials for portland cement concrete.
- B. Aggregate and aggregate grading for portland cement concrete.
- C. Water for portland cement concrete.
- D. Admixtures for portland cement concrete.
- E. Proportioning for portland cement concrete.
- F. Mixing and transporting portland cement concrete.
- G. Formwork for cast in place portland cement concrete.
- H. Embedded materials for portland cement concrete.
- I. Steel reinforcement for portland cement concrete.
- J. Placing and finishing portland cement concrete.
- K. Curing portland cement concrete.
- L. Protecting portland cement concrete.

1.02 RELATED DOCUMENTS

- A. ASTM Standards
 - 1. A 1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 2. A 615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 3. C 94, Standard Specification for Ready-Mixed Concrete.
 - 4. C 114, Standard Test Methods for Chemical Analysis of Hydraulic Cement.
 - 5. C 150, Standard Specification for Portland Cement.
 - 6. C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 7. D 1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruded and Resilient Bituminous Types).
- B. Caltrans Standard Specifications:
 - 1. Section 51: Concrete Structures.
 - 2. Section 73: Concrete Curbs and Sidewalks.
 - 3. Section 90-1: General section of Concrete section.
- C. California Building Code:
 - 1. Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2. Chapter 19A – Concrete.
 - 3. Chapter 33 – Safeguards During Construction.

1.03 DEFINITIONS

- A. ASTM: American Society for Testing and Materials.

1.04 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

- B. Design Mixes: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.
- C. Reinforcing Steel Shop-Drawings

1.05 QUALITY ASSURANCE

- A. Concrete shall be subject to quality assurance in accordance with Section 90 of the Standard Specifications.
 - 1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slabs on grade and other work.
- B. Certifications:
 - 1. Provide Owner's Representative at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:
 - 2. Materials contained comply with the requirements of the Contract Documents in all respects.
 - 3. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
 - 4. Statement of type and amount of any admixtures.
 - 5. Provide Owner's Representative, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.
- C. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.
 - 1. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.
 - 2. Construct "V" ditches in accordance with Section 72-5.03 of the Standard Specifications; except that finishing shall be in accordance with Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.
 - 3. Conform other construction of portland cement concrete items to the requirements of Section 51 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.
- D. Conform to the requirements of the California Building Code section 1929A.2 for testing of reinforcing bars.

1.06 DESIGNATION

- A. General: Whenever the 28-day compressive strength is designated herein or on the plans is greater than 3,600 psi, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the

plans which are 3,600 psi or less are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the plans, the concrete shall contain the cement per cubic meter shown in section 90-1.01 of the Caltrans Standard Specifications.

- B. Unless specified otherwise herein or on the Plans, Portland Cement Concrete for this Project shall be Class "2" as specified in the Caltrans Standard Specifications.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT

- A. General: Type V or type II (modified) cement conforming to the requirements of ASTM C 150, with the following modifications:
 - 1. Cement shall not contain more than 0.60% by weight of alkalis, calculated as the percentage of Na₂O plus 0.658 times the percentage of K₂O when determined by either 4 intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in accordance with the requirements of ASTM C 114.
 - 2. The autoclave expansion shall not exceed 0.50%.
 - 3. Mortar containing the Portland Cement to be used and the sand, when tested in accordance with Test Method No. Calif. 527, shall not expand in water more than 0.010% and shall have an air content less than .048%.
 - 4. Allowable tri-calcium Aluminate (C₃A) by weight shall not exceed 5%. Allowable tetracalcium aluminoferrite plus twice the tricalcium aluminate (C₄AF+2C₃A) by weight shall not exceed 25%. The sulfate expansion test (ASTM C 452) may be used in lieu of the above chemical requirements, provided the sulfate expansion does not exceed 0.040% at 14 days (max.).
 - 5. Contractor may substitute pozzolan for Portland Cement in amounts up to 15% of the required mix unless high early strength concrete is specified. Pozzolan shall consist of Class F Fly Ash meeting the requirements of ASTM C 618.
- B. Cement for Surface Improvements: Provide a coloring equivalent to ¼ pound of lampblack per cubic yard. Add to the concrete at the central mixing plant.
- C. Liquiblack, as supplied by Concrete Corporation of Redwood City, California, may be used in lieu of lampblack. One pint of liquiblack shall be considered equal to one pound of lampblack.

2.02 AGGREGATE AND AGGREGATE GRADING

- A. General: Conform to the requirements of Section 90-1.02C(1), 1.02C(2) and 1.02C(3) of the Caltrans Standard Specifications.
- B. Aggregate Size and Gradation: Conform to the requirements of the Caltrans Standard Specifications for 25-mm (1-inch) maximum combined aggregate.

2.03 WATER

- A. General: Conform to the requirements of section 90-1.02D of the Caltrans Standard Specifications, for mixing and curing portland cement concrete and for washing aggregates.

2.04 CLASSIFICATION OF PORTLAND CEMENT CONCRETE

- A. Concrete for the following items shall be designated by the following classes per the Caltrans Standard Specifications:
1. Vehicular Pavement: Class 2.
 2. Curbs, Gutters, and Sidewalks: Minor Concrete.
 3. Cast in place Concrete Pipe: The concrete shall consist of a minimum of 564 pounds of Portland cement per cubic yard of concrete.
 4. Thrust Blocks: The concrete shall have a minimum compressive strength of 3,000 psi.
 5. Sign and Fence Footings: The concrete shall consist of a minimum of 376 pounds of Portland cement per cubic yard of concrete.
 6. Water, Storm, and Sanitary Structures: The concrete shall consist of a minimum of 564 pounds of Portland cement per cubic yard of concrete.

2.05 EXPANSION JOINT MATERIAL

- A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:
1. Curbs, Curb Ramps, Island Paving, Sidewalks, Driveways and Gutter Depressions: ¼-inch.
 2. Concrete Slope Protection, Gutter Lining, Ditch Lining and Channel Lining: ½-inch.
 3. Structures: As indicated.

2.06 REINFORCEMENT AND DOWELS

- A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.
- B. Slip dowels, where noted or called for on the plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.
- C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM Designation A 1064 for the material and mesh. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.
- D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM Designation A 1064.
- E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

2.07 COLOR AND PATTERN FOR DECORATIVE SURFACES

- A. Colors for decorative surfacing shall be CHROMIX admixtures as manufactured by

the L. M. Scofield Company, Schedule A-312.05 or approved equal. The specific color shall be as designated or called for on the Plans.

- B. Patterns for decorative surfacing shall be standard "Bomanite" patterns as copyrighted by the Bomanite Corporation of Palo Alto, California or equal. The specific pattern shall be as designated or called for on the Plans.

2.08 ACCESSORY MATERIALS

- A. Conform water stops and other items required to be embedded in of Portland Cement Concrete structures to the applicable requirements of Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans or detail drawings.
- B. Curing Compounds:
 - 1. Regular Portland Cement Concrete: "Non-Pigmented Curing Compound - chlorinated Rubber Base-Clear" conforming to the requirements contained in Section 90-1.03B(3), of the Caltrans Standard Specifications.
 - 2. Color Conditioned Decorative Portland Cement Concrete: LITHOCHROME colorwax as manufactured by the L. M. Scofield Company or approved equal.

2.09 FORMS

- A. Conform to the requirements of Section 51-1.03C(2) of the Caltrans Standard Specifications.

2.10 PRECAST CONCRETE STRUCTURES

- A. Conform to the following Sections of Caltrans Standard Specifications:
 - 1. 51-7, Minor Structures.
 - 2. 70-5.02, Flared End Sections.
 - 3. 70-1.02H, Precast Concrete Structures.

2.11 PORTLAND CEMENT CONCRETE VEHICULAR PAVEMENT

- A. General: See Section 32 13 00 – Rigid Paving.

PART 3 - EXECUTION

3.01 STRUCTURAL EXCAVATION

- A. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.
- B. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material and compact in place to 95% of the maximum dry density.
- C. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site.

3.02 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.03 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.04 PLACING CONCRETE FORMS

- A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.
- B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.
- C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.
- D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

3.05 PLACING STEEL REINFORCEMENT

- A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:
 - 1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.
 - 2. Splice locations shall be made as indicated on the plans.
- B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.

- C. Place reinforcing to provide the following minimum concrete cover:
 - 1. Surfaces exposed to water: 4-inches.
 - 2. Surfaces poured against earth: 3-inches.
 - 3. Formed surfaces exposed to earth or weather: 2-inches.
 - 4. Slabs, walls, not exposed to weather or earth: 1-inch.
- D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

3.06 MIXING AND TRANSPORTING PORTLAND CEMENT CONCRETE

- A. Transit mix concrete in accordance with the requirements of ASTM Designation C 94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the Owner's Representative.
- B. Do not hand mix concrete for use in concrete structures.

3.07 PLACING PORTLAND CEMENT CONCRETE

- A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.
- B. Do not place concrete until the subgrade and the forms have been approved.
- C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.
- D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner's Representative. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.
- E. Concrete in certain locations may be pumped into place upon prior approval by the Owner's Representative. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

3.08 PLACING ACCESSORY MATERIALS

- A. Place water stops and other items required to be embedded in of portland cement concrete structures at locations shown or required in accordance with Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans.
- B. Curing Compounds:
 - 1. Regular Portland Cement Concrete: Apply "Non-Pigmented Curing Compound - chlorinated Rubber Base-Clear" in accordance with Section 90-1.03B(3), 1.03B(5) and 1.03B of the Caltrans Standard Specifications.

2. Color Conditioned Decorative Portland Cement Concrete: Apply LITHOCHROME colorwax in accordance with the manufactures instructions.

3.09 EXPANSION JOINTS

- A. Construct expansion joints incorporating premolded joint fillers at twenty (20) foot intervals in all concrete curbs, gutters, sidewalks, median/island paving, valley gutters, driveway approaches and at the ends of all returns. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.
- B. Orient slip dowels at right angles to the expansion joint and hold firmly in place during the construction process by means of appropriate chairs.

3.10 WEAKENED PLANE JOINTS

- A. Construct weakened plane joints in concrete curbs, gutters, sidewalks, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.
 1. Grooved Joints: Form weakened plane joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

3.11 FINISHING CONCRETE

- A. Finish curb and gutter in conformance with the applicable requirements of Section 73-1.03C and 73-1.05A of the Caltrans Standard Specifications as modified herein.
- B. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.
- C. Provide a medium broom finish to all horizontal surfaces unless otherwise shown.

3.12 FORM REMOVAL

- A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.
- B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.
- C. Leave forms for cast-in-place walls in place at least 72 hours after pouring.
- D. Leave edge forms in place at least 24 hours after pouring.

3.13 CONSTRUCTION

- A. Form, place and finish concrete walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of the Caltrans Standard Specifications as modified herein.
- B. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

3.14 CONNECTING TO EXISTING CONCRETE IMPROVMENTS

- A. New curb, gutter, or sidewalk is to connect to existing improvements to remain by

saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.

- B. A cold joint to the existing curb is not acceptable.

3.15 DECORATIVE SURFACING CONSTRUCTION

- A. Decorative surfacing concrete walks, concrete median islands or other installations shall be formed and placed as a concrete slab conforming to the details shown or noted on the Plans.

3.16 FIELD QUALITY CONTROL

- A. Finish subgrade for concrete improvements shall be subject to approval prior to placement of forms.
- B. No concrete shall be placed prior to approval of forms.
- C. Concrete improvements constructed shall not contain "bird baths" or pond water and shall be smooth and ridge free.
- D. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.
- E. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.03 and/or 73-3 of the Caltrans Standard Specifications.

3.17 RESTORATION OF EXISTING IMPROVEMENTS

- A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.
- B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

END OF SECTION

SECTION 32 11 00

BASE COURSES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Aggregate subbase.
- B. Aggregate base.
- C. Cement treated base.
- D. Lime stabilization.

1.02 RELATED DOCUMENTS

- A. ASTM:
 - 1. D 3740, Standard Practice for Minimum Requirement for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 2. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
 - 3. E 548, Standard Guide for General Criteria Used for Evaluating Laboratory Competence.
- B. Caltrans Standard Specifications:
 - 1. Section 24-2, Lime Stabilized Soil.
 - 2. Section 25, Aggregate Subbases.
 - 3. Section 26, Aggregate Bases.
 - 4. Section 27, Cement Treated Bases.

1.03 DEFINITIONS

- A. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material $\frac{3}{4}$ -cubic yards or more in volume that when tested, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.

1.04 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

1.05 QUALITY ASSURANCE

- A. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- B. Do not mix or place cement treated base when the temperature is below 36 degrees F or when the ground is frozen.
- C. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-2.01D(1)(a) of Caltrans Standard Specifications.
- D. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-2.03F of Caltrans Standard Specifications.
- E. Finish surface of cement treated base shall be as specified in Section 27 of Caltrans Standard Specifications.
- F. Do not project the finish surface of aggregate subbase above the design subgrade.
- G. Finish grade tolerance at completion of base installation: +0.05'

1.06 PROJECT CONDITIONS

- A. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- B. Temporarily stockpile material in an orderly and safe manner and in a location approved by the Owner.
- C. Provide dust and noise control in conformance with Division 1 General Requirements.

PART 2 - PRODUCTS

2.01 AGGREGATE SUBBASE

- A. Material: Caltrans Standard Specification Section 25.
 - 1. Class 1, 2, or 3: Section 25-1.02B.
 - 2. Class 4: Section 25-1.02C.
 - 3. Class 5: Section 25-1.02D.

2.02 AGGREGATE BASE

- A. Material: Caltrans Standard Specification Section 26.
 - 1. Class 2, 1-1/2-inch Maximum: Section 26-1.02B.
 - 2. Class 2, 3/4-inch Maximum: Section 26-1.02B.
 - 3. Class 3: Section 26-1.02C.

2.03 CEMENT TREATED BASE

- A. Materials: Caltrans Standard Specification Section 27-1.02.

2.04 LIME STABILIZATION

- A. Lime Treatment Material: Conform to Section 24-2.03B and 24-2.03C of Caltrans Standard Specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

3.02 WET WEATHER CONDITIONS

- A. Do not place or compact subgrade if above optimum moisture content.

3.03 AGGREGATE SUBBASE

- A. Spreading and Compacting: Sections 25-1.03D and 25-1.03E of Caltrans Standard Specifications.

3.04 AGGREGATE BASE

- A. Spreading and Compacting: Section 26-1.03D and 26-1.03E of Caltrans Standard Specifications.

3.05 CEMENT TREATED BASE

- A. Cement treated base shall be as follows: Proportioning and Mixing Plant-Mixed: Section 27-1.03D of Caltrans Standard Specifications.

3.06 LIME STABILIZATION

- A. Performing the stabilization shall conform to Section 24-2.03C through 24-2.03F of Caltrans Standard Specifications and the following:
 1. Add lime in the amount specified by a Geotechnical Consultant.
 2. Lime treat subgrade soils from back of curb to back of curb to a depth specified by a Geotechnical Consultant.
 3. Mix in two mixing periods, both with the tines lowered to the same depth. Both mixing periods shall be monitored and verified by a Geotechnical Consultant. The second mixing shall occur at about 36 hours after the initial mixing.
 4. Compact and grade the lime mixed subgrade immediately after the second mixing.
 5. Compact the lime treated subgrade to 95 percent as determined by ASTM D1557.
 6. After application of the curing seal, do not allow traffic on the lime treated material for a period of 7 days in lieu of the 3 days specified in Section 24-2.03A of Caltrans Standard Specifications.
 7. Proof-roll the stabilized subgrade after compacting to confirm that a non-yielding surface has been achieved. Yielding areas, if any, shall be mitigated. Mitigation could consist of over-excavation, utilization of stabilization fabric, or chemical treatment. Each case shall be addressed individually in the field by a Geotechnical Consultant.

3.07 DISPOSAL

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION

SECTION 32 12 00

FLEXIBLE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prime coat.
- B. Tack coat.
- C. Asphaltic concrete paving.
- D. Asphaltic concrete overlay and slurry seals.
- E. Speed bumps.
- F. Asphalt curbs.
- G. Pavement grinding.

1.02 RELATED DOCUMENTS

- A. ASTM:
 - 1. D 979: Standard Practice for Sampling Bituminous Paving Mixtures.
 - 2. D 1073: Standard Specification for Fine Aggregate for Asphalt Paving Mixtures.
 - 3. D 1188: Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
 - 4. D 2041: Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
 - 5. D 2726: Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures.
 - 6. D 2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 - 7. D 3549: Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
 - 8. D 3666: Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Mixtures.
- B. Caltrans Standard Specifications.
 - 1. Section 37: Bituminous Seals.
 - 2. Section 39: Asphalt Concrete.
 - 3. Section 96: Geosynthetics.
 - 4. Section 92: Asphalt Binders.
 - 5. Section 94: Asphaltic Emulsions.
- C. California Building Code:
 - 1. Chapter 11B – Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.
 - 2. Section 1127B – Exterior Routes of Travel.

1.03 DEFINITIONS

- A. ASTM: American Society for Testing Materials.

1.04 QUALITY ASSURANCE

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness of Asphaltic Concrete: In-place compacted thickness of asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 - 1. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement may be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - (a) One core sample may be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
 - (b) Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

1.05 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Job-Mix Designs: Certificates signed by manufacturers certifying that each asphaltic concrete mix complies with requirements.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Prime Coat: Minimum surface temperature of 60 deg F at application.
 - 2. Tack Coat: Minimum surface temperature of 60 deg F at application.

3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at application.
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at application.
5. Reinforcing Fabric: Air temperature is 50 deg F and rising and pavement temperature is 40 deg F and rising.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

- A. Caltrans Standard Specifications Section 39, Type B.
- B. Asphalt Materials:
 1. Asphalt: Caltrans Standard Specification Section 92, steam refined paving asphalt.
 - (a) Asphalt Curbs: use grade PG 70-10
 - (b) All other asphalt products: use grade PG 64-10.
 2. Prime Coat: Caltrans Standard Specification Section 93, SC-70.
 3. Tack Coat: Caltrans Standard Specification Section 94, SS1.
 4. Asphaltic Emulsion: Caltrans Standard Specification Section 94, quick-setting type, Grade QS1h anionic or CQS1h cationic.
- C. Aggregates: Conform to Caltrans Standard Specification Sections 37-3.02B(2) and 39-2.02 as applicable.
- D. Storing, Proportioning and Mixing Materials: Caltrans Standard Specification Section 39-3.
- E. Pavement Reinforcing Fabric: Caltrans Standard Specification Section 96.
- F. Sand: ASTM D 1073, Grade No. 2 or 3.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Owner in writing of any unsatisfactory conditions. Do not begin paving until these conditions have been satisfactorily corrected.

3.02 PAVEMENT GRINDING

- A. Clean existing paving surface of loose or deleterious material immediately before pavement grinding.
- B. Grind conforms as indicated.

3.03 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.04 SURFACE PREPARATION FOR AGGREGATE BASE MATERIALS

- A. General: Immediately before placing asphalt materials remove loose and deleterious material from substrate surfaces and ensure that prepared subgrade is ready to receive paving according to the Caltrans Standard Specifications.
- B. Prime Coat: Apply uniformly over surface of compacted-aggregate base according to the Caltrans Standard Specifications. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.
 - 1. If prime coat is not entirely absorbed within 8 hours after application, spread excess prime coat with hand tools and broadcast sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to all vertical surfaces against which asphaltic concrete is to be placed, including existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new asphalt pavement, according to the Caltrans Standard Specifications.
 - 1. Allow tack coat to cure undisturbed before paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.05 SURFACE PREPARATION FOR PAVEMENT AT ASPHALTIC CONCRETE OVERLAYS AND SLURRY SEALS

- A. Pavement Irregularities: Level with asphaltic concrete, Type B, No. 4 maximum.
- B. Pavement Cracks:
 - 1. Less than 1/8-inch wide: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion.
 - 2. Wider than 1/8-inch: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion and skin patch.
- C. Clean surface of all material, such as leaves, dirt, sand, gravel, water and vegetation including roots prior to applying binder of paving asphalt to existing surface.
- D. Oil spots shall be removed with brush and detergents and covered with Oil Spot Sealer by OverKote or an equal product.
- E. Prior to first application in exceptionally hot weather, dampen surface with water. Remove excess water and leave surface slightly damp.

3.06 APPLYING ASPHALT PAVEMENT OVERLAYS AND SLURRY SEALS

- A. Use OverKote Asphalt Pavement Coating or equal product.
- B. Apply at a rate of 25 gallons per 1,000 sf of surface area.
- C. Follow all manufacturers' recommendations for preparation and applications procedure of the products used.
- D. Apply second coat as soon as first coat is dry.

3.07 PAVEMENT REINFORCING FABRIC

- A. Protect from exposure to ultraviolet rays until placed.
- B. Reject rolls with broken or damaged cores, or factory wrinkled fabric that prevents wrinkle free placement.
- C. Place with binder of paving asphalt in accordance with Caltrans Standard Specifications.

3.08 ASPHALTIC CONCRETE SPREADING AND COMPACTING EQUIPMENT

- A. Spreading Equipment: Caltrans Standard Specification Section 39-5.01.
- B. Compaction Equipment: Caltrans Standard Specification Section 39-5.02.

3.09 ASPHALTIC CONCRETE PLACEMENT

- A. Place, spread and compact asphaltic concrete to required grade, cross section, and thickness according to the Caltrans Standard Specifications.
- B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.10 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections according to the Caltrans Standard Specifications.
 - 1. Construct joints free of depressions with same texture and smoothness as other sections of asphalt course.
 - 2. Clean contact surfaces and apply tack coat.
 - 3. Offset longitudinal joints in successive courses a minimum of 6 inches.
 - 4. Offset transverse joints in successive courses a minimum of 24 inches.
 - 5. Compact joints as soon as asphaltic concrete will bear roller weight without excessive displacement.

3.11 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact according to the Caltrans Standard Specifications.
- B. Compaction Requirements: Average Density to be 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.
- D. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- E. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh asphalt. Compact by rolling to specified density and surface smoothness.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.12 ASPHALT CURBS

- A. Construction: Place over compacted surfaces according to Caltrans Standard Specification Section 39-7.01 as specified for dikes. Apply a light tack coat prior to construction, unless pavement surface is still tacky and free of dust.
- B. Shape: Place asphaltic concrete to curb cross section indicated.

3.13 SPEED BUMPS

- A. Construct speed bumps over compacted pavement surfaces according to Caltrans Standard Specifications. Apply a light tack coat prior to construction, unless pavement surface is still tacky and free of dust.
- B. Place asphaltic concrete by hand using a template/screed designed to result in speed bump cross-section indicated after compaction.
- C. Compact speed bumps with 8-ton static roller.

3.14 INSTALLATION TOLERANCES

- A. Asphalt Pavement:
 - 1. Course thickness and surface smoothness within the tolerances in the Caltrans Standard Specifications.
 - 2. Total Thickness: Not less than indicated.

B. Trench Patch:

1. Compacted surface: Within 0.01 foot of adjacent pavement.
2. Do not create ponding.

END OF SECTION

SECTION 32 13 00

RIGID PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, placing, spreading, compacting and shaping portland cement concrete pavement with undoweled transverse weakened plane joints, for vehicular traffic.
- B. Form construction and use in placing portland cement concrete pavement.
- C. Joints for portland cement concrete pavement.
- D. Finishing portland cement concrete pavement.
- E. Curing and protecting portland cement concrete pavement.

1.02 RELATED DOCUMENTS

- A. AASHTO Standard Specifications
 - 1. T 53: Standard Method of Test for Softening Point of Bitumen (Ring-and-Ball Apparatus).
- B. ASTM Standards
 - 1. A 615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 2. A 775: Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - 3. A 934: Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
 - 4. C 881: Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - 5. D 2628: Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
 - 6. D 2835: Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements.
 - 7. D 6690: Standard Specification for Joint and Crack Sealants, Hot-Applied , for Concrete and Asphalt Pavements.
 - 8. D 3963: Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

C. Caltrans Standard Specifications:

1. Section 40, Concrete Pavement.
2. Section 52, Reinforcement.
3. Section 90, Concrete.
4. Section 95, Epoxy.

D. Caltrans Standard Plans:

1. Plan A35A: Portland Cement Concrete Pavement (Undoweled Transverse Joints).
2. Plan A35C: Portland Cement Concrete Pavement Joint and End Anchor Details.

1.03 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. ASTM: American Society for Testing and Materials.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 1. Manufacturer must be certified according to the National Ready Mix Concrete Plant Certification Program.
- B. Installer Qualification: An 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.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

1.05 SUBMITTALS

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results or other circumstances warrant adjustments.
- C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.
 1. Cementitious materials and aggregates.

2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compound.
5. Applied finish material.
6. Bonding agent of adhesive.
7. Joint filler.
8. Joint Sealant.
9. Tie Bars.
10. Epoxy.
11. Backer Rods.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

- A. General: Conform to Caltrans Standard Specifications, Section 90. Use Class 2 Concrete.

2.02 TIE BARS

- A. Deformed reinforcing steel bars conforming to the requirements of ASTM Designation A 615/A (615M), Grade 40 or 60 (Grade 300 or 420).
- B. Epoxy-coat in conformance with the provisions in Section 52-2.02 of Caltrans Standard Specifications, except that references made to ASTM Designation D 3963/D 3963M shall be deemed to mean ASTM Designation A 934/A 934M or A 775/775M.
- C. Do not bend tie bars.

2.03 EPOXY

- A. Bond tie bars to existing concrete with epoxy resin conforming to Section 95-1.02D, "Epoxy Resin Adhesive for Bonding Freshly Mixed Concrete to Hardened Concrete," of the Caltrans Standard Specifications.

2.04 SILICONE JOINT SEALANT

- A. Furnish low modulus silicone joint sealant in a one-part silicone formulation. Do not use acid cure sealants. Compound to be compatible with the surface to which it is applied and conform to the following requirements:

Specification	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM D 412 (Die C)	310 kPa max.
Flow at 25° ± 1°C	ASTM C 639 ^a	Shall not flow from channel
Extrusion Rate at 25° ± 1°C	ASTM C 603 ^b	75-250 g/min.
Specific Gravity	ASTM D 792 Method A	1.01 to 1.51
Durometer Hardness, at -18°C, Shore A, cured 7 days at 25° ± 1°C	ASTM C 661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C 793	No chalking, cracking or bond loss
Tack free at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM C 679	Less than 75 minutes
Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM D 412 (Die C)	500 percent min.
Set to Touch, at 25° ± 1°C and 45% to 55% R.H. ^e	ASTM D 1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquets, air cured 7 days at 25° ± 1°C	AASHTO T 132 ^c	345 kPa min.
Movement Capability and Adhesion, 100% extension at -18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C	ASTM C 719 ^d	No adhesive or cohesive failure after 5 cycles

Notes:

ASTM Designation: C 639 Modified (15 percent slope channel A).

ASTM Designation: C 603, through 3-mm opening at 345 kPa.

Mold briquets in conformance with the requirements in AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with the requirements in AASHTO Designation: T 132. Briquets shall be dried to constant mass at 100 ± 5° C.

Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with the requirements in ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5 mm.

a. R.H. equals relative humidity.

B. Formulate the silicon joint sealant to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

- C. Furnish to the Owner a Certificate of Compliance. Accompany certificate with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. Provide the certificate and accompanying test report for each lot of silicone joint sealant prior to use on the project.

2.05 ASPHALT RUBBER JOINT SEALANT

- A. Conform to the requirements of ASTM Designation: D 6690 as modified herein or to the following:
 - 1. Provide a mixture of paving asphalt and ground rubber. Ground rubber to be vulcanized or a combination of vulcanized and de-vulcanized materials ground so that 100 percent will pass a 2.36-mm sieve and contain not less than 22 percent ground rubber, by mass. Modifiers may be used to facilitate blending.
 - 2. The Ring and Ball softening point shall be 57°C minimum, when tested in conformance with the requirements in AASHTO Designation: T 53.
 - 3. Provide asphalt rubber sealant material capable of being melted and applied to cracks and joints at temperatures below 204°C.
- B. The penetration requirement of Section 4.2 of ASTM Designation: D 6690 do not apply. The required penetration at 25°C, 150g, 5s, shall not exceed 120.
- C. The resilience requirement of Section 4.5 of ASTM Designation: D 6690 do not apply. The required resilience, when tested at 25°C, shall have a minimum of 50 percent recovery.
- D. Accompany each lot of asphalt rubber joint sealant shipped to the job site, whether as specified herein or conforming to the requirements of ASTM Designation D 6690, as modified herein, by a Certificate of Compliance, storage and heating instructions and precautionary instructions for use.
- E. Heat and place in conformance with the manufacturer's written instructions and the details shown on the plans. Provide manufacturer's instructions to the Owner. Do not place when the pavement surface temperature is below 10°C.

2.06 PREFORMED COMPRESSION JOINT SEALANT

- A. Material: ASTM Designation: D 2628.
 - 1. Number of cells: 5 or 6.
 - 2. Lubricant Adhesive: ASTM Designation D 2835.
 - 3. Install compression seals along with lubricant adhesive according to the manufacturer's recommendations. Submit manufacture's recommendations to the Owner's Representative`.

- B. Accompany each lot of compression seal and lubricant adhesive by a Certificate of Compliance, storage instructions and precautionary instructions for use. Also submit the manufacturer's data sheet with installation instructions and recommended model or type of preformed compression seal for the joint size and depth as shown on the plans. Show evidence that the selected seal is being compressed at level between 20 and 50 percent at all times for the joint width and depth shown on the plans.

2.07 BACKER RODS

- A. Provide backer rods that have a diameter prior to placement at least 25 percent greater than the width of the saw cut after sawing and are expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond, adverse reaction occurs between the rod and sealant. In no case use a hot pour sealant that will melt the backer rod. Submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

PART 3 - EXECUTION

3.01 WATER SUPPLY

- A. Conform to Section 40-1.02 of Caltrans Standard Specifications.

3.02 SUBGRADE

- A. Conform to Section 40-1.04 of Caltrans Standard Specifications.

3.03 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.04 PLACING

- A. Conform to Section 40-1.03F of Caltrans Standard Specifications.

3.05 SPREADING COMPACTING AND SHAPING

- A. Conform to Section 40-1.07 of Caltrans Standard Specifications.
 - 1. Stationary Side Form Construction: Section 40-1.03F(4) of Caltrans Standard Specifications.
 - 2. Slip Form Construction: Section 40-1.03F(5) of Caltrans Standard Specifications.

3.06 INSTALLING TIE BARS

- A. Install at longitudinal contact joints, longitudinal weakened plane joints, and transverse contact joints as shown on the plans. In no case, shall any consecutive

width of new portland cement concrete pavement tied together with tie bars exceed 15 meters. In no case shall tie bars be used at a joint where portland cement concrete and asphalt concrete pavements abut.

B. Tie bars shall be installed at longitudinal joints by one of the 3 following methods:

1. Drilling and bonding in conformance with the details shown on the plans. Provide a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V. Grade 3 (Non-Sagging), Class shall be as follows:

<u>Temperature of Concrete</u>	<u>Required Class of Epoxy Resin</u>
Lower than 40° F (4.5 °C)	A
40° F (4.5° C) through 60° F (15.5° C)	B
Above 60° F (15.5° C)	C

2. Provide, at least 7 days prior to start of work, a Certificate of compliance and a copy of the manufacturer's recommended installation procedure. The drilled holes shall be cleaned in accordance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during the curing and shall remain undisturbed until the epoxy has cured a minimum time as specified by the manufacturer. Tie bars that are improperly bonded, as determined by the Owner, will be rejected. If rejected, adjacent new holes shall be drilled, as directed by the Owner, and new tie bars shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
3. Insert the tie bars into the plastic slip-formed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished to such an extent that there is no evidence on the surface of the completed pavement that there has been any insertion performed. Any loose tie bars shall be replaced by drilling and grouting into place with epoxy as described in method 1 above at the Contractor's expense.
4. By using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance and installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.

3.07 JOINTS

- A. Conform to Section 40-1.03B of Caltrans Standard Specifications, except that tie bars shall be as specified under Part 2, Products.

1. Transverse Contact Joints: Section 40-1.08A of Caltrans Standard Specifications.
 - (a) Construct a transverse contact (construction) joint at the end of each day's work, or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.
 - (b) If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of any excess concrete shall be at the Contractor's expense. Any excess material shall become the property of the Contractor and shall be properly disposed of.
 - (c) A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of tie bars.
2. Weakened Plane Joints: Section 40-1.08B, except that the insert method of forming joints in pavement shall not be used.

3.08 FINISHING

- A. Conform to Sections 40-1.03H(2) and 40-1.103H(3) of Caltrans Standard Specifications.

3.09 CURING

- A. Conform to Section 40-1.03I of Caltrans Standard Specifications.

3.10 SEALING JOINTS

- A. Liquid Joint Sealant Installation.
 1. The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after sealant has been placed, completely remove the joint material and disposed of, and replace at the Contractor's expense. Recess sealant below the final finished surface as shown on the plans.
 2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the plans.
 3. Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, clean the joint walls by the dry sand blast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Remove

surface moisture at the joints by means of compressed air or moderate hot compressed air or other means approved means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 mm and a minimum pressure of 0.62-MPa.

4. Install backer rod as shown on the plans. Provide an expanded, closed-cell polyethylene foam backer rod that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Install backer rod when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Install backer rod when the joints to be sealed have been properly patched, cleaned and dried. Do not use a method of placing backer rod that leave a residue or film on the joint walls.
5. Immediately after placement of the backer rod, place the joint sealant in the clean, dry, prepared joints as shown on the plans. Apply the joint sealant by a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Apply adequate pressure to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant recess the surface of the sealant as shown on the plans.
6. Any failure of the joint material in either adhesion or cohesion of the material will be cause for rejection of the joint. Conform the finished surface of joint sealant to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.
7. After each joint is sealed, remove all surplus joint sealer on the pavement surface. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

B. Preformed Compression Joint Seal Installation

1. The compression seal alternative joint detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after the compression seal has been placed, completely remove the joint materials and disposed of, and replace at the Contractor's expense. Compression seal shall be recessed below the final finished surface as shown on the plans.
2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the plans.

3. Seven days after the concrete pavement placement and not more than 4 hours before placing preformed compression joint seals, clean the joint walls by the dry sand blast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Remove surface moisture at the joints by means of compressed air or moderate hot compressed air or other means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 mm and a minimum pressure of 0.62-MPa.

3.11 PROTECTING CONCRETE PAVEMENT

- A. Conform to Section 40-1.12 of Caltrans Standard Specifications.

END OF SECTION

SECTION 32 16 13
CONCRETE CURBS AND GUTTERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete curbs and gutters.

1.02 RELATED DOCUMENTS

- A. American Concrete Institute (ACI):

- 1. ACI 301 - Specifications for Structural Concrete for Buildings.
- 2. ACI 308 - Standard Practice for Curing Concrete.

- B. American society for Testing and Materials (ASTM):

- 1. ASTM A 185 - Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
- 2. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- 3. ASTM D 1751 - Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

- C. Caltrans Standard Specifications:

- 1. Section 73: Concrete Curbs and Sidewalks.
- 2. Section 90: Portland Cement Concrete.

1.03 DEFINITIONS

- A. ASTM: American Society for Testing Materials

1.04 SUBMITTALS

- A. Submittal procedures shall be as outlined in Section 01 33 00 – Submittal Procedures.
- B. Concrete Mix Design: Have all concrete mixes designed by a testing laboratory and approved by the Owner. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

1.05 QUALITY ASSURANCE

- A. Concrete shall be subject to quality assurance in accordance with Section 90 of the Standard Specifications.
- B. Certifications:
 - 1. Provide Owner at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:
 - (a) Materials contained comply with the requirements of the Contract Documents in all respects.
 - (b) Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
 - (c) Statement of type and amount of any admixtures.
 - 2. Provide Owner, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.
- C. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.
 - 1. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.
 - 2. Construct "V" ditches in accordance with Section 72-4 of the Standard Specifications; except that finishing shall be in accordance with Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.

1.06 DESIGNATION

- A. General: Whenever the 28-day compressive strength is designated herein or on the Plans is 3,500 psi or greater, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are less than 3,500 psi are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the Plans, the concrete shall contain the cement per cubic yard shown in Section 90-1.01 of the Caltrans Standard Specifications.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Comply with requirements of Section 32 05 23 – Concrete for Exterior Improvements.

2.02 PORTLAND CEMENT CONCRETE

- A. Unless specified otherwise herein or on the Plans, Portland Cement Concrete for items in this section shall be Minor Concrete as specified in Section 90-1.01 of the Caltrans Standard Specifications.

2.03 CURBS AND GUTTERS FORMS

- A. Use flexible spring-steel forms or laminated boards to form radius bends. Tolerance: Not to deviate more than 1/4 inch in 10 feet in grade and alignment.

2.04 EXPANSION JOINT MATERIAL

- A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.
- B. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:
 - 1. Curbs, Curb Ramps, Island Paving, Driveways and Gutter Depressions: ¼-inch.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with requirements of Section 32 05 23 – Concrete for Exterior Improvements.
- B. Form, place and finish concrete walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of Section 73-2.03B and 73-3 of the Caltrans Standard Specifications as modified herein.
- C. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

3.02 SUBGRADE

- A. Conform to Section 40-1.04 of Caltrans Standard Specifications.

3.03 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.04 PLACING CONCRETE FORMS

- A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.
- B. Thoroughly clean all forms prior to placement and coat forms with approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.
- C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.
- D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

3.05 PLACING STEEL REINFORCEMENT

- A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond.
- B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.
- C. Place reinforcing to provide the following minimum concrete cover:
 - 1. Surfaces exposed to water: 4-inches.
 - 2. Surfaces poured against earth: 3-inches.
 - 3. Formed surfaces exposed to earth or weather: 2-inches.
 - 4. Slabs, walls, not exposed to weather or earth: 1-inch.

- D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

3.06 PLACING PORTLAND CEMENT CONCRETE

- A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.
- B. Do not place concrete until the subgrade and the forms have been approved.
- C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.
- D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.
- E. Concrete in certain locations may be pumped into place upon prior approval by the Owner. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

3.07 EXPANSION JOINTS

- A. Construct expansion joints incorporating pre-molded joint fillers at twenty (20) foot intervals in all concrete curbs, gutters, median/island paving, valley gutters, driveway approaches and at the ends of all returns. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.

3.08 WEAKENED PLANE JOINTS

- A. Construct weakened plane joints in concrete curbs, gutters, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.
- B. Grooved Joints: Form weakened plane joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

3.09 FINISHING CONCRETE

- A. Finish curb and gutter in conformance with the applicable requirements of Section 73-2.03B and 73-1.03C of the Caltrans Standard Specifications as modified herein.

- B. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.
- C. Provide a medium broom finish to all horizontal surfaces unless otherwise shown.

3.10 FORM REMOVAL

- A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.
- B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.
- C. Leave edge forms in place at least 24 hours after pouring.

3.11 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS

- A. New curb or gutter is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.
- B. A cold joint to the existing curb is not acceptable.

3.12 FIELD QUALITY CONTROL

- A. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.
- B. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

3.13 RESTORATION OF EXISTING IMPROVEMENTS

- A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.
- B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. General: The Contract General Conditions and Division 1, General Requirements, including, but not limited to, Summary of Work, Submittals and Cleaning, shall form a part of these Specifications with the same force and effect as though repeated herein. Work shall be done according to the Contract Documents and to the satisfaction of the Owner. That which is called for in one of the Contract Documents is binding as though called for in all.
- B. Scope: The Work included under this Section consists of furnishing and/or paying for all fees and permits, all labor, tools, equipment, transportation and services required to complete all on and off site parking and traffic controls as required by the contract drawings and specifications, including, but not necessarily limited to the following:
 - 1. Directional pavement markings.
 - 2. Painted stall striping, including handicapped stencils.
 - 3. Painted crosshatch on walkways.
 - 2. Handicap signs as per code, installed.
 - 5. Street name signs.
 - 6. No parking signs.
 - 7. Miscellaneous signs as required.
 - 8. Wheel Stops

1.02 REFERENCES

- A. ANSI A117.1: Standards of Accessible and Usable Buildings and Facilities.
- B. Caltrans Standard Specifications
 - 1. Section 84 - Markings
 - 2. Traffic Manual
 - 3. Section No. PTWB-01 Paint Waterborne Traffic Line.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. At locations shown on the plans, traffic stripes and pavement markings shall be painted with paint meeting the applicable State Standard Specifications for traffic line paint, and as required by the City.
- B. Paint: Latex, water-borne and chromate free, ready mixed. Caltrans No. PTWB-01
 - 1. VOC Content: No more than is allowed by local and federal regulations.
 - 2. Color White: Parking stall striping and accessible parking symbols.
 - 3. Color Blue (Federal Standard No. 15090): Striping for accessible parking stall loading area at perimeter border and diagonal hatching. Accessible parking symbol background.
- C. Wheel Stops: Prefabricated Recycled Plastic or Rubber: 4-in. high by 6-in. wide by 6-ft long. Adhered to asphalt paving with Overkote Bumper adhesive or equal product. Overdrive five (5) ½-in. diameter by 14-in. long galvanized spikes into asphalt. Head to set below finish by 1/4-in.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Preparation of Surface: All dirt, oil, grease and other foreign matter shall be removed from the areas of the pavement to be painted with traffic paint.
 - 1. Traffic paint shall not be applied to pavements which are excessively dirty, damp or cold. Traffic paint shall not be applied when temperature is less than 60° F, or when the pavement is wet or damp.
- B. Paint Application: Traffic paint shall be applied with approved atomizing spray type striping machine. Where required, the paint striping machine shall be equipped with separate thermostatically controlled heating devices for paint and bead pots.
 - 1. The machine shall be capable of applying paint whereby the lines and markings have clear-cut edges, true and smooth alignments and uniform thickness.
 - 2. All completed lines and markings shall be clean and sharp as to dimensions. Ragged ends of segments, fogginess along the sides or objectionable dribbling of paint along the unpainted portions of the stripes will be not be permitted.
 - 3. The Subcontractor shall exercise all reasonable precautions to protect the paint, as applied, during drying time and shall remove all objectionable tracking.

4. The finished paint shall have an opaque, well painted appearance with no black or other discoloration showing through.
- C. Rate of Application: Traffic paint shall be applied at the following rates:
Parking Stripe Rate of Application /Square Feet Per Gallon
First Coat 150 square feet per gallon
- D. Traffic Paint Removal
1. Traffic stripes and other pavement markings shall be removed by sand blasting only. Under no circumstances are traffic lines to be obliterated with black traffic paint.
 2. When temporary traffic lines are to be painted for construction detours or for some other reason, the old lines, which do not apply, shall be entirely obliterated by sand blasting.

END OF SECTION



DEMOLITION LEGEND

- TREE TO BE REMOVED. SEE LANDSCAPE PLANS.
- DEMOLITION AREA - ALL SITE FEATURES (PAVEMENT, CONCRETE, BASE ROCK AND UTILITIES) WITHIN THIS AREA ARE TO BE REMOVED, UNLESS NOTED TO REMAIN.
- TREE PROTECTION TREES TO REMAIN

DEMOLITION KEYNOTES

- EXISTING BOX TO REMAIN. PROTECT IN PLACE.
- EXISTING GATE AND FENCE TO REMAIN. PROTECT IN PLACE.
- EXISTING STORM DRAIN LINE TO BE REMOVED.
- EXISTING STORM DRAIN BOX TO BE REMOVED.
- EXISTING STORM DRAIN LINE TO REMAIN. PROTECT IN PLACE.
- EXISTING DRINKING FOUNTAIN TO REMAIN. PROTECT IN PLACE.
- EXISTING STRIPING TO BE REMOVED. SEE GRADING PLAN FOR RESTRIPING.
- STORAGE CONTAINERS TO BE RELOCATED TO CONCRETE PAD AREA. SEE GRADING PLAN.
- SAWCUT EXISTING FLATWORK CONCRETE AT NEAREST JOINT.
- EXISTING STORM DRAIN BOX TO REMAIN. PROTECT IN PLACE.
- EXISTING HEADER BOARD TO BE REMOVED WHERE NEW AC MEETS EXISTING AC.
- EXISTING STORM DRAIN MANHOLE TO REMAIN. PROTECT IN PLACE.
- EXISTING SANITARY SEWER LINE TO REMAIN. PROTECT IN PLACE.
- EXISTING SANITARY SEWER CLEANOUT TO REMAIN. PROTECT IN PLACE. CAP SEWER LINE AFTER CLEANOUT.

DEMOLITION NOTES

1. ALL EXISTING SERVICES AND UTILITIES THAT ARE TO REMAIN OPERATIONAL SHALL BE RELOCATED AS NECESSARY.
2. ALL TREES THAT ARE TO REMAIN SHALL BE PROTECTED DURING CONSTRUCTION.
3. CONTRACTOR SHALL VERIFY (POTHOLE IF NECESSARY) SIZE, MATERIAL, LOCATION AND DEPTH OF ALL SYSTEMS THAT ARE TO BE CONNECTED TO OR CROSSED PRIOR TO THE TRENCHING OR INSTALLATION OF PROPOSED UTILITIES, AND INFORM ENGINEER OF ANY CONFLICTS BEFORE PROCEEDING WITH WORK.
4. CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES, INVERTS AND LOCATIONS PRIOR TO BEGINNING ANY WORK ON THIS SITE.

OWNER: SAN RAFAEL CITY SCHOOLS

PROJECT NAME: VENETIA VALLEY SCHOOL FIELD

CLIENT ADDRESS: 177 N SAN PEDRO RD, SAN RAFAEL, CA 94903

SEAL:



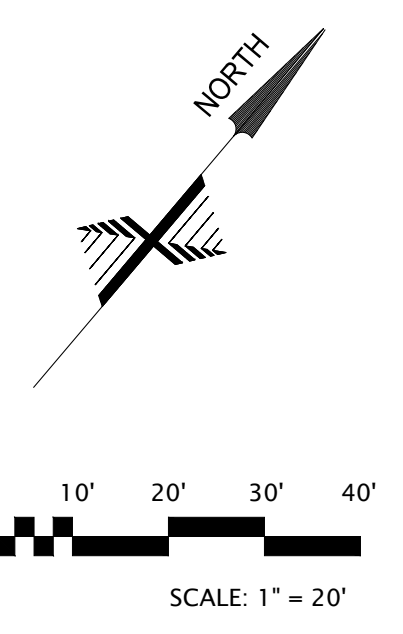
REVISIONS:

DESCRIPTION	DATE
ADDENDUM 1	12/23/2021
ADDENDUM 2	1/26/2022

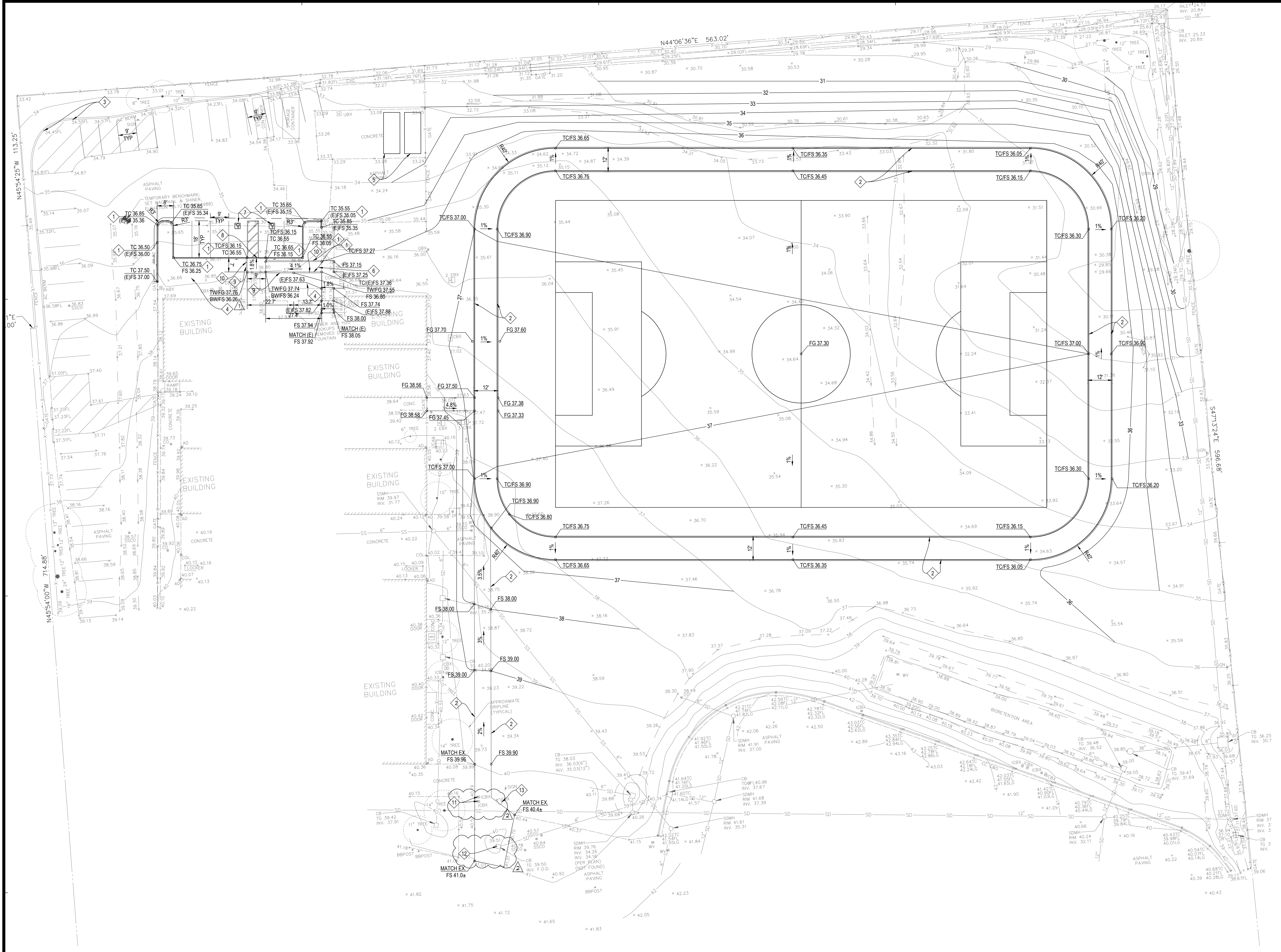
DATE ISSUED:
PROJECT NO: 2017-1018
SCALE: AS SHOWN
SHEET NUMBER:

C2.0

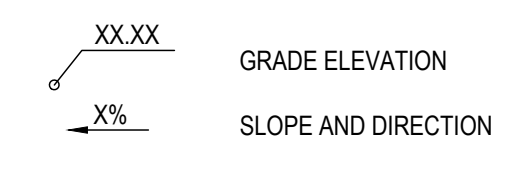
SHEET TITLE:
DEMOLITION PLAN



DISCLAIMER: TOPOGRAPHIC INFORMATION, INCLUDING PROPERTY LINES, EASEMENTS, EXISTING GRADES, EXISTING UTILITIES LOCATIONS, ETC., SHOWN ARE FOR GENERAL REFERENCE ONLY AND HAVE BEEN PROVIDED BY OTHERS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY HOHBACH-LEWIN, INC.



GRADING LEGEND



GRADING KEYNOTES

- 1 INSTALL NEW 6" CURB, SEE DETAIL 2/C6.0
- 2 INSTALL REDWOOD HEADER, SEE DETAIL 1/C6.0
- 3 CONTRACTOR TO FIX LOW SPOT IN ASPHALT AREA
- 4 CONTRACTOR TO REGRADE DIRT AREA TO WORK WITH NEW CURB
- 5 RELOCATED STORAGE CONTAINER
- 6 INSTALL SLOPING WALKWAY, SEE DETAIL 4/C6.0
- 7 NEW ADA PARKING STALLS, SEE DETAIL 9/C6.0
- 8 INSTALL NEW FLUSH CURB, SEE DETAIL 6/C6.0
- 9 INSTALL NEW RETAINING WALL, SEE DETAIL 8/C6.0
- 10 TRANSITION BETWEEN NEW RETAINING WALL AND NEW 6" CURB
- 11 REPLACE UTILITY BOX WITH CONCRETE CHRISTY BOX AND ADJUST RIM TO GRADE
- 12 ADJUST STORM DRAIN BOX RIM TO GRADE
- 13 ADJUST UTILITY BOX RIM TO GRADE AND RELOCATE TO OUTSIDE PAVEMENT AREA

OWNER: SAN RAFAEL CITY SCHOOLS

PROJECT NAME: VENETIA VALLEY SCHOOL FIELD

CLIENT ADDRESS: 177 N SAN PEDRO RD, SAN RAFAEL, CA 94903

SEAL:



REVISIONS:

REVISION	DESCRIPTION	DATE
▲	ADDENDUM 1	12/23/2021
▲	ADDENDUM 2	1/26/2022

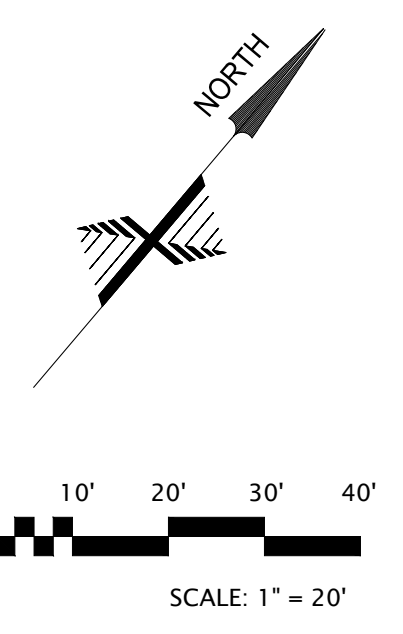
DATE ISSUED:

PROJECT NO: 2017-1018
SCALE: AS SHOWN
SHEET NUMBER:

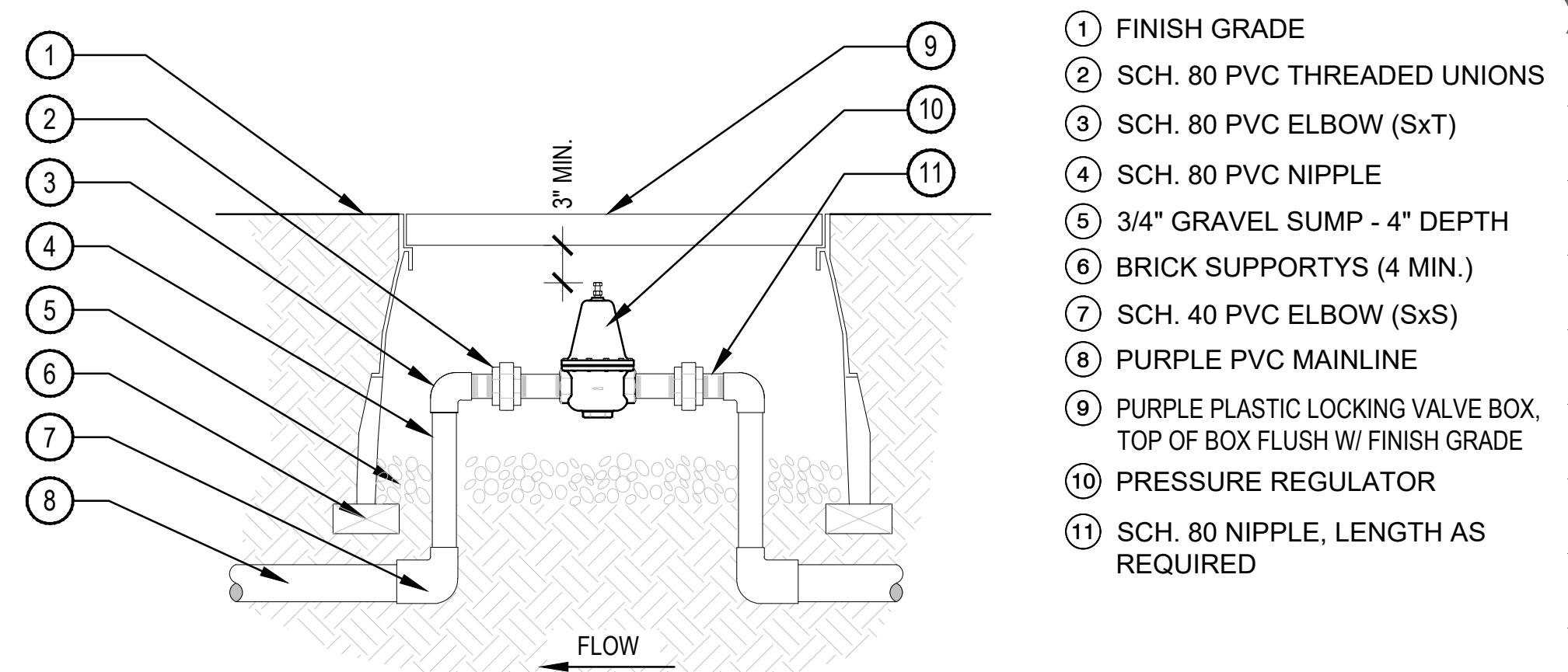
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SHEET TITLE:

GRADING AND DRAINAGE PLAN



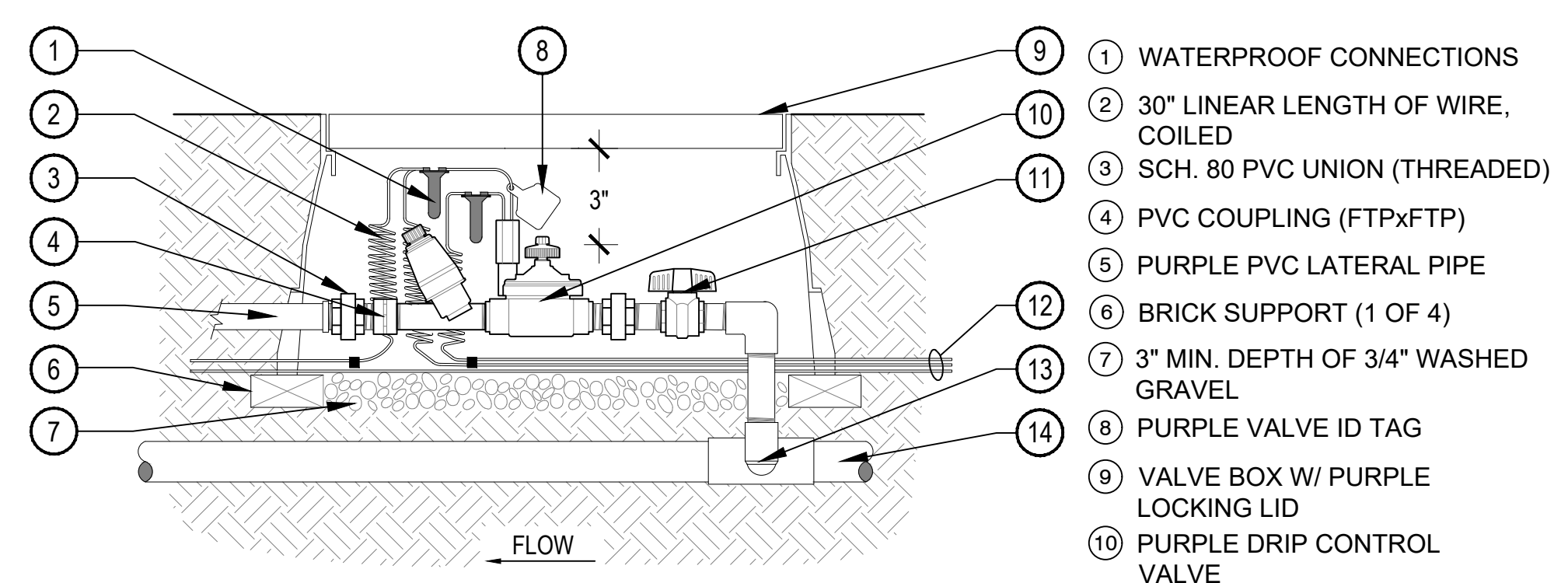
HOBACH-LEWIN, INC.
 STRUCTURAL & CIVIL ENGINEERS
 260 Sheridan Avenue, Suite 150
 Palo Alto, CA 94306
 (650) 617-5930, Fax (650) 617-5932



- 1 FINISH GRADE
- 2 SCH. 80 PVC THREADED UNIONS
- 3 SCH. 80 PVC ELBOW (SxT)
- 4 SCH. 80 PVC NIPPLE
- 5 3/4" GRAVEL SUMP - 4" DEPTH
- 6 BRICK SUPPORTYS (4 MIN.)
- 7 SCH. 40 PVC ELBOW (SxS)
- 8 PURPLE PVC MAINLINE
- 9 PURPLE PLASTIC LOCKING VALVE BOX, TOP OF BOX FLUSH W/ FINISH GRADE
- 10 PRESSURE REGULATOR
- 11 SCH. 80 NIPPLE, LENGTH AS REQUIRED

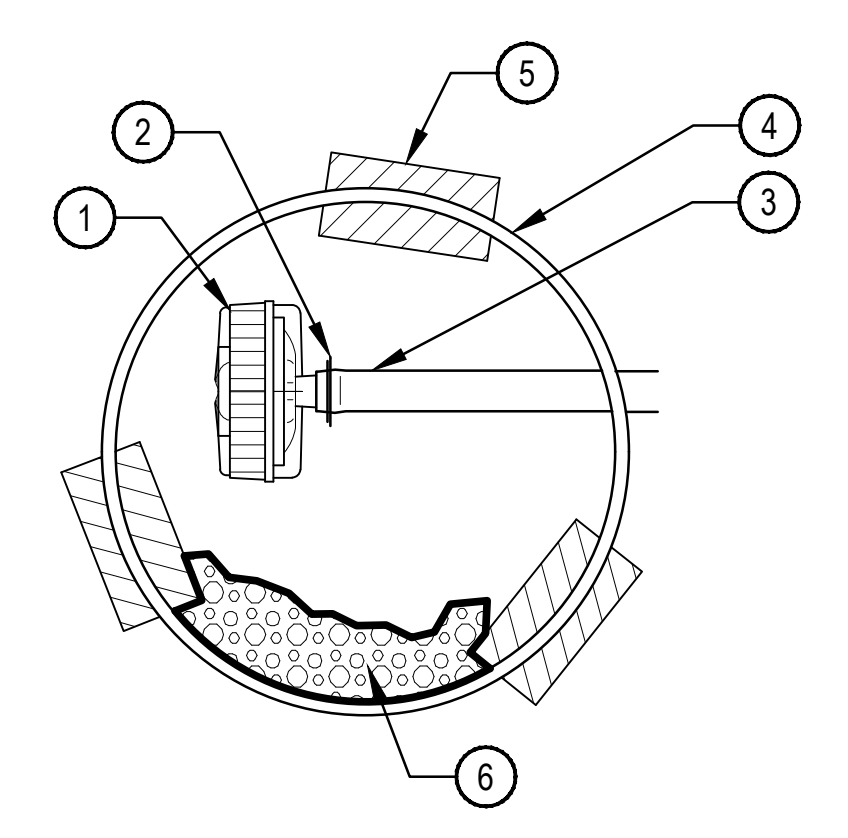
NOTE:
 1. COMPACT SOIL AROUND VALVE BOX TO THE SAME DENSITY AS ADJACENT UNDISTURBED SUBGRADE.
 2. ALL THREADED CONNECTIONS SHALL BE COATED WITH TEFLON TAPE.

5 PRESSURE REGULATOR
 NTS



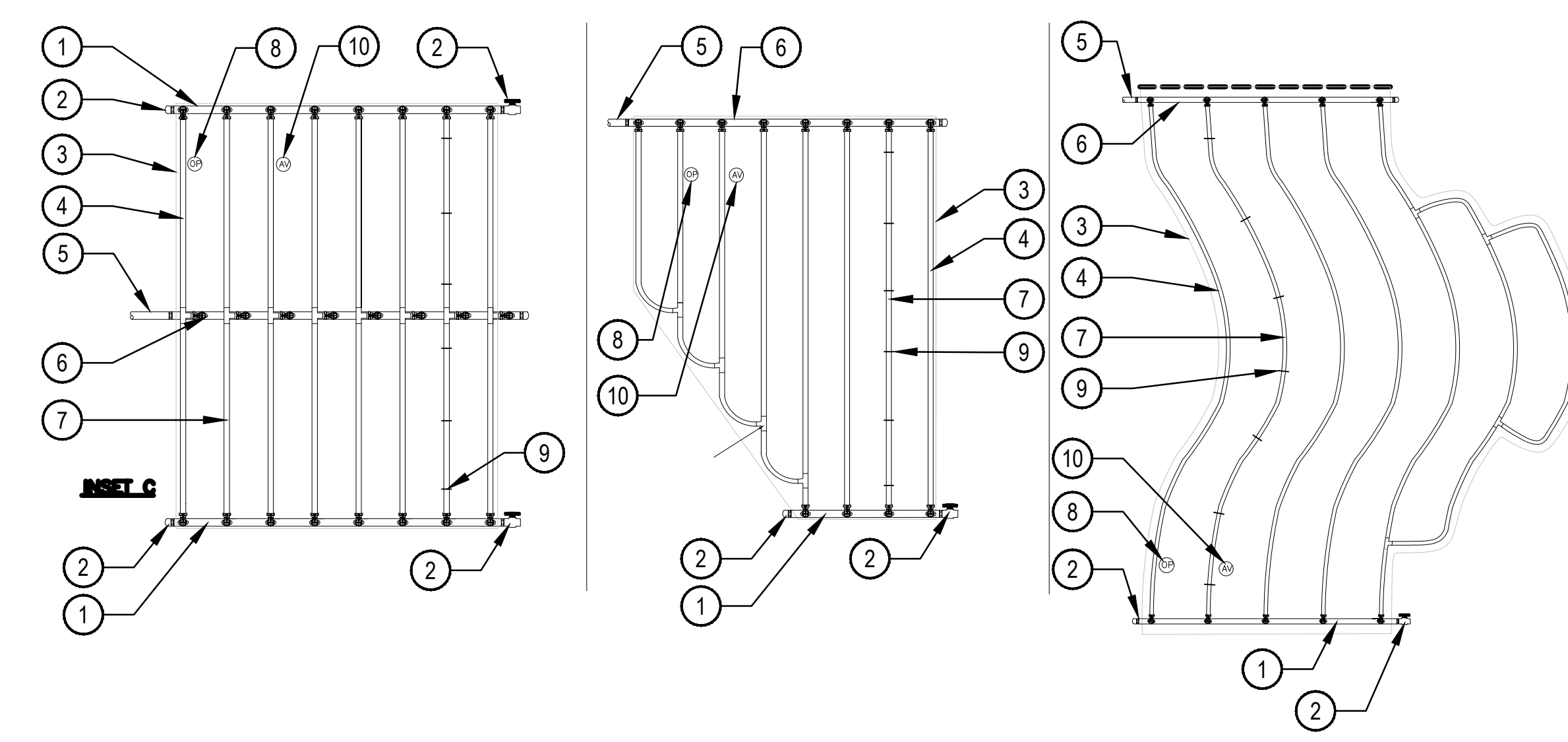
- 1 WATERPROOF CONNECTIONS
- 2 30" LINEAR LENGTH OF WIRE, COILED
- 3 SCH. 80 PVC UNION (THREADED)
- 4 PVC COUPLING (FTPxFTP)
- 5 PURPLE PVC LATERAL PIPE
- 6 BRICK SUPPORT (1 OF 4)
- 7 3" MIN. DEPTH OF 3/4" WASHED GRAVEL
- 8 PURPLE VALVE ID TAG
- 9 VALVE BOX W/ PURPLE LOCKING LID
- 10 PURPLE DRIP CONTROL VALVE
- 11 SCH. 80 PVC BALL VALVE
- 12 CONTROL AND COMMON WIRES FROM CONTROLLER
- 13 SCH. 80 PVC TEE (SxSxT)
- 14 PURPLE PVC MAINLINE PIPE

1 DRIP CONTROL ZONE KIT
 NTS



NOTE:
 1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

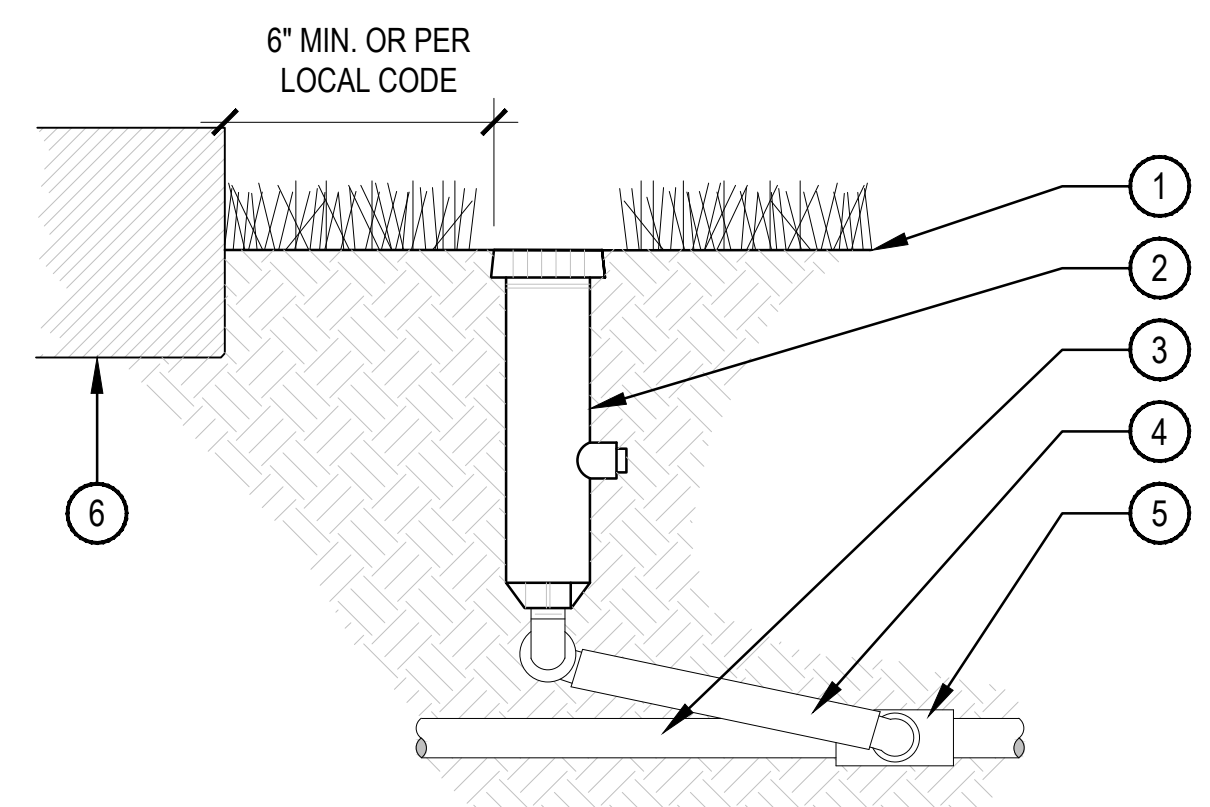
2 FLUSH VALVE
 NTS



- 1 PURPLE FLUSH HEADER
- 2 FLUSH POINT WITH PVC CAP OR OPTIONAL PVC BALL VALVE
- 3 PERIMETER OF AREA
- 4 PERIMETER DRIPLINE PIPE TO BE INSTALLED 2"-4" FROM PERIMETER OF AREA
- 5 PURPLE PVC SUPPLY LINE
- 6 PURPLE SUPPLY HEADER
- 7 PURPLE DRIPLINE (TYPICAL)
- 8 OPERATIONAL INDICATOR
- 9 DRIPLINE TIE-DOWN STAKES REFER TO MANUFACTURER'S DRIPLINE DESIGN GUIDE FOR PROPER SPACING
- 10 AIR RELIEF VALVE
- 11 DRIPLINE FITTING
- 12 INLINE DRIP EMITTER
- 13 MULCH
- 14 FINISH GRADE

NOTE:
 1. DISTANCE BETWEEN LATERAL ROWS AND EMITTER SPACING TO BE BASED ON SOIL TYPE, PLANT MATERIALS AND CHANGES IN ELEVATION. SEE INSTALLATION SPECIFICATIONS ON MANUFACTURER'S RECOMMENDATIONS FOR SUGGESTED SPACING.
 2. LENGTH OF LONGEST DRIPLINE LATERAL SHOULD NOT EXCEED THE MAXIMUM SPACING PER MANUFACTURER'S RECOMMENDATIONS.
 3. AT FITTINGS WHERE THERE IS A CHANGE OF DIRECTION SUCH AS TEES OR ELBOWS, USE TIE-DOWN STAKES ON EACH LEG OF THE CHANGE OF DIRECTION.

3 DRIPLINE LAYOUT
 NTS



- 1 FINISH GRADE
- 2 PURPLE POP-UP SPRAY/ROTARY
- 3 PURPLE PVC LATERAL PIPE
- 4 SWING JOINT ASSEMBLY
- 5 PVC SCH. 40 FITTING (SxT)
- 6 HARDSCAPE EDGE

NOTE:
 1. AFTER FLUSHING HEADS, REGRADE AND COMPACT AS NEEDED TO RETURN TO FINISH GRADE.
 2. SPRINKLERS SHALL BE MIN. 6" FROM ANY WALLS, WALKS, COURTS, AND 12" FROM TURF EDGE.
 3. ADJUST ALL SPRINKLERS HEADS SO THAT NO OVERSPRAY OCCURS ON ANY WALLS, WALKS, COURTS, ETC.
 4. ALL THREADED CONNECTIONS SHALL BE COATED WITH TEFLON TAPE.
 5. COMPACT SOIL AROUND HEAD TO THE SAME DENSITY AS ADJACENT UNDISTURBED SUBGRADE.

4 POP-UP SPRAY/ ROTARY
 NTS

WEEKLY SCHEDULE BASED ON JULY ET0 AND PRECIPITATION RATE				
Type	Precip Rate (in/hr)	Weekly Water Req. (in/wk)	Time cycle (min/wk)	Total Times (hr/wk)
Shrub Dripline	0.85	0.52	37	1 0.81
Shrub Spray	1.64	0.62	23	2 0.76
Shrub Rotaries	0.40	0.58	87	2 2.92
Shrub Rotors	0.64	0.58	55	7 6.38
Turf MPR Rotors	0.64	1.17	109	9 16.40
Turf Rotors	0.44	1.17	159	7 18.55

Water window per local codes: 9 PM to 6 AM (9 Hours)
 Note: Hunter I-50 turf rotors have been calculate for half (180 degrees) spray and contractor shall calculate for quarter and full rotors.

MAINTENANCE													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly Et0	1.43	2.03	3.26	4.53	5.35	5.95	6.22	5.52	4.46	3.2	1.78	1.29	45.02
Estimated Percent Run Time Per Month of July													
Run Time	23%	33%	52%	73%	86%	96%	100%	89%	72%	51%	29%	21%	Minutes/Week Based on July
Estimated Number of Watering Days Per Month													
Shrub Dripline	2	3	4	6	7	8	8	7	6	4	2	2	37
Shrub Spray	2	3	4	6	7	8	8	7	6	4	2	2	23
Shrub Rotaries	2	3	4	6	7	8	8	7	6	4	2	2	87
Shrub Rotors	2	3	4	6	7	8	8	7	6	4	2	2	55
Turf MPR Rotors	3	5	8	11	13	14	15	13	11	8	4	3	109
Turf Rotors	3	5	8	11	13	14	15	13	11	8	4	3	159

ESTABLISHMENT													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly Et0	1.43	2.03	3.26	4.53	5.35	5.95	6.22	5.52	4.46	3.2	1.78	1.29	45.02
Estimated Percent Run Time Per Month of July													
Run Time	23%	33%	52%	73%	86%	96%	100%	89%	72%	51%	29%	21%	Minutes/Week Based on July
Estimated Number of Watering Days Per Month													
Shrub Dripline	4	5	8	12	14	15	16	14	12	8	5	3	73
Shrub Spray	4	5	8	12	14	15	16	14	12	8	5	3	46
Turf Dripline	4	5	8	12	14	15	16	14	12	8	5	3	175
Turf Rotors	4	5	8	12	14	15	16	14	12	8	5	3	109
Turf Dripline	7	10	16	22	26	29	30	27	22	15	9	6	219
Turf Rotors	7	10	16	22	26	29	30	27	22	15	9	6	318

1. TOTAL WATERING TIME WOULD BE DIVIDED BY THE NUMBER OF WATERING DAYS PER WEEK.
 2. CONTRACTOR TO VERIFY AND ADJUST WATERING SCHEDULE SOAK AND CYCLE PER FIELD CONDITIONS IN ORDER TO AVOID WATER RUNOFF.
 3. CONTRACTOR SHALL PROGRAM THE CONTROLLER TO MEET THE WEEKLY RUNTIME MINUTES WHILE ACHIEVING THE NUMBER OF DAYS PER MONTH.
 4. THE CONTRACTOR SHALL ADJUST THE WEEKLY MINUTES PER THE MONTHLY PERCENTAGES BASED ON ET.
 5. DRIP IRRIGATION CAN RUN OUTSIDE OF WATERING WINDOW.

SAN RAFAEL CITY SCHOOLS
VENETIA VALLEY GR 1-5 CLASSROOM REPLACEMENT AND NEW MPR BUILDING
 177 N San Pedro Rd, San Rafael, CA 94903
DSA SUBMITTAL- INCREMENT 2

OWNER:
PROJECT NAME:
CLIENT ADDRESS:

IDENTIFICATION STAMP
 DIVISION OF THE STATE ARCHITECT
 OFFICE OF REGULATION SERVICES
A# 01-117438
 AC _____ FLS _____ SS _____
 DATE _____

REVISIONS:

NO.	DESCRIPTION	DATE
1	ADD 2 DELTA 2	1/31/22

DATE ISSUED: 01/31/2022
PROJECT NO: 2017 / 40104
SCALE: As indicated
SHEET NUMBER: IR2.01
SHEET TITLE: IRRIGATION DETAILS

DIGALERT
 DIAL TOLL FREE 811 AT LEAST TWO DAYS BEFORE YOU DIG
 A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

SVA ARCHITECTS
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