PROJECT MANUAL FOR

BELMONT PEDESTRIAN HYBRID BEACON
FRESNO CHAFFEE ZOO

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**BELMONT PEDESTRIAN HYBRID BEACON**

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TECHNICAL SPECIFICATIONS

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**SECTION 01 10 00**

**SUMMARY OF WORK**

**PART 1 - GENERAL**

1.01 SCOPE

A. Work Included:

1. The "Work" of this Contract comprises the construction of new parking lot with polypavment, concrete accessible parking, chain link fencing and frontage sidewalk along Belmont Avenue for the Fresno Chaffee Zoo.

B. This bid package will be constructed under a single prime contractor.

C. Project location: South side of Belmont Ave, between Teilman Ave and Pacific Ave

D. Owner: Fresno Chaffee Zoo

E. Contract Documents for this bid package Prepared by:

1. Yamabe & Horn Engineering, Inc.
2. 2985 North Burl Ave., Suite 101
3. Fresno, CA 93727
4. (559) 244-3123

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions.

B. Divisions 1 and 2

1.03 WORK UNDER OTHER CONTRACTS

A. Work may be underway by others on the Belmont crosswalk immediately adjacent to this project.

1.04 CONTRACTOR'S DUTIES

A. Except as specifically noted, provide and pay for:

1. Labor, material and equipment
2. Tools, construction equipment and machinery.
3. Utilities required for construction.
4. Other facilities and services necessary for proper execution and completion of work.
5. Water: See Specification Section 01 50 00 – Construction Facilities and Temporary Controls.

B. Pay legally required sales, consumer and use taxes.

C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids.

1. Licenses, Permits and Fees

D. Give required notices.

E. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

F. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.

1. Appropriate modifications to Contract Documents will adjust necessary changes.

G. Enforce strict discipline and good order among employees. Do not employ on work:

1. Unfit persons.

2. Persons not skilled in assigned task.

H. Restore all existing improvements removed or damaged by the work, including but not limited to: asphalt concrete paving; concrete curb, gutters, walks and other concrete work; turf or ground cover areas; shrubs and trees; fences and walls; utilities and other improvements. Restore all improvements to new condition by replacement satisfactory to the Owner.

I. Adjust all existing and proposed facilities, such as pull boxes, valve boxes, manhole covers, vault covers, irrigation equipment, fire hydrants, cleanouts, etc., to match the final surface elevation of all proposed finished surfaces. Materials and methods to be as approved by the Owner.

J. Except where specifically indicated by note on the construction plans or by specific phrase in the project manual that a material or item of work is to be performed “by Owner” or “by others”, furnish all materials required and perform all work shown to accomplish the intent of the plans and project manual. Include full compensation therefor in bid.

K. It is the intent of the construction plans and project manual for the Contractor to construct the work shown to a finished condition, complete in every detail. Include in bid full compensation therefor.

1.05 CONTRACTOR USE OF PERMISES

A. Confine operations at sites to areas permitted by:

1. Laws.

2. Ordinances.

3. Permits.

4. Contract Documents.

B. Do not unreasonably encumber work site with materials or equipment.

C. Do not load any existing or proposed improvement with weight that will endanger structure.

D. Limit storage of materials to site designated by the Owner.

E. Assume full responsibility for protection and safekeeping of Contractor's material stored on premises, and keep the site secure at all times.

F. Obtain and pay for use of additional storage or work areas needed for operations.

G. Limit use of designated site for work and storage.

H. Limit use of premises to minimum work area required for each sequence or phase.

I. Confine operations at work sites to minimum area necessary to accomplish the work, and do not disturb portions of the site outside the minimums required.

J. Allow for owner occupancy and use by the public of buildings and other improvements while carrying out the work.

K. Keep driveways, walkways and entrances serving the premises clear and available to the Owner, the Owner's employees, students, and emergency vehicles at all times. Do not use these areas for storage of materials or parking.

L. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

M. Where the work involves penetration of existing buildings, maintain affected areas of buildings in a weather tight condition throughout the construction period. Repair any damage caused by the construction operations. Take all precautions necessary to protect buildings and occupants during the construction period.

N. The Owner will occupy the site of work and areas adjacent to the site of work during the entire construction period. Cooperate with Owner and Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the work so as to minimize interference with Owner's operations.

O. Minimize time of disruption at work site, by careful scheduling and diligent prosecution of the work to completion.

1.06 WORK SEQUENCE

A. Provide a progress schedule and sequence of work which minimizes disruption of the surrounding streets and coordinates with Owner activities.

B. Submit progress schedule at pre-construction conference, for approval.

C. Conduct the work in conformance with the approved progress schedule.

D. Update schedule as work progresses. Furnish Owner with schedule updates when requested.

1.07 MEANS AND METHODS

A. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work under the Contract.

**PART 2 - PRODUCTS**

Not Used

**PART 3 – EXECUTION**

Not Used

**END OF SECTION**

**SECTION 01 25 00**

**MATERIAL AND EQUIPMENT**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work Included:

1. Work substituted for work in DIVISIONS 1, 2 and 16 shall meet the requirement of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions.

B. Section 01 42 19 - Reference Standards, Codes.

C. Section 01 33 00 - Submittals.

D. Section 01 60 00 - Materials and Equipment.

1.03 SPECIFIED WORK

A. Contractor's Options:

1. Product specified only by reference standards: Select any product meeting standards.

2. Product specified by naming several products and/or manufacturers: Select any product and/or manufacturer named.

3. Product specified by naming several products and/or manufacturers and reference standards: Select any product meeting standards. Product and /or manufacturer names indicate products and/or manufacturers which meet standards.

4. Product specified by naming only product: Select product specified.

5. Product specified by naming one or more products and stating "or approved equal" adjacent to specified product: Select any product named or submit request for substitution for any product not specifically named in accordance with Section 01630/1.04 Substitution Request.

1.04 SUBSTITUTION REQUEST

A. Content of Request:

1. For products:

a) Product identification, including manufacturer's name and address.

b) Manufacturer's literature including product description, performance, test data and reference standards.

c) Samples.

2. For construction methods:
    a) Detailed description of proposed methods.
    b) Drawings illustrating methods.
    c) Attached to request an itemized comparison of proposed substitution with product or method specified.
    d) Provide information on specified item or products to assist the Engineer in comparison.

B. In making request for substitution, Contractor attests that:
    1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
    2. He will provide the same warranty for substitution as for product or method specified.
    3. He will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.
    4. He waives all claims for additional costs related to substitution, including those which subsequently become apparent.

C. Submit 6 copies of substitution request in accordance with Exhibit "C" – Contract General Conditions, within 30 calendar days of the commencement of work on the Contract.

1.05 ACCEPTANCE OF SUB STITUTIONS

A. Procedures:
    1. The Contract is based on materials, equipment and methods described in the Contract Documents.
    2. Engineer will consider proposals submitted in accordance with Article 01630/ 1.04 Substitution Request.
    3. Substitutions will be considered when submitted in accordance with Public Contract Code Section 3400, unless otherwise indicated in the Contract Documents.
    4. Engineer is solely responsible for judging the acceptance of substitutions.
    5. Substitute materials, equipment or methods shall not be used unless such substitution has been specifically approved for this work by the Engineer.
    6. Substitutions will not be considered if:
        a) They are indicated or implied on product submittals without formal request submitted in accordance with Article 01630/1.04 Substitution Request.
        b) Acceptance will require substantial revision of Contract Documents.

1.06 DECISIONS PURSUANT TO REQUEST FOR SUBSTITUTION

A. Within 15 days of receipt of request for substitution, the Engineer will request additional information or documentation necessary for proper evaluation of request.

B. Within 15 days of receipt of request or within 15 days of receipt of requested additional information, whichever is later, the Engineer will accept or reject proposed substitution.

C. If a decision on a substitution cannot be made within the time allocated, the product specified shall be used.

D. There shall be no claim for additional time for review of proposed substitutions.

E. The Contractor is responsible to make sure all accepted substitutions will fit and work with all other proposed products.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01 31 19**

**PROJECT MEETINGS**

## PART 1 - GENERAL

1.01 SCOPE

A. This Section specifies requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Progress meetings.
3. Special coordination meetings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions.

B. Section 01 25 00 - Submittals.

1.03 PRECONSTRUCTION CONFERENCE

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Engineer, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments. See General Conditions for further requirements.

B. Attendees: Authorized representatives of the Owner, Engineer, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product data, and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Parking availability.

11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures and first aid.
14. Security.
15. Housekeeping.
16. Working hours.
17. Other items.

1.04 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site at monthly intervals. Notify the Owner, Project Inspector, and the Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

D. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

E. Review the present and future needs of each entity present, including the following:

1. Interface requirements.
2. Time.
3. Construction phasing issues.
4. Sequences.
5. Status of submittals.
6. Deliveries.
7. Offsite fabrication problems.
8. Access.
9. Site utilization.

10. Temporary facilities and services.

11. Hours of work.

12. Hazards and risks.

13. Housekeeping.

14. Quality and work standards.

15. Change Orders.

16. Documentation of information for payment requests.

17. Other items.

F. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

G. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.05 SPECIAL COORDINATION MEETINGS

A. Conduct special project coordination meetings at times convenient for all parties involved. Special project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01 33 00**

**SUBMITTALS**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

1.02 RELATED SECTIONS

A. Contract General Conditions.

B. Section 01 70 00 - Project Closeout

1.03 SUBMITTAL PROCEDURES

A. Provide 6 copies of submittals materials.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section, as appropriate.

C. Apply Contractor's stamped, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirement of the Work and Contract Documents.

D. Schedule submittals to expedite the Project, and deliver to project inspector.

E. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.

F. Identifying variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Architect/Engineer review stamps.

H. Revise and resubmit, identify all changes made since previous submission.

I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any liability to comply with provisions.

J. Submittal procedures shall also comply with the Contract General Conditions.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. Submit 6 copies of initial schedule.

B. Revise and resubmit as required.

C. Submit revised schedules at prescribed intervals, and at each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each major section of Work or operation, identifying first work day of each week.

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.

F. Indicate estimated percentage of completion for each item of Work at each submission.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01 40 00**

**QUALITY CONTROL**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. Tolerances.

C. Field samples.

D. Manufacturers' field services and reports.

E. Responsibilities.

F. Associated Services.

1.02 RELATED SECTIONS

A. Contract General Conditions.

B. Divisions 1 and 2.

1.03 QUALITY AS SURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 TOLERANCES

A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturer's tolerances. Should manufacturers' tolerance conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.05 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level of the work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Engineer.

1.06 MANUFACTURES' FIELD SERVICES AND REPORTS

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, condition of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

B. Individuals to report observations and site decisions or instructions given to applicator or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 15 days of observation to Engineer for review.

1.07 RESPONSBILITIES

A. Unless otherwise specifically indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Include the costs for these services in the amount bid for the project.

B. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Include the costs for these services in the amount bid for the project.

C. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

D. The Contractor is responsible for the cost of retesting where results of inspections, tests, or other quality services unsatisfactory and indicate noncompliance with. Contract Document requirements, regardless of whether the original test was the Contractor's responsibility. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Documents requirements.

1.08 ASSOCIATED SERVICES

A. Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

   1. Provide access to the Work.
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Provide facilities for storage and curing of test samples.
   5. Deliver samples to testing laboratories.
   6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   7. Provide security and protection of samples and test equipment at the Project Site.

B. Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

C. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section “Cutting and Patching.”

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is the Contractor’s responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

**END OF SECTION**

**SECTION 01 42 00**

**ABBREVIATIONS, SYMBOLS AND DEFINITIONS**

## PART 1 - GENERAL

1.01 GENERAL

A. The abbreviations, symbols and word meanings not defined in the Contract Documents are in accordance with building industry usage and convention. Questions which arise as to meaning or intent shall be referred to the Owner prior to bidding for interpretation.

B. Refer to Drawings for additional abbreviations and symbols.

C. Refer to General and Supplemental Conditions and specific specifications sections for additional definitions.

1.02 DEFINITIONS

A. CERTIFICATE OF COMPLIANCE: Manufacturer's certificate certifying that products supplied meet or exceed specified requirements.

B. EXECUTE: Perform what is required to install and otherwise incorporate products into this Project.

C. FURNISH: Supply products required, deliver to Project, unload and store in location as directed by Contractor, Owner or Engineer.

D. INSTALL: Incorporate into this Project.

E. OWNER: Fresno Chaffee Zoo.

F. PRODUCTS: The material, equipment, fixtures and other physical substances required to execute the Project.

G. WARRANTY: Use of the term or the word GUARANTEE will be recognized interchangeably and have the same definition that a WARRANTY is an assurance by the seller or installer that products or work are as represented or will be as promised in compliance with Specifications.

## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

Not Used

**END OF SECTION**

**SECTION 01 42 19**

**REFERENCE STANDARDS, CODES**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality Assurance.

B. Schedule of References.

C. Applicable Codes.

D. Major Governing Codes and Regulations.

E. Specifications Format and Content.

F. Industry Standards.

1.02 RELATED SECTIONS

A. Contract General Conditions.

B. Section 01 25 00 - Substitutions.

1.03 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for first Invitation to Bid.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Neither the contractual relationship, duties and responsibilities of the parties to the Contract, nor those of the Architect/Engineer, shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. Applicable portions of the Standards listed that are not in conflict with the Contract Documents shall be construed as specifications for this work.

1.04 SCHEDULE OF REFERENCES

A. Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

| | |
|---|---|
| ACI | American Concrete Institute<br>P. O. Box 9094<br>Farmington Hills, MI 48333<br>(810) 848—3 700 |
| AISI | American Iron and Steel Institute<br>1101 17th Street, NW.<br>Washington, DC 2003 6-4700<br>(202) 452-7100 |
| ANSI | American National Standards Institute<br>11 West 42nd Street, 13th Floor<br>New York, NY 10036-8002<br>(212) 642-4900 |
| ASTM | American Society for Testing and Materials<br>100 Barr Harbor Dr.<br>West Conshohockon, PA 19428-2959<br>(610) 832-9500 |
| AWS | American Welding Society<br>550 LeJeune Road, NW.<br>Miami, FL 33126<br>(305) 443-9353 |
| AWWA | American Water Works Association<br>6666 West Quincy Avenue<br>Denver, CO 80235<br>(303) 794-7711 |
| CALTRANS | Department of Transportation<br>State of California<br>PO. Box 942873<br>Sacramento, CA 95814<br>(916) 654-5266 |
| CRSI | Concrete Reinforcing Steel Institute<br>933 N. Plum Grove Road<br>Schaumburg, IL 60173-4758<br>(847) 517-1200 |
| EJMA | Expansion Joint Manufacturers Association<br>25 North Broadway<br>Tanytown, NY 10591<br>(914) 332-0040 |
| IEEE | Institute of Electrical and Electronic Engineers<br>345 East 47th Street<br>New York, NY 10017-23 94<br>(212) 705-7900 |
| NEMA | National Electrical Manufacturers Association<br>2101 'L' Street, N.W., Suite 300<br>Washington, DC 20037 |

| | |
|---|---|
| | (202) 457-8400 |
| NFPA | National Fire Protection Association<br>One Batterymarch Park<br>P. O. Box 9101<br>Quincy, MA 02269-9101<br>(800) 344-3555 |
| PCA | Portland Cement Association<br>5420 Old Orchard Road<br>Skokie, IL 60077-1083<br>(847) 966-6200 |
| UL | Underwriters' Laboratories, Inc.<br>333 Pfingston Road<br>Northbrook, IL 60062<br>(847) 272-8800 |
| Others | As may be referenced in Contract Documents |

1.05 APPLICABLE CODES

A. All Codes, laws, ordinances, rules, regulations, orders and other legal requirements of City, County, State, Federal and other public authorities which bear on performances of work shall be applicable to Project. Latest editions shall be applicable unless specified otherwise.

B. Relationship between Applicable Codes and Contract Documents: The Contract Documents have been developed with the intent to conform with applicable codes. Nothing within the Contract Documents shall be construed to permit work not conforming with applicable codes.

C. Comply with all federal, state and local laws, ordinances, rules and regulations indicated and which bear on the conduct of the work.

D. For all work within the Public Right-of-Way shall comply with City of Fresno Standards and Specifications.

1.06 MAJOR GOVERNING CODES AND REGULATIONS

A. All work shall comply with the requirements of the following codes and regulations. Special reference in other Sections of the Specifications to a specific code may be by use of the abbreviation given in front of the Code. Latest edition of pertaining ordinances, laws, rules, codes, regulations, standards, and others of public agencies having jurisdiction of the work are intended wherever reference is made in either the singular or plural to Code or Building Code except as otherwise specified, including but not limited to latest edition of those in the following listing.

| | |
|---|---|
| ADA | Americans with Disability Act |
| CCR-T8 | California Code of Regulations, Title 8-Industrial Safety. |
| CCR-T19 | California Code of Regulations, Title 19-Public Safety. |

| | |
|---|---|
| CCR-T21 | California Code of Regulations, Title 21-Public Works. |
| CBC | California Building Code, California Code of Regulations, Title 24-Part 2, CCR-T24. |
| CEC | California Electrical Code, California Code of Regulations, Title 24-Part 3, CCR-T24. |
| CMC | California Mechanical Code, California Code of Regulations, Title 24-Part 4, CCR-T24. |
| UBC | Uniform Building Code. |
| UPC | Uniform Plumbing Code. |
| Others | As may be referenced in Contract Documents, or as may be applicable. |

1.07 SPECIFICATIONS FORMAT AND CONTENT

A. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and Masterformat numbering system.

B. The sections are placed in the Project Manual in numeric sequence; however, this sequence is not complete and the Table of Contents of the specifications must be consulted to determine the total listing of sections.

C. The section title is not intended to limit the meaning or content of the section, nor to be fully descriptive of the requirements specified therein.

D. The organization of the specifications shall not control the division of the work among subcontractors or establish the extent of work to be performed by any trade.

E. Specifications use certain conventions regarding style of language and the intended meaning of certain terms, words, and phrases when Used in particular situations or circumstances. These conventions are:

1. Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable to maintain the context of the Contract Document indicated.

2. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. Subjective language is used for clarity to describe responsibilities that must be fulfilled directly or indirectly by the Contractor, or by others when specifically so noted.

3. The words "shall be" are implied wherever a colon(:) is used within a sentence or phrase.

1.08 INDUSTRY STANDARDS

A. Except where Contract Documents include more stringent requirements, applicable construction industry standards shall apply as if bound into the Contract Documents to

the extent referenced. Such standards are made part of Contract Documents by reference.

B. Conform to reference standard by date of issue current on date for receiving bids except when a specific date is indicated.

C. Where compliance with 2 or more standards is specified and where standards may establish different or conflicting requirements for quantities or quality levels, the more stringent, higher quality and greater quantity of work shall apply.

D. The quantity or quality level shown or specified shall be the minimum provided or performed. Indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements.

E. Each entity engaged in construction of the work is required to be familiar with industry standards applicable to its construction activity.

F. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required activity, Contractor shall obtain copies directly from publication source.

G. Trade association names and titles of general standards are frequently abbreviated. Where such abbreviations are used in the Specifications or other Contract Documents, they shall mean the recognized trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to' the content of the text provision. Refer to the “Encyclopedia of Associations”, published by Gale Research Co., available in most libraries.

H. Refer to individual specification sections and related drawings for names and abbreviations of trade associations and standards applicable to specific portions of the work. In particular, refer to Division 15 for names and abbreviations applicable to mechanical work, and refer to Division 16 for names and abbreviations applicable to electrical work.

I. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01 43 26**

**TESTING LABORATORY SERVICES**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide access, assistance and information required for testing of the various portions of the Work as required by regulatory agencies, the Contract Documents and the Owner.

2. The owner will pay for all initial testing except as specified otherwise. The Contractor shall pay for all testing specifically indicated as paid by Contractor, and for all retesting.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions.

B. Divisions 1 and 2, requirements for testing the various portions of the Work are listed in the appropriate Sections of these Specifications.

1.03 WORK NOT INCLUDED

A. Selection of Independent Testing Laboratory will be by the Owner. Once selected, the Owner will contract with the Independent Testing Laboratory.

B. Payment for initial testing, except where specifically indicated as paid by Contractor, will be paid by Owner

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: In accordance with Section 014219-Reference Standards, Codes

B. References Standards: In accordance with Section 014219-Reference Standards, Codes

C. Testing Laboratory Qualifications: In accordance with ASTM E329 and ASTM 3740.

D. Testing Standards. In accordance with regulatory agencies and appropriate ASTM Standards.

1.05 CONTRACTORS DUTIES

A. Testing Schedule:

1. The Contractor is to provide written notice to Owner's Inspector and the Independent testing Laboratory a minimum of two (2) working days prior to time of required test.

B. Cooperation with testing laboratory.

1. Provide access to work being tested.

2. Provide test samples as selected by testing laboratory.

C. Additional inspections and tests required by regulatory agencies shall be the responsibility of and shall be paid for by the Contractor unless specified otherwise.

D. Inspections and testing performed exclusively for the Contractor's convenience shall be the sole responsibility and cost of the Contractor.

E. Payment of testing shall be as scheduled below, and as indicated in 01 40 00 - Quality Control.

1.06 TESTING LABORATORY'S DUTIES

A. Taking all specimens.

B. Performing tests.

C. Writing test reports.

D. Distribute test reports to Owner, Inspector, Engineer and Contractor.

**PART 2 - PRODUCTS**

2.01 TESTING SCHEDULE

A. Testing Schedule at the end of this section should be used as a guide only and it is not considered a complete list. Refer to regulatory agency requirements and specific specification sections for complete testing requirements.

**PART 3 - EXECUTION**

A. As indicated in Part 1.

B. Contractor shall contact the regulatory agencies and perform all tests required by any regulatory agency, at the expense of the Contractor.

C. All Contractor performed tests shall be performed in the presence of the project inspector.

**TESTING SCHEDULE**

| SECTION/NAME | TEST | ORIGINAL TESTS PAID BY/DONE BY |
|---|---|---|
| 31 00 00 - Earthwork: Excavation, Filling and Grading | Compaction Testing | Owner/Testing Lab |
| 31 23 33 - Trench Excavation and Backfilling | Compaction Testing | Owner/Testing Lab |
| 32 11 00 - Aggregate Base Course | Compaction Testing | Owner/Testing Lab |
| 32 16 00 - Sitework Concrete | Compressive Strength Testing | Owner/Testing Lab |
| 32 12 00 - Asphaltic Concrete Paving | Compaction Testing | Owner/Testing Lab |
| 33 40 00 - Storm Drain Improvements | Deflection Testing for PVC Pipe | Contractor/Contractor |
| 32 80 00 - Landscape Irrigation System | 1. Pressure Testing<br>2. Coverage Testing | Contractor/Contractor<br>Contractor/Contractor |

**Note:** Any subsequent testing required due to failure of original testing to be at the expense of the Contractor.

**END OF SECTION**

**SECTION 01 44 00**
**OWNER'S INSPECTION SERVICES**

**PART 1 – GENERAL**

1.01 DESCRIPTION

A. Work included:

1. Provide access, facilities and information required for Owner's inspection of Project.

B. Work Not Included:

1. Selection and payment of Owner's inspection services will be by Owner.

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. In accordance with Section 014219 – Reference Standards, Codes.

1.03 CONTRACTOR'S DUTY

A. Furnish facilities in accordance with Section 015000 – Construction Facilities and Temporary Controls.

B. Provide Owner's Inspector free access to any and all parts of the Project at all times.

C. Provide Owner's Inspector information necessary to keep him fully informed with respect to the progress and manner of work and character of work.

D. Perform no work in absence of Owner's Inspector unless alternate arrangements have been made in advance and agreed to by Owner and Engineer.

E. Owner's Inspection of work shall not relieve Contractor from any conditions of this Contract.

1.04 OWNER'S INSPECTOR DUTIES

A. Provide inspection of work in accordance with General Conditions and all Code Requirements.

B. Report to owner and Engineer as required.

C. Provide Owner's Inspector information necessary to keep him fully informed with respect

a) to the progress and manner of work and character of work.

D. Perform no work in absence of Owner's Inspector unless alternate arrangements have been made in advance and agreed to by Owner and Engineer.

E. Owner's Inspection of work shall not relieve Contractor from any conditions of this Contract.

**PART 2 – PRODUCTS**

Not Used

**PART 3 – EXECUTION**

Not Used

**END OF SECTION**

**SECTION 01 50 00**

**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

## PART 1 - GENERAL

1.01 SCOPE

A. Provide all material, labor, equipment and services necessary to furnish and install Construction Facilities and Temporary Controls and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions and Divisions 01 and 02.

1.03 STANDARDS

A. Meet requirements and recommendations of applicable portions of Codes and Standards listed:

| | |
|---|---|
| ADA | Americans with Disability Act |
| CCR-T8 | California Code of Regulations, Title 8 Industrial Safety. |
| CCR-T19 | California Code of Regulations, Title 19 Public Safety. |
| CCR-T21 | California Code of Regulations, Title 21 Public Works. |
| CBC | California Building Code, California Code of Regulations, Title 24-Part 2, CCR-T24. |
| CEC | California Electrical Code, California Code of Regulations, Title 24-Part 3, CCR-T24. |
| CFC | California Fire Code, California Code of Regulations, Title 24-Part 9, CCR- T24. |
| CMC | California Mechanical Code, California Code of Regulations, Title 24-Part 4, CCR-T24. |
| CPC | California Plumbing Code, California Code of Regulations, Title 24-Part 5, CCR-T24. |

Other Applicable Codes and Standards.

## PART 2 - PRODUCTS

2.01 GENERAL

A. The following list of services and facilities shall be provided and maintained throughout the construction period by the Contractor, or by the Owner where specifically noted. The Contractor shall assume all responsibility for the provision and maintenance of these facilities and services and for the provision of public safety where the Operations under this contract interface with public areas. These facilities and services shall include the following items: Temporary water, power, telephone and sanitary facilities; parking for all of the Contractor's forces; access; construction fencing enclosures; storage buildings

and enclosures; site office (if desired by Contractor); noise, dust and traffic control services, drainage control, erosion and sediment control, temporary trench resurfacing, and other services and facilities required by the Contract.

1. The Contractor shall give seven (7) days prior written notice of any required utility "shut down" required for this project, except as specified otherwise in Section 00700. Verify verbally with the Owner's representative twenty-four (24) hours prior to the actual "shut down".

2.02 WATER

A. The Contractor shall make his own arrangements for and shall provide himself with a satisfactory water supply for the work done under the Contract. All water so used shall be paid for by the Contractor. All costs for furnishing water shall be included in the various bid items of work.

2.03 TELEPHONE

A. Should the Contractor desire to maintain a construction office with telephone service, the Contractor shall connect into the Owner's phone system and pay to the Owner seventy-five dollars ($75.00) per line hook-up charge and shall pay all phone charges at the rate of seventeen dollars ($17.00) per month per line plus all long distance charges. Remove all temporary telephone facilities upon completion of the contract.

2.04 ELECTRIC SERVICE

A. The Contractor shall provide and pay for electric service for all purposes of power and lighting required for the construction of the work of the Contract and shall maintain such service until the completion of the contract.

2.05 SANITARY FACILITIES

A. Provide adequate, self-contained toilets as required for all persons employed on Project. Place such toilets only at locations approved by Owner.

2.06 ACCESS FACILITIES

A. Provide such access facilities to the construction areas as are necessary and required for carrying on the Work and keep passable at all times. The contractor shall be responsible for any damage to streets, curbs and sidewalks due to the use of such facilities, and such damaged portions shall be repaired as required to place them in as good condition as existed before commencement of the Work. Contractors shall comply in every respect with applicable Building Codes regarding the use of public streets and sidewalks and the proper barricading and lighting of public thoroughfares surrounding the construction activities.

2.07 STORAGE SHEDS AND FENCES

A. Furnish as needed by the Contractor to protect materials, from weather, vandalism, theft, and to exclude the intrusion of the public into the storage area. Locate only at a location approved by Owner.

2.08 CONTRACTOR'S FIELD OFFICE

A. Supply, if desired, at option of Contractor. Place only at location approved by Owner.

2.09 INSPECTOR'S FIELD OFFICE

A. Not required.

2.10 PROTECTION

A. Install and maintain barricades, warning signs, steps, bridges, platforms and other temporary construction necessary for proper completion of work and in accordance with regulatory agencies and pertinent safety regulations.

2.11 PROJECT ENCLOSURES

A. Install and maintain enclosures around the various construction sites to exclude and protect the public and to protect the completed work. Temporarily fence all excavation sites.

2.12 TRAFFIC CONTROL (PEDESTRIAN AND VEHICULAR)

A. Refer to Contract General Conditions and Section 00 70 00.

B. Provide at all times for the convenience and safety of pedestrians and vehicular traffic.

C. Furnish, construct, maintain and finally remove, temporary detours, lights, signs barricades, temporary fences, flares, miscellaneous traffic devices, flagmen, temporary paving, temporary ramps, and such other items and services as are necessary to adequately safeguard pedestrians and vehicles from hazard and inconvenience.

D. Secure the site of work at all times.

E. Conduct operations so as to cause the least possible obstruction and inconvenience to pedestrians and vehicles, and have under construction no greater length or amount of work than can be prosecuted properly with due regard to the safety and convenience of pedestrians and vehicles.

F. Close no streets, drives, or parking areas, temporarily or otherwise, without the approval of the City or Owner.

G. Provide and maintain in good condition safe temporary crossings (minimum width 5 feet) for pedestrians, at reasonable intervals along the Work.

H. Sign construction area in streets, drives, parking lots and other areas in accordance with the State of California Manual of Traffic Control, latest edition. Furnish reflectorized signs and flasher equipped barricades for nighttime visibility. Compliance with the requirements of said manual shall be considered as a minimum requirement and it is the responsibility of the Contractor to provide additional safety devices when necessary to provide a safe condition.

I. Provide and maintain temporary 6' high chain link fencing around any Open excavation or other potential hazard area.

J. Place and maintain temporary surfacing at all street crossings of utility trenches, and such other locations as directed by the Inspector. Temporary trench resurfacing shall consist of a minimum of 2 inches of cold mix asphalt-concrete mixed in a central plant, placed and diligently maintained. Remove temporary surfacing prior to placing final resurfacing.

2.13 DUST CONTROL

A. Perform work in such a manner as to minimize the spread of dust and flying particles. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to public and neighbors. Compliance with all environmental codes and standards applicable to this project shall be a requirement for the project duration.

B. Contractor shall comply with all requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) for construction activity related to this project.

C. A Dust Control Plan, as required by the SJVAPCD, is required for this project. Contractor shall be responsible for preparing said Dust Control Plan, submitting it to the SJVAPCD for review and approval, and paying all SJVAPCD review and permitting fees related to the Dust Control Plan

D. No construction activity related to this project may begin until Contractor has secured an approved Dust Control Plan.

E. Contractor shall be solely responsible to implement all requirements of the Dust Control Plan throughout the life of this contract.

F. Should fines or fees be levied against the Project for violations of the Dust Control Plan and/or related SJVAPCD regulations, Contractor shall be responsible to pay all said fines or fees and to implement all mitigation measures required by SJVAPCD in order to bring the construction activity into compliance with SJVAPCD regulations. The costs for any such fines or fees shall be included in the lump sum price bid for work under this contract and no additional payment will be made therefore.

2.14 PARKING

A. All construction personnel shall park all personal and work vehicles within the project site or at locations designated by the Owner.

2.15 NOISE CONTROL

A. Minimize construction noise near buildings.

B. Ambient noise due to construction activities:

1. In order to maintain a quality academic environment, sustained ambient apparent noise due to construction is to be held at or below 70 dBA in adjacent occupied areas (classrooms, offices) during normal University working hours, i.e. 7 am to 10 pm. Sustained noise is defined as continuous or intermittent work in excess of five minutes duration. If these noise level restrictions cannot be met, it will be the contractor's sole responsibility to adjust work practices and/or schedules accordingly. Agents of the

University will determine whether or not the levels of noise are within the 70 dBA limit.

C. Include all costs involved in noise control in bid.

2.16 DRAINAGE CONTROL

A. Maintain excavations and other work areas free of water. Provide, operate and maintain pumping equipment.

B. Dewater existing facilities as required to accomplish the work.

2.17 EROSION AND SEDIMENT CONTROL

A. Conform to Best Management Practices for Contractor Activities and Disposal Alternatives as defined in Chapters 4 and 5 of the Construction Activity Handbook published by the Storm Water Quality Task Force.

B. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

C. Minimize amount of bare soil exposed at one time.

D. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

E. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

F. Coordinate construction activities with control procedures established in the project's Storm Water Pollution Prevention Plan (SWPPP).

2.18 MEANS AND METHODS

A. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work under the Contract.

**PART 3 - EXECUTION**

3.01 GENERAL REQUIREMENTS

A. Perform work and provide and maintain services and facilities in accordance with the requirements of all regulatory agencies having jurisdiction. Remove services, facilities and temporary connections upon completion of the Project.

B. Services to be provided and maintained from commencement of work until final acceptance.

3.02 UTILITY CONFLICTS

A. If, during excavation for the Work, utility lines are uncovered (water, electric, sewer, etc.) not shown on the drawings which affect the location of the Work, the Owner's Inspector and the Engineer must be notified promptly for their review and direction.

3.03 USE OF PROPERTY

A. Contractors shall cooperate with other contractors and the Owner in the use of the site and shall adjust their operations to maintain harmonious relations and uninterrupted progress of the Work.

3.04 CLEANING UP

A. The Contractor shall at all times keep the various sites of work free from accumulations of waste materials or rubbish caused by his employees or work, and at the completion of the Work, he shall remove all his rubbish, tools, and surplus materials and shall leave his work "broom clean" or its equivalent.

**END OF SECTION**

**SECTION 01 60 00**

**MATERIAL AND EQUIPMENT**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Damage and restoration.

1.02 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Provide interchangeable components of the same manufacturer, for similar components.

C. Provide products that comply with the Contract Documents, that are undamaged and are unused at the time of installation.

D. Provide products complete with all accessories, trim, finish, safety guards and other devices and detail needed for a complete installation and for the intended use and effect.

E. Where products are specified by name or by manufacturer provide the product or manufacturer specified. No substitutions will be permitted unless made under the provisions of Section 01 25 00.

F. Where specifications only describe a product or assembly by listing exact characteristics required, provide a product or assembly that provides the characteristics.

G. Where specifications only require compliance with performance requirements, provide products that comply with those requirements.

H. Where the specifications only require compliance with an imposed code, standard or regulation, provide a product that complies with the standards, codes or regulations specified.

I. Where specifications require review and acceptance of a sample, the Engineer's decision will be final on whether a proposed product sample is acceptable or not.

1.03 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Schedule delivery to minimize long—term storage at site to prevent overcrowding of construction spaces.

C. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

D. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide offsite storage when site does not permit onsite storage.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid Condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

H. Prevent the discharge of pollutants to storm water from storage of materials onsite using best management practice techniques defined in Chapter 4 of the Construction Activity Handbook published by the Storm Water Quality Task Force.

1.05 PROTECTION

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.06 DAMAGE AND RESTORATIONS

A. Damage to existing or new work whether accidental or not shall be restored or replaced as specified and directed by Engineer.

B. Restoration shall be equal to structural performance of original work.

C. Finish shall match appearance of existing adjacent work.

D. Work not properly restored or where not capable of being restored shall be removed and replaced.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

**END OF SECTION**

**SECTION 01 70 00**

**PROJECT CLOSEOUT**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Adjusting.

D. Demonstration and Instructions.

E. Project Records Documents

F. Operation and Maintenance Data.

G. Warranties.

H. Spare Parts and Maintenance Materials.

1.02 RELATED SECTIONS

A. Contract General Conditions.

B. Section 01 71 23 - Field Engineering.

C. Section 01 50 00 - Construction Facilities and Temporary Controls.

D. Section 01 77 00 - Warranties.

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is completed in accordance with Contract Documents and ready for Engineer's inspection.

B. Provide submittals to Owner that are required by Contract Documents.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean site; sweep paved or concrete areas, rake clean landscaped surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 DEMONSTARTION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.07 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instructions for assembly, installation and adjusting.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances encountered or installed.
2. Field changes of dimension and detail.
3. Details not on original Contract Drawings.
4. As-built locations and elevations of installed surface improvements and installed underground facilities.
5. Where vertical elevations referenced to benchmark datum are shown on the plans, reference vertical locations of encountered or installed facilities to said datum. Where vertical information is presented in relative vertical location only, or is referenced to existing surface level, reference vertical locations of encountered or installed facilities to existing features or surfaces identifiable on the Construction Plans.

F. Record Drawings: At the Contractor's cost and as part of the Contractor's overhead expense, the Contractor shall transfer all changes, notations, etc., from the "Project Record" set to a set of bond copy drawings and submit them to the Engineer for the preparation of the record drawing.

G. Prior to the completion of the project, submit to the Engineer and inspector a completed bond copy set of "Project Record" for review and approval. When plans are approved as correct by the Engineer and inspector, a PDF copy of the plans are to be made on CD and supplied with the Record Drawings.

H. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor.

1.08 OPERATION AND MAINTENANCE DATA

Not Used

1.09 WARRANTIES

A. Provide per Section 01 74 00 - Warranties.

1.10 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

**END OF SECTION**

**SECTION 01 71 23**

**FIELD ENGINEERING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

A. Work included:

1. Provide field engineering for proper layout of the work and for recording the as-built location of the Work.

1.02 SECTION INCLUDES

A. Survey and Field Engineering.

B. Quality Control.

C. Submittals.

D. Project Record Documents.

1.03 RELATED SECTIONS

A. Construction Plans.

B. Contract General Conditions.

C. Section 01 70 00 - Project Closeout.

1.04 QUALITY CONTROL

A. Employ a Land Surveyor (or Registered Civil Engineer licensed for land surveying) licensed in the State of California, to perform survey work of this section.

1.05 SUBMITTALS

A. Submit name, address, and telephone number of Surveyor/Engineer before starting survey work.

B. Submit evidence of Engineer's and Surveyor's E&O insurance coverage ($100,000 minimum coverage) in the form of Insurance Certificates.

C. Report in writing and by drawings any significant inconsistency between field engineering and intent of construction plans.

1.06 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. Submit Record Documents under provisions of Section 01700 - Project Closeout.

1.07 EXAMINATION

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect/Engineer of any discrepancies discovered.

1.08 SURVEY REFERENCE POINTS

A. Contractor to locate and protect survey control and reference points.

B. Horizontal and vertical control datum for survey is that indicated on Drawings.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.09 SURVEY REQUIREMENTS

A. Provide field engineering services. Utilize recognized engineering survey practices.

B. Prior to construction, obtain location, elevation and outside dimension of intersecting utilities exposed (potholed) by the Contractor. Report findings to Owner's inspector for directions on possible grade changes on proposed facilities. Incorporate any directed changes into the construction staking.

C. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements; stakes for out lines, grading, fill placement, utility locations, slopes, invert elevations, surface and subsurface improvements, striping and marking, and all other proposed improvements.

2. Verify layouts by same means.

3. Measure and record as-built locations (horizontal and vertical) of all constructed features of the project.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

3.01 COORDINATION

A. Coordinate layout of all work to verify proper and adequate interface of work with existing improvements.

**END OF SECTION**

**SECTION 01 73 29**

**CUTTING AND PATCHING**

## PART 1 - GENERAL

1.01 SCOPE

A. Do all cutting, fitting or patching of existing construction and new work as may be required to make the several parts come together properly as shown or reasonably implied by the drawings and specifications for the work. Conduct work as directed by the Owner's Inspector and/or Engineer to achieve the intended work and degree of finish shown.

1.02 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of work.

1.03 RELATED SECTIONS

A. Section 01 10 00 - Summary of Work.

B. Section 31 11 00 - Clearing and Demolition.

## PART 2 - PRODUCTS

2.01 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of Section 01 25 00 —Substitutions.

## PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing work, assess conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

C. Maintain excavations free of water.

3.03 CUTTING AND PATCHING

A. Execute cutting, fitting, and patching including excavation and fill to complete work.

B. Fit products together, to integrate with other work or existing facilities.

C. Remove and replace defective or non-conforming work.

D. Remove samples of installed work for testing when requested.

3.04 GRINDING EXISTING ASPHALT - CONCRETE PAVEMENT

A. Remove existing asphalt-concrete pavement to the thickness and width as shown on the construction plans, utilizing cold planning equipment designed for such purpose.

B. Remove all loose grindings by sweeping or other approved methods

3.05 PERFORMANCE

A. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.

B. All out lines in existing pavement and concrete shall be straight and uniform, and alignment and location of cuts shall be approved in advance by the Owner's inspector.

C. Employ skilled installers to perform cutting and patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work to existing pipes, sleeves, ducts, conduit, and other improvements.

G. Refinish surfaces to match adjacent finish, except as otherwise indicated.

**END OF SECTION**

**SECTION 01 74 00**

**WARRANTIES**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. Contractor shall warranty that the Work done under this Project Manual will be free from faulty materials or workmanship and hereby agrees, upon receiving notification from the Owner or his Agent, to immediately remedy, repair or replace, without cost to the Owners and to Owner's entire satisfaction, all defects, damages or imperfections appearing in said work within a period of one (1) year unless specified otherwise, after date of final acceptance by the Owner of all work done under this Project Manual, regardless of whether or not the Owner or persons operating under contract with the Owner partially or wholly occupies any portion of the work prior to acceptance.

B. Warranties shall be in the form required by the Owner and shall be submitted in duplicate by the Contractor.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Contract General Conditions.

B. Division 1 and 2.

1.03 SUBMITTALS

A. Submit 2 copies of all manufacturers' or installer/applicator's warranties and bonds as specified within the Contract General Conditions and Divisions 1 and 2.

B. Submit to Engineer together with Project Record Documents.

C. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by—1 l-inch (l lS-by-280-mm) paper.

D. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.

E. Identify each binder on the front and Spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.

F. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

G. Accompany submittals with transmittal letter in duplicate.

H. When product submittals are required, submit copy of warranty with product submittal.

**PART 2- PRODUCTS**

Not Used

**PART 3- EXECUTION**

Not Used

**END OF SECTION**

DIVISION 2 – SITE WORK

**SECTION 31 11 00**
**CLEARING AND DEMOLITION**

## PART 1 - GENERAL

1.01 SCOPE

A. Sawcut and remove sidewalk, curb, gutter, ramp, slab valley gutter and asphalt concrete pavement structural section.

B. Remove vegetation.

C. Remove chain link fence fabric, post and concrete footings.

D. Work shall include the provision of all materials, equipment and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the work specified.

1.02 RELATED WORK

A. Section 31 22 00 – EARTHWORK EXCAVATION FILLING AND GRADING

1.03 REGULATORY REQUIREMENTS:

A. No burning shall be allowed.

B. Dispose of all material off-site in accordance with accepted safety standards prescribed by authorities having jurisdiction.

C. Obtain all necessary permits for transport and disposal of debris.

## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

3.01 DEMOLITION:

A. Remove existing pavement structural section at the areas as noted on the plans.

B. Remove vegetation, concrete improvements, signs, sign posts, footings, as shown on the plans.

C. Remove chain link fence fabric, post and concrete footings as shown on plan.

3.02 PROTECTION:

A. Protect existing improvement not designated to be removed.

B. Protect bench marks and existing work from damage or displacement.

C. Maintain designated site access for vehicle and pedestrian traffic.

3.03 DUST ALLEVIATION:

A. Contractor to be responsible for and shall provide pollution and dust abatement and control measures satisfactory to the owner continuously during the course of work.

3.04 CLEANUP AND REMOVAL:

A. Upon completion of clearing and stripping operations, the entire work site shall be cleaned of all construction debris, waste, and rubbish of any nature.

**END OF SECTION**

## SECTION 31 22 00

## EARTHWORK: EXCAVATION, FILLING, AND GRADING

### PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Excavating soil and other materials for surface improvements

B. Compaction of existing ground.

C. Placement of fill (if necessary)

D. Preparation of subgrade for other improvements.

E. Grading of soil.

1.02 RELATED SECTIONS:

A. Contract General Conditions.

B. Section 31 11 00 — Clearing and Demolition.

C. Section 31 05 13 — Soil Materials

D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications sections, apply to the work of this section.

1.03 REFERENCES:

A. ASTMD 1557.

1.04 COORDINATION:

A. Coordinate work with Owner personnel.

B. Verify that the location of existing utilities have been indicated at work site by utility authorities and University personnel.

1.05 EXISTING UTILITIES:

A. The Engineer has indicated on the plans the location of all known existing utility facilities within the work area. The location of said facilities shall be considered approximate only, until exposed by the Contractor.

B. Service laterals have been shown where information was available. The location of said facilities shall be considered approximate only, until exposed by the Contractor.

C. Contractor shall verify all utilities within the work area, including using hand method. Contractor shall protect all existing utilities not designated to be removed.

D. Maintain all existing utility mains and service lines in constant service during construction of the work.

1.06 PROJECT RECORD DOCUMENTS:

A. Accurately record actual locations of utilities encountered, provide as built information.

**PART 2 - PRODUCTS**

2.01 MATERIALS:

A. Fill in Turf or Other Planting Areas: Type A per Section 31 05 13 — Soil Materials.

B. Fill in Non-planting Areas: Type B or C per Section 31 05 13 — Soil Materials.

**PART 3 - EXECUTION**

3.01 EXAMINATION:

A. Verify site conditions.

3.02 PREPARATION:

A. Identify required elevation.

B. Locate, identify, and protect existing above and below grade utilities from damage.

C. Protect any existing improvement not authorized for removal.

3.03 EXCAVATION:

A. Excavate soil to finish subgrade of improvements or to finish surface grade where no improvements are to be placed thereon.

B. Conform excavation to the grades and cross-sections shown on the plans

C. When excavating through tree roots, perform work by hand and cut the roots, where authorized, with a saw.

D. Remove and stockpile excess soil not to be use as fill in the Work at the location

E. designated by the University, all at no additional costs to the Owner.

3.04 FILLING:

A. Clear all debris, vegetable matter and any other material from areas to receive fill, per Section 31 22 00

B. Compact existing ground to required relative compaction prior to placement of fill.

C. Place and compact soil to finish subgrade of improvements or to finish surface grade where no improvements are to be placed thereon.

D. Conform fill to grades and cross—section shown on the plans.

E. Any fill layers shall not exceed 0.67 foot in un-compacted thickness.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Compact fill materials per Section 31 22 00/3-05.

H. Provide imported soil materials conforming to Soil Type B per 31 02 13, as needed to attain finished grades of Work outside the limits of non-vegetative surface improvements.

I. Provide imported soil materials conforming to Soil Type C per 31 05 13, as needed to attain finished subgrade of Work within the limits of non-vegetative surface improvements.

3.05 COMPACTING:

A. Maintain optimum moisture content of materials to attain required compaction density.

B. Compact in layers not exceeding 0.67 foot in un-compacted thickness.

C. Obtain minimum 95% relative compaction of soil in areas to receive concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvements.

D. Obtain minimum 85% relative compaction of soil in areas to receive replacement sod, other replacement vegetation, or bare ground.

3.06 PREPARATION FOR SUBGRADE FOR SURFACE IMPROVEMENTS: (such as concrete, asphalt-concrete, aggregate base, and other non-vegetative surface)

A. Blade or disk the soil to a depth of 8 inches, and remove and dispose of (off the project site) all unsuitable material over 2.5 inches in size.

B. Thoroughly mix, water, roll, and compact to a relative compaction of no less than 95%.

C. Prior to commencing construction of surface improvements make sure no soft or spongy areas requiring repair.

D. Repair at no additional cost to the Owner, any soft, spongy, or otherwise unstable areas encountered in the subgrade, by removing the material and replacing it with acceptable materials.

E. Conform finished subgrade, grades shown on the plans.

3.07 FINE GRADING:

A. Fine grade all finished surfaces to grades shown on the plans.

B. Rake and smooth all finished surfaces not to receive surface improvements.

3.08 TOLERANCES:

A. Plus or minus 0.05 foot from planned elevation

3.09 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed as per Section 01 40 00 — Quality Control.

B. Compaction testing will be performed in accordance with ASTM D 1557.

C. If tests indicate work does not meet specified requirements, re-compact, or remove and replace, and retest.

END OF SECTION

**SECTION 31 23 16**
**TRENCH EXCAVATION AND BACKFILL**

## PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Excavating trenches, holes, and pits for constructing the work.

B. Backfilling and compaction pipeline or underground structure from bedding to subgrade or finish grade elevations

1.02 RELATED SECTIONS:

A. Division 01 —General Requirements.

B. Section 01 40 00 — Quality Control.

C. Section 01 50 00 — Construction Facilities and Temporary Controls.

D. Section 31 11 00 - Clearing and Demolition.

E. Section 31 05 13 — Soil Materials.

F. Section 31 22 00 — Earthwork: Excavation, Filling, and Grading.

G. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications sections, apply to the work of this section.

1.03 REFERENCES

A. ASTM D 1557.

1.04 COORDINATION:

A. Coordinate work with Owner personnel.

B. Verify that the location of existing utilities have been indicated at work site by Owner personnel.

1.05 EXISTING UTILITIES:

A. The Engineer has indicated on the plans the location of all known existing utility facilities within the work area. The location of said facilities shall be considered approximate only, until exposed by the Contractor.

B. Service laterals have been shown where information was available. The location of said facilities shall be considered approximate only, until exposed by the Contractor.

C. Contractor shall verify all utilities within the work area, including using hand method. Contractor shall protect all existing utilities not designated to be removed.

D. Maintain all existing utility mains and service lines in constant service during construction of the work.

**PART 2 - PRODUCTS**

2.01 FILL MATERIALS:

A. Backfill with native, suitable materials.

**PART 3 - EXECUTION**

3.01 PREPARATION:

A. Protect all improvement not authorized for removal.

B. Maintain and protect above and below grade utilities to remain.

C. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.

3.02 EXCAVATION:

A. Excavate soil required to locate existing utilities and install the work, use hand method as necessary in congested area.

B. Employ equipment and methods appropriate to the work site.

C. Cut trenches just wide enough to enable installation and proper backfill and do not interfere with 45 degree bearing splay of foundations. When excavating through tree roots, cut roots by hand.

D. Excavate trenches to provide the minimum cover required.

E. Excavate trenches, pits, or holes bottoming in hardpan to a minimum of 6 inches below the grade for the bottom of the pipe and any couplings.

F. In all trenches or excavation sites where a firm foundation is not encountered, such as soft, spongy, or otherwise unsuitable material, remove the material to a minimum of 12

inches, or to a depth determined by the Engineer, below the bottom of the proposed pipe or structure.

G. Stockpile excavated material to be returned to trench adjacent thereto in location, which will not be detrimental to existing improvements, or pedestrian or vehicular traffic. Remove unsuitable or excess materials not being used, from site.

3.03 BACKFILLING:

A. Backfill from bottom of the trench to pipe grade with Type B and C soil.

B. After installation of pipes and appurtenances and backfill of pipe bedding material.

C. Backfill trenches above pipe bedding material and to within 6 inches of finish subgrade with Type A, B, & C soils. Compact all soil backfill not exceeding 8 inches in uncompacted thickness. Maintain optimum moisture content of fill materials.

D. Backfill final 6 inch thickness to finish subgrade in areas to receive concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvement, with Type B or C soils.

E. Backfill final 6 inch thickness to finish subgrade in areas to receive sod, other vegetation, or bare soil with Type A soil.

F. Obtain 85 percent relative compaction of backfill from bottom of backfill to a level of 2 feet below finish subgrade, and obtain minimum of 95 percent relative compaction of backfill in top 2 feet below finish subgrade, in areas to receive concrete, asphalt-concrete, aggregate base, concrete, or other non-vegetative surface improvement.

G. Obtain minimum of 85 percent relative compaction of backfill in areas to receive sod, other vegetation, or bare soil.

3.04 TOLERANCES:

A. Top surface of Backfilling Under Paved or Concrete Areas: Plus or minus 0.05 feet from required elevations.

B. Top Surface of General Backfilling: As required surface to match adjacent improvements or ground.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 – Quality Control.

B. Compaction testing will be performed in accordance with ASTM D 1557.

C. If tests indicate work does not meet specified requirements, recompact, and retest.

3.06 PROGRESS AND PROSECUTION:

A. Backfill any excavation opened in any day on that same day.

END OF SECTION

**SECTION 31 31 00**
**SOIL STERLIZATION**

## PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Furnishing and installing soil sterilant under all new asphaltic-concrete pavement.

1.02 RELATED SECTIONS:

A. Section 31 22 00 — Earthwork.

B. Section 32 13 13 —Concrete Paving.

C. Drawings and general provisions of Contract, including General and Supplementary

D. Conditions and Division-01 Specifications sections, apply to the work of this section.

1.03 STANDARDS:

A. In accordance with the following:

| | |
|---|---|
| CCR-T21 | California Code of Regulations, Title 21 Public Works. |
| CBC | California Building Code, California Code of Regulations, Title 24, Part 2, CCR-T24. |
| USDA | United States Department of Agriculture. |
| EPA | Environmental Protection Agency. |

B. All applicable Environmental Regulations and Standards.

1.04 QUALITY ASSURANCE:

A. Provide licensed operator to apply soil sterilant.

B. All products shall comply with the current EPA laws at the time of application.

1.05 SUBMITTALS:

A. Certificates of application.

B. Certificates of compliance for material use.

## PART 2 - PRODUCTS

2.01 MATERIALS:

A. Soil Sterilant: Treflan, weed and grass preventer, or approved equal.

**PART 3 - EXECUTION**

3.01 EXAMINATION:

A. Verify that the site is ready for application.

3.02 PREPARATION:

A. Identify installation locations.

B. Employ equipment and methods appropriate to the work site.

3.03 APPLICATION:

A. Thoroughly water soak surface to be treated. Avoid excessive water runoff.

B. Apply sterilant solution over surface to be paved prior to application of asphalt-concrete.

C. Apply in spray form, at rate as allowable by State of California.

3.04 FIELD QUALITY CONTROL:

A. Field inspection will be performed per Section 01 40 00 — Quality Control.

END OF SECTION

**SECTION 32 13 13**

**CONCRETE PAVING**

## PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete base course and concrete surface course.

B. Concrete product is not specified in this Section. Refer to Section 03 30 04.

1.02 REFERENCES

A. ACI 305: Hot Weather Concreting.

B. ACI 306: Cold Weather Concreting.

C. APWA Plan No. 261: Manual of Standard Plans for Concrete Pavement Joints.

D. ASTM A 307: Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

E. ASTM C 39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

F. ASTM C 78: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).

G. ASTM C 150: Standard Specification for Portland Cement.

H. ASTM C 172: Standard Method of Sampling Freshly Mixed Concrete.

I. ASTM D 3549: Standard Tet Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

J. ASTM D 5249: Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement and Asphalt Joints.

K. ASTM E 950: Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference.

L. ASTM E 1274: Standard Test Method for Measuring Pavement Roughness Using a Profilograph.

1.03 SUBMITTALS

A. Before delivery.

1. Traffic control plan, Section 01 55 26.

2. Joint layout plan.

3. Curing plan. Describe method to prevent excessive concrete temperatures and water evaporation that could impair strength or serviceability of the concrete. Refer to ACI 305.
4. Proof of finisher's ACI certification.
5. Make and model name of paving machine.
6. Concrete mix design and number, Section 03 30 04.
7. Proof of profilograph calibration and profilograph operator certification.
8. Manufacturer's recommended installation procedures for joint sealing material which, when accepted by ENGINEER, will become the basis for accepting or rejecting actual installation procedures used in the Work.

B. At Delivery: Batch ticket, Section 03 30 10.

C. After delivery.

1. Profile deviation report.
2. Ride index report.
3. Upon ENGINEER's request, submit a written quality control inspections and testing report describing source and field quality control activities and test results performed by CONTRACTOR and CONTRACTOR's Supplier.

1.04 QUALITY ASSURANCE

A. Do not change concrete Supplier until ENGINEER accepts new source and new mix design.

B. Reject product that does not meet requirements of Section 03 30 04.

C. Remove product found defective after installation and install acceptable product at no additional cost to OWNER.

D. Foreman of paving crew has completed at least three (3) projects of similar size and nature.

1.05 WEATHER

A. Hot weather, ACI 305.

B. Cold weather, ACI 306.

1.06 NOTICE

A. Send written notice to residents and businesses within affected area at least 3 days before start of paving.

B. Indicate paving time and when new surface can be used.

C. Warn of potential vehicle tow away and other construction issues affecting neighborhood.

D. Should work not occur on specified day, send a new notice.

1.07 ACCEPTANCE

A. General:

1. Acceptance is by Lot. Lot size is specified below.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring material as part of its installation.
3. Section 01 29 00.
4. Dispute resolution, Section 01 35 10 and Section 03 30 05.
5. Opening a paved surface to traffic does not constitute acceptance.

B. Concrete Mix:

1. Testing Frequency: Section 03 30 05. Sample per ASTM C 172.
2. Temperature, Slump, Air: Lot size is 1 random batch. Reject noncomplying batches until 2 consecutive batches are compliant then continue in random batch testing for acceptance.
3. Strength: Lot is acceptable if strength test deviations are within pay factor 1.00 limits.
4. At ENGINEER's discretion, a Lot with a sub-lot test deviation greater than Reject may stay in place at 50 percent cost.

a) Compression: ASTM C 39. Lot size is 500 square yards.

| **Pay Factor** | **PSI Below 28 day Compressive Strength** |
|---|---|
| 1.00 | 0 |
| 0.98 | 1 to 100 |
| 0.94 | 101 to 200 |
| 0.88 | 201 to 300 |
| 0.80 | 301 to 400 |
| Reject | Greater than 400 |

b) Flexural: ASTM C 78. Lot size is 750 square yard.

| **Pay Factor** | **PSI Below 28 day Flexure Strength** |
|---|---|
| 1.00 | 0 |
| 0.95 | 1 to 29 |

| | |
|---|---|
| 0.85 | 30 to 60 |
| Reject | Greater than 60 |

C. Installation:

1. Placement, finishing and protection, Section 03 30 10.
   a) Verify grade, cross slope, finish and dimensions.
   b) No standing water in curb and gutter.
2. Thickness. Lot size is 1,000 square yards.
   a) Thickness will be determined on ASTM D 3549 cored or sawed specimens. Acceptance will be based on the average of all Lot thickness tests.

| **Pay Factors** | **Tolerance (inches less than specified thickness)** |
|---|---|
| 1.00 | 0.00 to 0.25 |
| 0.90 | 0.26 to 0.50 |
| 0.70 | 0.51 to 0.75 |
| 0.50 | 0.76 to 1.00 |

   b) When any thickness measurement is less than specified by more than 1 inch, the actual thickness of the Pavement will be determined by taking additional cores at intervals less than 10 feet parallel to the centerline in each direction from the affected location, until in each direction a core is found which is not deficient by more than 1 inch. Exploratory cores for deficient thickness will not be used in averages for price adjustments.
   c) Payment may be made for areas deficient in thickness by more than 1 inch at 50 percent. If not, remove and replace.
   d) Price adjustments and Pavement removal will be applied only to those areas showing the deficient thickness which is defined by an additional set of cores taken at the 100 percent pay point as determined in a straight line basis between the original cores. If the second set of cores is deficient, the area will be defined on a straight-line basis using all scores for the different pay factors.
3. Roughness: “Must grind” bumps are removed and tolerance for profile roughness index is not exceeded.

## PART 2 - PRODUCTS

2.01 CONCRETE

A. Compression Design:

1. Cast-in-place: Class 4000, Section 03 30 04.
2. Slump per accepted mix design.

B. Flexure Design.

1. Tensile Strength: 650 psi per ASTM C 78.
2. Cement Content: 6.5 bags.
3. Water Cement Ratio: 0.44 maximum by weight (prior to pozzolan exchange), ACI 318.
4. Entrained Air: 5 to 7 percent, ASTM C 231 (pressure).
5. Slump per accepted mix design

2.02 POLYPAVEMENT

A. See manufacturer's specifications for Mud and Dust Prevention Application.

2.03 MISCELLANEOUS MATERIALS

A. Reinforcement: Grade 60 ksi galvanized or epoxy coated steel, Section 03 20 00.

B. Hook Bolts: Steel, ASTM A 307 Grade A nuts and bolts, internally and externally threaded.

C. Expansion Joint Filler: F1 sheet, Section 32 13 73.

D. Contraction Joint Filler (Backer Rod): Type 1 round, closed cell, ASTM D 5249.

E. Contraction Joint Sealant: HAS1, HAS4, or CAS6, Section 32 13 73.

F. Curing Compound: Liquid membrane, Section 03 39 00.

G. Bond Breaker: Wax based compound.

H. Grout: Epoxy adhesive, Section 03 61 00.

I. Evaporative Reducer: Water-based mono-molecular polymer liquid at application rates recommended by the manufacturer. Not to be used as a finishing aid.

## PART 3 - EXECUTION

3.01 PREPARATION

A. General:

1. Coordinate utility location, Section 01 31 13. Contact utility companies and other agencies, for dangerous concentration of combustible, flammable, or explosive matter.
2. Lower Street Fixtures if paving machine is not capable of passing over fixtures.
3. Coat surface of Street Fixtures with oil to prevent bond with concrete Pavement.
4. Remove sand, leaves and other objectionable materials prior to placing the paving course.
5. Notify ENGINEER minimum 24 hours prior to commencement of concreting operations.

B. Trees, Plants, Ground Cover:

1. Protect trees, plants and other ground cover from damage.
2. Prune trees, Section 32 01 93 to allow equipment passage underneath. Repair tree damage at no additional cost to the OWNER.

C. Traffic Control:

1. Provide worker and public safety, Section 01 55 26.
2. Apply temporary traffic and lane marking tape or paint after placement layout has been verified with ENGINEER.

D. Base Course:

1. Follow Section 31 25 00 for herbicide treatment.
2. Verify base course is placed to grade, compacted and dampened.
3. If indicated, apply prime coat, Section 32 12 13.

E. Cement Treated or Lean Concrete Base: Remove loose material from surface of cement treated or lean concrete base course immediately before placing concrete surface course. Moisten the surface but do not place concrete over puddled water. Apply a double coat of bond breaker prior to placing surface concrete.

F. PolyPavement:

1. See manufacturer's specifications for Mud and Dust Prevention application instructions.

3.02 FORM CONSTRUCTION

A. Section 03 11 00.

B. Check formwork for grade and alignment variance from the following tolerances:

1. Top of forms not more than 1/4 inch from true grade.

2. Vertical face on longitudinal axis not more than 1/4 inch from true line.

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

3.03 REINFORCEMENT PLACEMENT

A. Section 03 20 00.

B. Interrupt reinforcement at expansion joints.

C. Use load transfer bars on longitudinal construction and transverse construction joints.

D. Use smooth dowel in expansion joints.

E. Keep load transfer bars and dowels in vertical center of concrete and perpendicular to the joint during concrete placement.

F. Position mats on bar chair supports and properly tie before any concrete is poured. Keep mats clean, free from rust, flat, and free of distortions. Straighten bends, kinks, and other irregularities or replace units before concrete placement. Provide a minimum of 2 inch overlap to adjacent mats.

3.04 JOINTS

A. General:

1. Review joint layout with ENGINEER.

2. Follow Section 32 13 73 requirements.

3. Follow joint requirements in APWA Plan No. 261.

B. Construction Joint: Construction joints (contact joints) (cold joints) are those made by placing concrete against cured concrete.

1. The contact joint between separately laid lanes cannot deviate from a true line by more than 1/4 inch in any direction at any point.

2. Tie both sides of longitudinal and transverse construction joints together with tie bars or key-way. Before placing concrete in adjoining slab, straighten tie bars to 0.1 feet of straight position.

3. Do not cause edge slump when placing tie-bars or by over-working edge of slab.

C. Contraction Joints: Contraction joints (crack control joints) are scorelines made to force crack joint locations in concrete. Keep a minimum of 3 working power saws on the Project when concrete operations are underway. Saw all joints before uncontrolled shrinkage cracking takes place. Do not tear or ravel concrete during sawing.

1. Joint spacing measured in feet = twice the slab thickness measured in inches or a maximum of 15 feet.

2. Joint Depth = T/3.
3. Use of a mechanical control joint-void former in lieu of saw cutting or tooling is acceptable.
4. Longitudinal Joints: Make longitudinal joints the same dimension as transverse joints.
5. Make transverse joints across width of the Pavement full length and meet curb and gutter joints.
6. Leave forms in place until paving operations are resumed on the other side of the joint.

D. Volunteer Crack Joint:
1. If a volunteer crack joints falls within 5 feet of the location of proposed contraction joint, omit the contraction joint.
2. Rout volunteer crack joints to a 1-1/4 inch depth by 3/8 inch width. Clean and fill crack joint with backer rod and joint sealant.
3. When crack joints occur within 2 feet of expansion or construction joints, replace panel. Use saw cuts and tie-bars or dowels in cut planes.

E. Expansion Joints:
1. If a deformed rebar is used in an expansion joint, provide sleeve for movement.
2. Secure fillers to prevent movement. When butted together, do not leave voids or gaps between filler units.
3. Set joint fillers full depth if no joint sealant is specified.
4. Recess joint fillers if backer rods and joint sealant are specified or provide a plastic cap.

F. Joint Sealing: Section 32 13 73.

G. If CONTRACTOR chooses to open the roadway to construction or public traffic prior to final sawing and sealing, install backer rod in the initial (green) cut to prevent entrance of incompressibles.

3.05 CONCRETE PLACEMENT

A. Section 03 30 10.

B. At the beginning of concrete placement, test slump and air. If corrections are necessary, placement may proceed after 2 subsequent and consecutive batches pass testing.

C. Any delay in excess of 15 minutes from placing to start of finishing operations is cause for stopping placement work.

D. Do not place concrete until concrete sub base and surface course forms have been checked for line and grade. Moisten sub base if required to provide a uniform dampened condition at time of concrete placement. Do not place concrete around Manholes or other structures until they are at required finish elevation and cross-slope.

E. Prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

F. Do not place concrete in a longitudinal section until test specimens from the adjacent lane have attained an ASTM C 78 flexural strength (modulus of rupture) of 450 psi.

G. Deposit and spread concrete in a continuous operation between transverse joints. If interrupted for more than 1/2 hour, place a construction joint.

H. Place the concrete to the full width of the Pavement in a single construction operation unless indicated otherwise.

3.06 FINISHING

A. Section 03 35 00.

B. Any delay in excess of 30 minutes for completing the finishing operation is cause for stopping concrete placing to correct the difficulties.

C. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

D. After floating, test slab for trueness with a straight edge. Distribute concrete as required to remove surface irregularities. Refloat repaired areas to provide a continuous smooth finish.

E. Round edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool. Eliminate tool marks.

F. Surface Texture: After floating when excess moisture or surface sheen has disappeared.

1. For speed less than 45 mph: 1/16 inch deep burlap drag, turf drag, or broom.

2. For speed greater than 45 mph: 1/8 inch deep groove placed 80 degrees to center line and randomly spaced between 3/8 and 1-1/2 inches.

G. Do not remove forms for at least 24 hours after concrete has been placed. After form removal, clean ends of joints and patch any minor honeycombed areas. Remove and replace areas or sections with major defects.

H. PolyPavement:

1. See manufacturer's specifications for Mud and Dust Prevention application instructions.

3.07 CURING

A. Section 03 39 00.

B. Type II Class A or B (white pigmented) membrane forming compound applied in two directions for total white coverage on all exposed surfaces after texturing.

C. Eliminate thermal shock of concrete by keeping cure temperature close to ground and air temperature.

3.08 TOLERANCES

A. Grade: 1/8 inch in 10 feet parallel to centerline.

B. Cross Slope: 1/4 inch in 10 feet perpendicular to centerline except at cross section grade breaks.

C. Thickness: Not less than 1/4 inch deficient.

D. Roughness:

**Table 1 – Roughness Tolerance**

| **Speed and Traffic Class** | | **Profile Roughness Index, (PRI) Inches / Mile** | | | | **Profile Deviation Inches/25 feet Maximum** |
|---|---|---|---|---|---|---|
| | | **IRI** | | **PI** | | |
| | | **Min** | **Max** | **Min** | **Max** | |
| 0 to 29 mph | I or II | – | – | – | – | 0.4 |
| | III or IV | 129 | 177 | 46 | 66 | 0.4 |
| 30 to 44 mph | I or II | 90 | 115 | 35 | 50 | 0.4 |
| | III or IV | 70 | 90 | 21 | 35 | 0.4 |
| 45 mph + | All Classes | – | 70 | – | 21 | 0.3 |

NOTES

(a) Use a zero blanking band.

(b) As a minimum, trace right wheel path in direction of travel

(c) Traffic class defined in Table 3, Article 32 12 05.

(d) IRI (International Roughness Index), ASTM E 950

(e) PI (Profile Index), ASTM E 1274 .

1. Profile Deviation: Begin traces 50 feet before edge of new pavement and end traces 50 feet after edge of new pavement. Areas exceeding profile deviation tolerance are "must grind" areas.
2. Profile Roughness Index: (PRI)
    a) Lot is 0.1 lane mile (528 feet long one lane wide). Add segments shorter than 250 feet to preceding Lot. Treat partial segments longer than 250 feet as a Lot.
    b) Exclude from the Lot are turn lanes, parking lanes, medians, Street Fixtures, crowns of intersecting streets, bridge decks, grades greater than 8 percent, and vertical curves less than 1,000 feet radius (including super-elevation transitions).

3.09 OPENING TO TRAFFIC

A. Not less than 3,000 psi compressive or 400 psi flexure strength.

3.10 PROTECTION AND REPAIR

A. General: All expenses are at no cost to OWNER.

B. Protection: Section 03 30 10 and as follows.

1. Do not allow steel wheel rollers or steel wheel vehicles on the concrete Pavement. Keep traffic and construction equipment off at least 10 days after concrete placement or until 100 percent of the design strength has been achieved and verified by either
    a) Maturity meter.
    b) Concrete cylinders.
2. If construction traffic is permitted, keep Pavement clean. Remove surface stains and spillage of materials as they occur.
3. Remove saw-cut dust immediately. Protect neighborhood, storm drains and down-stream fish habitat.

C. Repair: Section 03 30 10.

1. Corrective Action for "Must Grinds": Grinding per Section 02 41 14 is acceptable after concrete cure.

2. Corrective Action for Profile Roughness Index: Grinding is acceptable. Re-profile corrected segments to verify ride index meets tolerance.
3. Corrective Action for Cracks: Consider repair options published in Guidelines by the American Concrete Pavement Association (ACPA). Do not begin corrective work until ENGINEER agrees with repair option. Drill test cores when necessary to determine magnitude. Fill holes with Portland cement concrete bonded to Pavement with epoxy adhesive.

END OF SECTION

**SECTION 32 16 00**

**SITEWORK CONCRETE**

## PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included: Provide all cast-in—place concrete for all site work concrete including sidewalks, curb, gutter and valley gutter, complete, in place, as indicated on the Drawings, specified herein.

1.02 QUALITY ASSURANCE:

A. Codes and Standards:

1. Comply with applicable provisions of the following codes and standards:

a) American Society for Testing and Materials (ASTM): The specifications and standards hereinafter referred to, are the latest editions, except when year is specified.

A615 Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

C94 Standard Specification for Ready-Mixed Concrete

C171 Standard Specification for Sheet Materials for Curing Concrete

C173 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method

C231 Air Content of Freshly Mixed Concrete by the Pressure Method

C309 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete

D1751 Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural construction (Non-extruding and Resilient Bituminous types).

D1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

D1850 Concrete Joint Sealer, Cold Application Type

b) American Association of State Highway and Transportation Officials (AASHTO) Publication: M182-60 1974) Burlap Cloth made from jute or Kenaf.

c) Provisions of California Code if Regulations, Title 24 is applicable to the work. When requirements of such codes are at variance with requirements specified in foregoing paragraph, the provisions of California Code of Regulations 24 shall take precedence.

d) Caltrans Standard Specifications.

B. Qualifications of Installer:

1. Throughout the progress of installation of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this Section.

2. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents.

3. In acceptance or rejection of work performed under this Section, the Architect will make no allowance for lack of skill on the part of the workmen.

**PART 2 - PRODUCTS**

2.01 MATERIALS:

A. Caltrans Class “A” Concrete:

1. Concrete shall be designed per Caltrans Standard Specifications, Section 90: Portland Cement Concrete.

2. Minimum compressive strength of 2,500 psi at 28days.

B. Concrete Curing Materials:

1. Burlap: AASHTO M182 having a weight of 14 ounces or more per square yard when dry.

2. Impervious Sheeting: ASTM C171.

3. Liquid Membrane Curing Compound: ASTM C3 09, Type 2. Compound shall be free of paraffin or petroleum.

C. Joint Materials:

1. Expansion Joint Fillers: ASTM D1751 or ASTM D1752.

2. Joint Sealers: ASTM D1850.

D. Aggregate Base: The aggregate base material should conform to Class 2 Aggregate Base as outlined in Section 26-1.02A of the State of California, Department of Transportation, Standard Specifications.

E. Class 2 Aggregate Base: Aggregate for Class 2 aggregate base shall be free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

Aggregate Grading Requirements

3/4 inch maximum

| Sieve Size | Percent Passing |
|---|---|
| 2" | - |
| 1-1/2 " | - |
| 1" | 100 |
| 3/4 " | 90-100 |
| No. 4 | 35-60 |
| No. 30 | 10-30 |
| No. 200 | 2-9 |
| Tests | |
| Resistance (R-value) | 78 Min |
| Sand Equivalent | 22 Min |
| Durability Index | 35 Min |

F. Sidewalk, Ramp and Driveway Forms: Shall be of wood or steel, straight of sufficient strength to resist springing during depositing and consolidating concrete, and of a height equal to the full depth of the finished sidewalk. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet, with a minimum of three stakes per form, at maximum spacing of 4 feet. Comers, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4- inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form Spreaders, and fillers. Forms shall have a

nominal length of 10 feet, with a minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms.

G. Curb , Gutter, Forms: shall be of wood or steel, straight, and of sufficient strength to resist springing during depositing and consolidating the concrete. The outside forms shall have a height equal to the full depth of the curb or gutter. The inside form or curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Straight forms of wood shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Wood forms shall have a nominal length of 10 feet, with a minimum of three stakes per form, at maximum spacing of 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Forms shall have a nominal length of 10 feet, with minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms. Rigid forms shall be provided for curb, returns, except that benders of thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2-inch benders, for the full height of the curb, cleated together.

1. Reinforcing Steel: ASTM A615, Grade 60.

**PART 3 - EXECUTION**

3.01 SUBGRADE PREPARATION:

A. General: The subgrade shall be constructed true to grade and crosss section.

B. Sidewalk Subgrade: The subgrade shall be thoroughly wetted and then compacted with two passes of a 500-pound roller to obtain a relative compaction of 95%. Yielding material deflecting more than 1/2 inch under the specified roller shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with an approved granular material. The material shall be then be compacted as described above. The completed subgrade shall be tested for grade and cross

section with a template extending the full width of the sidewalk and supported between side forms.

C. Curb, Gutter and Valley Gutter Subgrade: The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent roadway and shall be placed and compacted to conform with applicable requirements. the subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter.

D. Maintain of Subgrade: The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

E. Install new electric pull boxes per manufacturer's instructions where existing boxes were removed.

3.02 FORM SETTING:

A. Sidewalk: Forms for sidewalks shall be set with the upper edge true to line and grade and shall be held rigidly in place by stakes placed at intervals not to exceed 4 feet. After forms are set, grade and alignment shall be checked with a 10- foot straightedge. Forms shall conform to line and grade with an allowable tolerance of of 1/8 inch in any 10-foot long section. Forms shall be coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory. Side forms shall not be removed for less than 12 hours after finishing has been completed.

B. Curb, Gutter and Valley Gutter: Forms for curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb. Forms shall be held rigidly in place by the use of stakes placed at intervals not to exceed 4 feet. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. The forms on the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.03 CONCRETE PLACER/TENT AND FINISHING:

A. Sidewalks:

1. Placing: Concrete shall be placed in the forms in one layer of such thickness that when compacted and finished the sidewalk will be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be tamped and consolidated with a suitable wood or metal tamping bar, and the surface shall be finished to grade with a wood float. Finished surface of the walk shall not vary more than 3/16—inch from the testing edge of a 10-foot- straightedge. Irregularities exceeding the above shall be satisfactorily corrected. The surface shall be divided into rectangular areas by means of contraction joints spaced at not more than 5 feet on centers.

2. Concrete Finishing: After straight edging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. The final finish equivalent to a medium broom finish.

3. Edge and Joint Finishing: All slab edges, including those at formed joints, shall be finished carefully with an edger having a radius of 1/8-inch. Comer and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

4. Contraction Joints: The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove.

5. Expansion Joints: Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated or at intervals of not less than 30 or more than 50 feet. Transverse expansion joints shall be filled with l/2-inch joint filler strips. Joint filler shall be placed with top edge l/4-inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of l/8-inch, and concrete over the joint filler shall be removed. Expansion joints shall be formed about structures and features that project through or into the

sidewalk pavement, using joint filler of the type, thickness, and width indicated. The filler shall be installed in such manner as to form a complete, uniform separation between the structure and sidewalk pavement. At the end of the curing period, expansion joints shall be carefully cleaned and filled with joint sealer. Concrete at the joint shall be surface dry, and the atmospheric and pavement temperatures shall be above 50°F at the time of application of joint-sealing materials. Joints shall be filled flush with the concrete surface in such manner as to minimize spilling on the walk surface. Spilled sealing material shall be removed immediately and the surface of the walk cleaned. Dummy groove joints shall not be sealed.

6. Surface Uniformity: The completed surface shall be uniform in color and free of surface blemishes and tool marks.

B. Curb, Gutter and Valley Gutter:

1. Placing: Concrete shall be placed in layers not to exceed 6 inches. Concrete shall be thoroughly consolidated by tamping and spading or with approved mechanical Vibrators.

2. Concrete Finishing: The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of l/2-inch and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float. Except at grade changes or curves, finished surfaces shall not vary, from the testing edge of 10-foot straightedge, more than 1/8 inch for gutter and entrance and 1/4 inch for top and face of curb. Irregularities exceeding the above shall be satisfactorily corrected. Visible surfaces and edges of finished curb and gutter shall be free of blemishes and form and tool marks, and shall be uniform in color, shape, and appearance.

3. Joints: Expansion joints and contraction joints shall be constructed at right angles to the line of curb and gutter.

   a) Contraction Joints: Contraction joints shall be constructed by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and

gutter. Contraction joints shall be constructed directly opposite contraction joints in abutting Portland-cement concrete pavement. Where curb and gutter do not abut Portland-cement concrete pavements, contraction joints shall be so placed that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint. Separators shall be removed prior to finishing.

b) Expansion Joints: Expansion joints shall be formed by means of preformed expansion—joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb at the end of all returns. Expansions joints shall be provided in curb and gutter directly opposite expansion joints of abutting Portland Cement concrete pavement and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut Portland cement concrete pavement, expansion joints at least l/2-inch in width shall be provided at intervals not exceeding 45 feet. Expansion joints shall be provided in non-reinforced concrete gutter at locations indicated.

3.04 CURING AND PROTECTION:

A. Curing: Immediately after the finishing operations, exposed concrete surfaces shall be cured by one of the following methods as the Contractor may elect.

1. Mat Method: The entire exposed surface shall be covered with two or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

2. Impervious Sheeting Method: The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18 inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or by placing a bank of moist earth along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3. Membrane-Curing Method: The entire exposed surface shall be covered with a membrane-forming curing compound. Where type 1 curing compound is used, the

concrete surface shall be shaded from the direct rays of the sun during the curing period. Curing compound shall be applied in two coats by hand-Operated pressure Sprayers at a coverage of approximately 400 square feet per gallon for each coat. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects. Concrete surfaces that are subjected to heavy rainfall within 3 hours after curing compound has been applied shall be re-sprayed by the above method and at the above coverage at no additional cost to the Owner. Expansion-joint openings shall be sealed at the top by inserting moistened paper or fiber rope or covering with strips of waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action that might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction Operations within the 7-day curing period shall be re—sprayed as specified above at no additional expense to the Owner.

B. Backfilling: After curing, debris shall be removed, and the area adjoining the sidewalk shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

C. Protection: Completed sidewalk shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Sidewalk that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.05 ROCK POCKETS:

A. Immediately upon stripping curb forms and prior to backfill all rock pockets or honeycombs shall be repaired to the satisfaction of the Architect.

3.06 CLEANING-UP:

A. During the progress of the work as may be requested by the Architect and before acceptance and final payment, the Contractor shall remove all surplus earth and other surplus material from the site of the work and then complete the cleanup by sweeping or

washing the work area and leave the whole area in a neat and finished condition within two weeks after the concrete work has been completed.

END OF SECTION

**SECTION 32 17 23**

**PAVEMENT MARKINGS**

## PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Paints for Pavement striping.

B. Words and other markings in paint or plastic film.

C. One or two-way prismatic reflectors for Pavement marking.

1.02 REFERENCES

A. AASHTO M 237: Standard Specification and Recommended Practice for Epoxy Resin Adhesive for Bonding Traffic Markers to Hardened Concrete.

B. AASHTO M 247: Standard Specification for Glass Beads Used in Traffic Paint.

C. AASHTO M 248: Standard Specification for Ready-Mixed White and Yellow Traffic Paints.

D. AASHTO M 249: Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form).

E. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.

F. ASTM E 303: Standard Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

G. FS L-S-300: Sheeting and Tape, Reflective: Nonexposed Lens.

H. Federal Standard 141: Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling, and Testing.

I. Federal Standard 370: Instrumental Photometric Measurements of Retroflective Materials and Retroreflective Devices.

J. MUTCD: Manual on Uniform Traffic Control Devices for Streets and Highways.

1.03 SUBMITTALS

A. Specifications of primer to be used for tape applications.

B. Manufacturer's affidavit certifying paint products meet or exceed material requirements of this section.

C. Sample of prismatic reflector to be used along with manufacturer's statement of the reflector's minimum reflective area and specific intensity at the 0.2 degree observation angle.

D. Manufacturer's recommendation for type of epoxy to be used when installing prismatic reflectors and markers.

E. Samples of each thermoplastic or preformed plastic Pavement markings along with a statement of how the materials will be applied.

**PART 2 - PRODUCTS**

2.01 ALKYD RESIN PAINT

A. White or yellow Type F (Fast dry) ready-mixed, AASHTO M 248.

2.02 THERMOPLASTIC PAINT

A. White or yellow, AASHTO M 249.

2.03 GLASS BEADS

A. Type 1, AASHTO M 247.

2.04 REFLECTIVE TAPE

A. Type II white or yellow with a Class 1 (pressure-sensitive) adhesive, FS L-S-300.

2.05 PREFORMED PLASTIC FILM MATERIALS

A. Film: A retroflective pliant polymer with white or yellow pigments selected and blended to conform to standard highway colors throughout the expected life of the film and glass beads distributed throughout its base cross-sectional area, with a reflective layer of beads bonded to the top surface and composed of the following materials.

| **Materials** | **Minimum Percent By Weight** |
|---|---|
| Resing and Plasiticizers | 20 |
| Pigments and Extenders | 30 |
| Graded Glass Beads | 33 |

1. Type 1: Subjected to high traffic volume and severe wear conditions such as repeated shear action from crossover, encroachment on edge and channelization lines, and stop, start, or turn movements.
    a) Class 1: Without precoated adhesive, for application with epoxy cement.
    b) Class 2: With precoated pressure sensitive adhesive.
2. Type 2: Subjected to lower traffic volumes and less severe wear action such as most highway edge lines, markings on rural highways, lane lines in well-channelized areas and transverse and word/symbols subjected primarily to free rolling traffic.
    a) Class 1: Without precoated adhesive, for application with epoxy cement.
    b) Class 2: With precoated pressure sensitive adhesive

B. Tensile Strength: Sample 6 x 1 x 0.06 inches at a temperature between 70 deg. F. and 80 degrees F using a jaw speed of 10 inches to 12 inches per minute tested per ASTM D 638 requirements.

1. Type 1: 150 pounds per square inch of cross-section.
2. Type 2: 40 pounds per square inch of cross-section.

C. Elongation: 75 percent minimum at break when tested per ASTM D 638 requirements using a Sample 6 x 1 x 0.06 inches at a jaw speed of 10 inches to 12 inches per minute.

D. Skid Resistance: Initial minimum skid resistance values are 35 BPN as measured by the British Portable Skid Test, ASTM E 303 requirements.

E. Reflectance: Minimum reflectance values at 0.2 degrees and 0.5 degrees observation angles and 86.0 degrees entrance angle as measured per the testing procedures of Federal Standard 370.

| **Film Type** | **Observation Angles** | | | |
|---|---|---|---|---|
| | **White** | | **Yellow** | |
| | **0.2** | **0.5** | **0.2** | **0.5** |
| Type 1: SL (mcd/sf/fc) | 550 | 380 | 410 | 250 |
| Type 2: SL (mcd/sf/fc) | 960 | 760 | 680 | 510 |

1. The photometric quantity is measured in specific luminance (SL),and expressed as millicandelas per square foot per foot candle (mcd/sf/fc).
2. Use a test distance 50 feet and a Sample size of 2. x 2.5 feet.
3. Use an angular aperture of both the photoreceptor and light projector of 6 minutes of arc.
4. The reference center is the geometric center of the Sample, and the reference axis is taken perpendicular to the test Sample.

F. Film Reflectivity Retention: Not more than 15 percent of the beads lost due to popout and the predominate mode of Failure is "wear down" of the beads, when subjected to 200 cycles of a Taber Abraser Simulation test using an H-18 wheel and 125 gram load.

G. Thickness: 0.06 inch without adhesive.

H. Effective Performance Life: The film, when applied according to the recommendations of the manufacturer, will provide a neat, durable marking that will not flow or distort due to temperature if the Pavement surface remains stable. Although reflectivity is apply wear, the pliantpolymer will provide a cushioned, resilient substrate that reduces bead crushing and loss. Use a film that shows no appreciable fading, lifting, or shrinkage throughout the useful life of the marking, and shows no significant tearing, roll back, or other signs of poor adhesion.

I. Abrasion Resistance: Use a material that when tested will not wear through to the conformable backing surface in less than 5,000 cycles when tested per Federal Standard 141, Method 6192, using a CS-17 wheel and a 1,000 gram load.

J. Acid Resistance: Use a material that will show resistance to etching, hazing, or delamination of bead surface after exposure to a 1 percent solution of sulfuric acid.

2.06 PRISMATIC REFLECTORS

A. Unless indicated otherwise, provide single lens snowplow resistant automatic skip control reflectors of the color indicated.

1. With a cast iron housing and acrylic prismatic reflector.

2. With an overall size not less than 9 inches long, 5 inches wide, and 1-3/4 inch thick with a 7/16 inch maximum projection above the roadway.

3. With a minimum reflective area of 1.6 square inches per face.

B. Reflector Specific Intensity:

| | **Intensity at 0.2 Degree Observation Angle** | |
|---|---|---|
| **Color** | **0 Degree Entrance Angle** | **20 Degree Entrance Angle** |
| White | 3. | 1.2 |
| Yellow | 1.8 | 0.72 |

2.07 2.7 EPOXY ADHESIVE

A. Epoxy, AASHTO M 237 requirements and as recommended by the manufacturer of the reflector. Provide a minimum adhesion value of 1.1 pounds per inch width.

**PART 3 - EXECUTION**

3.01 CONSTRUCTION EQUIPMENT

A. Use equipment manufactured for Pavement marking. Use workers experienced in operating such equipment.

B. Use equipment capable of applying a strip, or strips with a width tolerance of plus or minus 1/4 inch. Equip the machine with an giving a 10 feet long marked segment and a 30 feet long gap within a linear tolerance of 6 inches over that cycle.

C. If applying glass beads, locate bead applicator directly behind and synchronized with marking applicator.

D. For thermoplastic paint materials, use equipment that is designed to agitate the paint to prevent scorching, discoloration, or excessive high temperatures.

3.02 PREPARATION

A. Broom or flush the surface to remove dirt, loose stones, or other foreign material immediately prior to applying.

B. Prior to applying, mark roadway between control points established by ENGINEER. ENGINEER will establish points on tangent at least every 100 feet and at 25 feet long intervals on curves. Maintain the line within 1 inch of the established control points. ENGINEER may also designate other Pavement striping locations such as stop bars, crosswalks, zebra striping, etc.

C. Markings that adhere to asphalt concrete or Portland cement concrete by either a pressure sensitive precoated adhesive or an epoxy cement shall mold to the Pavement contours by traffic action at normal Pavement temperatures and shall be ready for traffic immediately after application.

D. Begin Pavement painting and marking operations not later than 24 hours after receipt of written order by ENGINEER.

E. Apply striping and markings per MUTCD requirements.

F. Apply all materials in accordance with manufacturer's and ENGINEER's directions.

3.03 APPLICATION

A. Apply Pavement paintings and markings only when Pavement surface is dry and air temperature is above 40 deg. F. during daylight hours.

B. Do not apply paints and markings when rain is anticipated within 12 hours.

3.04 ALKYD RESIN PAINT STRIPING

A. Adjust Pavement striping machine to apply paint at rate recommended by paint manufacturer.

B. Glass Bead Application Rate: 5.9 to 6.1 pounds per gallon of paint.

C. Protect the markings until dry by placing approved guarding or warning device wherever necessary. Remove any markings not authorized or smeared or otherwise damaged, or correct as approved by ENGINEER.

3.05 THERMOPLASTIC PAINT STRIPING

A. Clean off dirt, glaze, and grease before prestriping.

B. Prestripe the application area with a binder material that will form, when sprayed, a continuous film over the Pavement surface, and will dry rapidly and mechanically adhere to the Pavement surface. Install the material in varying widths if indicated.

C. Extrude the thermoplastic material at a temperature of 412 plus or minus 12 deg. F. from approved equipment to produce a line 1/8 inch to 3/16 inch thick, continuous and uniform in shape, and have clean and sharp dimensions.

D. Do not use material which produce fumes that are toxic, obnoxious, or injurious to persons or property.

E. Apply so that finished lines have well-defined edges free of waviness.

F. Glass Beads Application Rate: 6 pounds of glass beads to every 100 square feet of marking.

3.06 TAPE STRIPING

A. Apply Pavement marking tape as indicated or directed. ENGINEER will establish control points.

B. Apply the tape only on surfaces that are dry and free of oils, grease, dust and dirt, and primed at the rate of approximately 1 quart per 60 feet with an approved primer material.

C. Maintain the line on established control points. Apply intermittent Pavement marking tape 24 inches long, spaced approximately 100 feet on tangents, and approximately 25 feet on curves unless otherwise directed. The ENGINEER will designate other Pavement striping locations such as stop bars, crosswalks, zebra striping, etc.

D. Press down the tape immediately after application until it adheres and conforms to the surface of the Pavement.

E. Completely remove all tape on sections where tape conflicts with revised traffic lanes prior to opening new lanes to traffic.

3.07 PAVEMENT MARKING FILMS

A. Use Pavement marking films that are capable of being applied to new, dense, and open-graded asphalt concrete wearing courses during the paving operation in accordance manufacturer's instructions, and that are capable of conforming to Pavement contours through the action of traffic at normal Pavement temperatures.

B. Use a Pavement marking film that is capable of use for patching worn areas of the same type film.

C. Apply before traffic is allowed on the freshly paved surface.

D. Unless indicated otherwise, provide Type C, Class II, polymer film markings in specified widths and shapes. Provide and layout words and marking symbol configurations per MUTCD requirements and as indicated.

E. When indicated, inlay the markings in fresh asphalt surface by a compaction roller during the paving operation.

F. Apply all markings in accordance with manufacturer's recommendations.

3.08 PRISMATIC REFLECTOR INSTALLATION

A. Install reflectors by cutting Pavement and partially filling cut area with epoxy adhesive. Place reflector housing in the adhesive and apply pressure to properly seat. Allow epoxy to completely set before allowing traffic on markers.

B. Install marker so that housing edges are flush with Pavement and so that the angle formed by the longitudinal axis of the marker and the adjacent Pavement stripe does not exceed 5 degrees.

3.09 WORDS AND OTHER MARKINGS

A. Wet sandblast existing or temporary Pavement markings that may be confusing. Removal of markings by high-pressure water may be used if approved by ENGINEER.

B. Apply word markings, letters, numerals and symbols with indicated stencils and templates. In the absence of such information all stencils and templates shall be identical to those currently used by OWNER.

3.10 TEMPORARY PAVEMENT MARKINGS

A. Renew when stripes and markings have lost 50 percent of their original visual effectiveness.

END OF SECTION

**SECTION 32 31 13**

**CHAIN LINK FENCES AND GATES**

## PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chain link fabric, posts, braces, anchorage, gates, miscellaneous hardware and appurtenances.

1.02 REFERENCES

A. ASTM A 53: Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
B. ASTM A 121: Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
C. ASTM A 392: Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
D. ASTM A 491: Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
E. ASTM A 585: Standard Specification for Aluminum-Coated Steel Barbed Wire.
F. ASTM A 641: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
G. ASTM F 567: Standard Practice for Installation of Chain-Link Fence.
H. ASTM F 573: Standard Specification for Residential Zinc-Coated Steel Chain-Link Fence Fabric.
I. ASTM F 626: Standard Specification for Fence Fittings.
J. ASTM F 654: Standard Specification for Residential Chain-Link Fence Gates.
K. ASTM F 668: Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.
L. CLFMI: Chain Link Fence Manufactures Institute Product Manual for Chain Link Fence Installation.

1.03 SUBMITTALS

A. Drawings: Indicate plan layout, grid, size and spacing of components, accessories, fittings, anchorage, and post section.er
B. Data: Submit manufacturer's installation instructions and procedures, including details of fence and gate installation.
C. Submit sample of fence fabric and typical accessories.

## PART 2 PRODUCTS

2.1 GENERAL

A. Galvanizing: Class 3, ASTM A 121.
B. Aluminizing: Class 2, ASTM A 585.
C. Polyvinyl Chloride (PVC): With PVC coated materials, paint all posts, fittings, hardware and accessories as indicated to match PVC color. The fabric shall be hot dipped

galvanized steel wire complying with ASTM A 392 and coated with a continuous PVC bonding process (minimum 15 mil thickness) in accordance with ASTM F 668. Color of PVC coating as indicated and applied free of voids, cracks, tears and to have a smooth and lustrous surface.

D. Steel: Schedule 40, ASTM A 53.
E. Cast-in-place Concrete: Class 3000 minimum, Section 03 30 04.

2.2 CHAIN LINK FABRIC

A. 11 gage steel wire fabric for all fences less than 60 inches in height and 9 gage for fences over 60 inches coated as follows.
    1. Zinc coating, ASTM A 392.
    2. Aluminum coating, ASTM A 491.
    3. Polyvinyl chloride coating, ASTM F 668.
B. For residential fabric, provide zinc coated fabric, ASTM F 573 requirements.
C. Unless indicated otherwise use chain link fabric that has approximately 2 inches square mesh and coated after fabrication.
D. Knuckle finish top edge and twist and barb bottom edge on fabric less than 60 inches wide. For fabric 60 inches or greater in width, twist and barb finish on both edges. Provide fabric that barbing has been done by cutting the wire on the bias.
E. If indicated, insert slats in fabric.

2.3 BARBED WIRE

A. Wo strand, 12-1/2 gage wire with 14 gage, 4 point round barbs spaced approximately 5 inches on center.

2.4 TENSION WIRES AND FABRIC TIES

A. Tension Wires: 7 gage galvanized coil spring steel wire, ASTM A 641.
B. Fabric Fasteners: 9 gage galvanized or 6 gage aluminum wire, or approved non-corrosive metal bands, for ties to fasten fabric to posts, rails, and gate frames. Fasten fabric to bottom tension wire spaced 24-inches on center.

2.5 TRUSS OR TENSION BARS

A. Galvanized steel rod 3/8 inch diameter for truss or tension bars used in trussing gate frames and line posts adjacent in end, corner, slope, or gate posts. When used in trussing line posts, provide adjustment by means of galvanized turnbuckles or other suitable tightening devices.
B. Tension Bars:
1. Galvanized high carbon steel bars not smaller than 3/16 inch x ¾ inch for tensions bars to fasten fabric to end and corner posts and gate frames. Provide 1 tension bar for each end post and 2 for each corner and pull post per section of fabric.

2. Use tension bar bands made from heavy pressed galvanized steel spaced on 15 inch centers to secure tension bars to posts.

2.6 POSTS, CAPS, RAILS, COUPLINGS

A. Posts, Frames, Stiffeners, Rails:
1. Table 1 – Posts, Frames, Stiffeners, Rails
2. Proposed Use
3. Nominal Type
4. and Size End, corner, slope and gate posts for single gates 6 feet or less in width and double gate 12 feet or less in width for
B. Fence less than 72 in. high 2" pipe. Fence 72 inches or higher 2-1/2" pipe.
C. Gate posts for single swing gates over 6 feet, but not over 13 feet in width and double swing gates over 12 feet, but not over 26 feet in width or for all slide gates with leaves larger than 6 feet 3-1/2" pipe Gate posts for single swing gates over 13 feet, but not over 18 feet in width and double swing gates over 26 feet, but not over 36 feet in width 6" pipe
D. Gate posts for single swing gates over 18 feet in width and double swing gates over 36 feet in width 8" pipe
E. Frame for gates 1-1/2" pipe
F. Stiffeners for gates 1-1/4" pipe
G. Line posts for fence 72 in. or higher 2" pipe
H. Line posts for fences less than 72 in. high 1-1/2" pipe, or 1-1/8" x 1-5/8" H
I. Top rail 1-1/4" pipe, or 1-1/2" x 1-1/4" H
J. Bottom rail 6-gage, coiled spring steel tension wire
K. Posts: Galvanized steel, at the indicated length.
L. Caps: Pressed galvanized steel or malleable iron designed to fit securely over post ends forming a weather tight closure. Where top rail is used, provide cap to permit passage of top rail. "H" section posts do not require caps.
M. Top, Intermediate and Bottom Rails: Galvanized steel, in lengths as required. Provide joint couplings to connect rails securely. Provide means for attaching top rail securely to each end, corner, line, slope and gate posts.
N. Joint Coupling: Galvanized steel, 6 inches long minimum for each joint.
O. 1 coupling in 5 shall have expansion spring. Couplings shall be outside sleeve type with bore of sleeve true to maintain adjacent lengths of rail in alignment.

2.7 FITTINGS AND HARDWARE

A. Unless indicated otherwise, galvanize fittings and hardware.
B. Rivets: Make all hardware attachments with galvanized steel rivets.

2.8 SUPPORT OR EXTENSION ARM

A. Use support or extension arms for barbed wire that are of a type that can be attached to the tops of the posts and carry the number of wires indicated.
B. Use only support arms on the fence for barbed wire that are capable of supporting a 250 pound vertical load at the end of the arm without causing permanent deflection.
C. Single support arms are to be integral with a top post weather cap and have a hole for passage of the top rail when required.

2.9 GATES

A. Residential gates: Refer to ASTM F 654 requirements.
B. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware and accessories.
C. Assemble gate frames and attach hardware by welding or by using fittings and rivets to make rigid connections. Use same fabric as for fence. Install fabric with stretcher bars to gate frame at not more than 15-inch on center.
D. Provide diagonal cross-bracing consisting of 3/8 inch diameter adjustable length truss rods on gates where necessary to prevent frame from sagging or twisting.

2.10 GATE HARDWARE

A. Hinges: Pressed steel or malleable iron to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide minimum of one pair of hinges for each leaf.
B. Latch: Forked steel type or plunger-bar steel type to permit operation from either side of gate. Provide locking device and padlock eye as integral part of latch.
C. Keeper: Provide keeper for all vehicle gates which automatically engages the gate leaf and holds it in the open position until manually released.
D. Gate Stops: Mushroom type or flush plate with anchors set in concrete to engage the center drop rod or plunger bar.
E. Sliding Gates: Manufacturer's standard heavy-duty track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, steel wheel or rubber wheel, and accessories as required.

**PART 3 EXECUTION**

3.1 PREPARATION

A. Identify utility location, Section 01 31 13.
B. Excavation, Section 31 23 16.
C. Refer to ASTM F 567 and CLFMI products manual for chain link fence installation.
D. Protect roots and branches of trees and plants to remain.
E. Limit the amount of clearing and grading along the fence line to permit proper installation.

3.2 LAYOUT OF WORK

A. Accurately locate and stake locations and points necessary for installation of fence and gates.
B. General arrangements and location of fence and gates are indicated.
C. Install except for minor changes required by unforeseen conflicts with work of other trades.

3.3 INSTALLATION OF POSTS

A. Space line posts as follows:
    1. Tangent sections to 500 feet radius: 10 feet maximum.
    2. 200 feet radius to under 500 feet radius: 8 feet maximum.
    3. 100 feet radius to under 200 feet radius: 6 feet maximum.
    4. Under 100 feet radius: 5 feet maximum.
    5. Provide pull posts at 500 feet maximum intervals. Changes in line of 30 degrees or more are considered corners.
B. Set all posts to true line and grade in concrete bases or in approved pipe sleeves or sockets.
C. Check for vertical and horizontal alignment.
D. Construct concrete bases for posts at least 10 inches in diameter. Place a minimum of 6 inches concrete below each post. Depth of post in concrete as follows.
    1. Line Posts: 18 inches.
    2. End, Pull, Corner and Gate Posts Less Than 6 inches Diameter: 24 inches
    3. Gate Posts: 30 inches.
E. Where posts are required to be set in concrete walls or masonry, set sockets for the posts to a depth of at least 18 inches. Use sockets that consist of lengths of 0.048 inch galvanized metal pipe sleeves, with an inside diameter sufficient to allow the posts to fit loosely therein. Coat the inside of the socket and outside of the posts with an approved bituminous paint. Caulk the posts securely in place with lead wool.

3.4 INSTALLATION OF BRACE ASSEMBLIES

A. Attached brace rail from end, pull, corner or gate posts to first ensuing line post. Install braces so posts are plumb when diagonal truss rod is under proper tension.

3.5 INSTALLATION OF RAILS

A. Install rails level and plumb with grade between posts and attached to posts before stretching fabric. Top rails shall form continuous brace from end-to-end of each run of fence.

3.6 INSTALLATION OF FENCE FABRIC

A. Place fence fabric on security side of posts unless otherwise specified. Place fabric approximately 1 inch above the ground. Maintain a straight grade between posts by excavating high points of the ground. Filling depressions with soil will be permitted only upon approval of ENGINEER.
B. Stretch the fabric taut and securely fasten to posts. Fasten to end, gate, corner, and pull posts. Secure stretcher bars with metal bands spaced at 15 inch intervals. Cut the fabric and fasten each span independently at all pull and corner posts. Fasten to line posts with tie wire, metal bands, or other approved methods at 15 inches intervals. Attach the top edge of fabric to the top rail or tension cable at approximately 24 inches intervals. Attach bottom tension wire to fabric with tie wires at 24 inches intervals and secure to the end of pull posts with brace bands.
C. Draw barbed wire to assure minimum sag at high temperature and no breakage at low temperature. Connect the wires and arms by means of 0.142 gauge galvanized wire stays.

3.7 INSTALLATION OF GATES

A. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation.

3.8 REPAIR DAMAGED COATING

A. Grind smooth and wire brush all welds made after galvanizing to remove loose or burned zinc coating, after which neatly coat the areas with 50-50 solder or as otherwise directed by ENGINEER. Make repairs to abraded or otherwise damaged zinc coating in a similar manner. Replace PVC coating.

END OF SECTION

**SECTION 32 80 00**

**IRRIGATION SYSTEM**

## PART 1 - GENERAL

1.01 DESCRIPTION:

A. Provide all materials, labor, equipment and services necessary to furnish and install Irrigation System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded. The extent of the underground irrigation system is shown on the drawings. Point of Connection (P.O.C), and controller location as shown on the drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections, apply to work of this section.

1.03 CODES AND REGULATIONS

A. All work and materials shall be in full accordance with the following codes adopted and amended by the authority having jurisdiction. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. The specifications shall govern in the event that the drawings or specifications call for material or methods of construction of higher quality or standard than required by these codes.
   1. California Plumbing Code
   2. California Administrative Codes:
      a. Title 8, Industrial Relations
      b. Title 19, Public Safety
   3. California Electrical Code
   4. Standards and Regulations of other agencies or organizations as listed in this specification relating to products or procedures. For example, American Society for Testing and Materials.

## 1.04 EXPLANATION OF DRAWINGS

A. The intent of the drawings and specifications is to indicate and specify a complete and efficient sprinkler irrigation system ready for use in accordance with the manufacturer's recommendations, and all applicable local codes and ordinances. Questions concerning interpretation of irrigation plans and specifications shall be the responsibility of the Design Engineer.

B. All plot dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and shall report any variations to the Project Inspector and Design Engineer.

C. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his work, and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed in the most direct and workmanlike manner; so that conflicts between sprinkler systems, planting, utilities, and site design features will be avoided. All necessary parts, fittings, labor, components, equipment, services, etc. shall be provided by the Contractor to complete the system as fully operational as required by the Owner.

D. All work called for on the drawings by notes shall be furnished and installed whether or not specifically mentioned in the specifications.

E. The Contractor shall not willfully install the irrigation facilities as indicated on the drawings when it is obvious in the field that unknown obstructions might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Project Inspector.

F. The Contractor shall examine carefully the site of work contemplated and the proposal, plans, specifications, and all other contract documents. It will be assumed that the Contractor has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantity of work to be performed and materials to be furnished, and as to the requirements of the specifications. The Contractor shall take necessary precautions to protect existing site conditions that are to remain. Should damage be incurred, the Contractor shall make the necessary repair or replacement to bring it back to its original condition at his own expense.

G. Prior to cutting into the soil, the Contractor shall coordinate with the Project Inspector locate all cables, conduits, sewers, septic tanks, and other such utilities as are commonly encountered underground and he shall take proper precaution not to damage or disturb

such improvements. If a conflict exists between such obstacles, notify the Project Inspector who will consider realignment of the proposed work. The Contractor will proceed in the same manner if a rock layer or any other condition encountered underground makes change advisable. Should utilities not shown on the plans he found during excavations, Contractor shall promptly notify the Project Inspector for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown in plans.

H. The Contractor shall verify the correctness of all finish grades within the work area in order to insure the proper soil coverage (as specified) of the sprinkler system pipes. The Contractor shall verify and be familiar with location and size of the proposed water supply (P.O.C.). He shall make approved type connection and install new work.

I. Within seven (7) days after start of irrigation system installation the Contractor shall be responsible for notifying the Project Inspector in the event any equipment or methods indicated on the drawings or in the specifications conflict with local codes or capabilities of specified equipment, prior to installing. It the event the Contractor neglects to do this, he will accept full responsibility for any revisions necessary.

1.05 PERMITS AND INSPECTIONS

A. The Contractor shall obtain and pay required fees to any governmental or public agency. Any permits for the installation or construction of any of the work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examination required by these authorities.

B. In all cases, where inspection of the irrigation system work is required and/or where portions of the work are specified to be performed under the direction and/or inspection of the Owner authorized Representative the Contractor shall notify the Owner's Authorized Representative, at least 48 hours in advance of the time when such inspection and/or direction is required. Any necessary re- excavation or alterations to the system needed because of failure of the Contractor to have the required inspection shall be performed at the Contractor's own expense.

1.06 GUARANTEE

A. Irrigation system shall be guaranteed for one year from date of final acceptance by the Design Engineer.

1.07 OPERATIONS AND MAINTENANCE INSTRUCTIONS/RECORD DOCUMENTS

A. The Contractor shall prepare and deliver to the Owner Representative within ten (10) calendar days prior to completion of the construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two individually bound sets of Operating and Maintenance Manuals. These manuals shall describe the material installed and shall be in sufficient depth to permit operating personnel to understand, operate and maintain all equipment. Spare part lists and related manufacturer identification shall be included for each installed equipment item. Each complete, bound manual shall contain the following information:
   1. Index sheet stating Contractor's address and telephone number, duration of guarantee period, and list of equipment, with names and addresses of local manufacturer representatives.
   2. The Contractor to issue a "CERTIFICATE OF CONSTRUCTION COMPLIANCE" to the Project Inspector which indicates that all work done, materials and equipment used and installed are in compliance with the approved plans, specifications and all authorized revisions.
   3. Complete operating and maintenance instruction on all major equipment.
   4. Complete set of manufacturer's literature and specifications of material installed, including parts list.
   5. Diagrams for all wiring of controller, controller valves, etc.
   6. Initial electrical data on each control valve.
      a. Ohmmeter reading for each valve taken at the controller and valve.
      b. Voltmeter reading for each valve.

B. The contractor shall furnish one set of reproducible As-Built drawings, in form of full size bond copy and scanned PDF files on CD, as record documents.
   1. Label first page of each document, or set of documents, "PROJECT RECORD" in neat large printed letters on lower right hand corner. Record information concurrently with construction progress. Prints for this purpose may be obtained from the Project Inspector. This set of drawings shall be kept on the site and shall be used only as a record set. Do not conceal any work until required information is

recorded. These drawings shall also serve as work in progress sheets, and the Contractor shall make neat and legible annotations thereon daily as the work progresses, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in a location designated by the Project Inspector. The Contractor shall submit the Record Drawings to the project inspector for review and approval. When the plans are approved by the project inspector as being complete they can then be scanned as PDF files and the files transferred to a CD.

2. Drawings: Legibly mark to record actual construction:
    a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Give sufficient horizontal and vertical dimensions to accurately trace route and invert of each concealed line or item. Accurately locate each capped, plugged or stubbed line.
    b. Field changes of dimension and detail.
    c. Changes made by Field Order, by Addenda, or by Change Order.
    d. Details not on original Contract Drawings.
3. Deliver all Record Documents (As - Builts) to Project Inspector for review and approval. Accompany submittal with transmittal letter in duplicate, containing:
    a. Date.
    b. Project title.
    c. Contractor's name and address.
    d. Title and number of each Record Document (As-Built).
    e. Signature of Contractor or his authorized representative.

C. The Contractor shall provide one controller chart for each controller installed. The chart will show the area irrigated by the controller and shall be the maximum size the controller door will allow. The chart may be a reduced drawing of the actual plans. The chart shall be colored with a different color for each station. The chart shall be laminated or covered in a watertight envelope.

## 1.08 SUBMITTALS

A. Contractor shall submit six (6) copies of complete lists of proposed materials to the Design Engineer, including manufacturer's name and catalog numbers. No substitution will be allowed without prior written approval by the Design Engineer.

B. Shop drawings shall follow for all equipment, including dimensions, capacities, and other characteristics as listed in product specifications. Materials and equipment shall not be ordered until given written approval by the Design Engineer.
C. When specific name brands of equipment and materials are used, they are intended as preferred standards only. This does not imply any right upon the part of the Contractor to furnish other materials unless specifically approved in writing as equal in quality and performance by the Design Engineer. Decisions by the Design Engineer shall govern as to what name brands of equipment and materials are equivalent to those specified on the plans and his decisions shall be final. It shall be the responsibility of the prospective bidder to finish proof as to equality of any proposed equipment or material.
D. Approval of any item, alternate or substitute indicates only that the products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

1.09 DEFINITIONS

A. Piping: All pipe fittings, valves, and accessories as required for a complete piping system.
B. PVC: Polyvinyl Chloride.
C. Agencies and Organizations:
    1. ASTM- American Society for Testing and Materials
    2. AWWA- American Water Works Association
    3. IAPMO- International Association of Plumbing and Mechanical Officials
    4. NEC - National Electrical Code.
    5. UL - Underwriter's Laboratories

1.10 REJECTION OF MATERIAL OR WORK

A. The Owner reserves the right to reject any material or work which does not conform to the contract plans, specifications without any written approval from the Design Engineer. The rejected material or work shall be removed or corrected by the Contractor at no additional cost to the Owner.

## PART 2 — PRODUCTS

2.01 PIPING MATERIALS

A. Piping:
   1. Pressure pipe/upstream of control valve:
      a. Bell end '0' ring gasketed PVC 1120 Class 200 high impact pipe ASTM D2241-83 & ASTM D1785-83).
      b. Solvent weld bell end PVC 1120 Schedule 40 high impact pipe (ASTM D2241-83 & ASTM D1785-83).
   2. Lateral line/downstream of control valve:
      A. Solvent weld bell end PVC 1120 Class 200 Normal Impact pipe (ASTM D2241—83 & ASTM D1785-83).
   3. Sleeving under paving:
      a. Vor pipes 3” and smaller to be solvent weld bell end PVC 1120 Schedule 40 high impact pipe (ASTM D2241-83 & ASTM D1785-83) and for pipes 4” and larger to be SDR 35 PVC pipe (ASTM designation 3034).
   4. All pipe shall be continuously and permanently marked and conform with the following information:
      Manufacturer's name or trademark, nominal pipe size, schedule and type of pipe, pressure rating in PSI and (NSF) seal of approval. Pipe shall be of improved white rigid polyvinyl chloride (PVC) compound manufactured by Lasco Industries or approved equal.

B. Fittings:
   1. For PVC plastic pipe: white rigid polyvinyl chloride (PVC) Schedule 40 type I and II grade 1, solvent weld socket fittings ASTM D2466-78 for all lateral line pipe and Schedule 80 type I and II grade 1 solvent weld socket fittings ASTM D2464-76 for all mainline pipe. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable (IPS) schedule, and (NSF) seal of approval. All plastic fittings and connectors shall be injection molded of an improved polyvinyl chloride compound featuring high tensile strength, high chemical resistance and high impact strength in terms of current ASTM standards for such fittings and as manufactured by Lasco Industries or approved equal. Where threads are required in plastic fittings, these shall be injection molded also.

2. For connections between main lines and electric control valves: Schedule 80 PVC ASTM D2464-76 TOE nipples, glued at main line, glued at lateral line, and threaded at valve. A minimum of 9” on both sides of valve.

C. Galvanized pipe and fittings:
   1. Galvanized Pipe shall be hot dip galvanized continuous welded, seamless steel pipe SCH 4O conforming to applicable current (ASTM) standards.
   2. Galvanized Fittings shall be galvanized malleable iron ground joint SCH 40 conforming to applicable current (ASTM) standards.

D. Solvent Weld Adhesive:
   1. All socket type connections shall be joined with primer and PVC solvent cement which shall meet the requirements of ASTM F656 for primer and ASTM D25 64-80, "Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings." Solvent cement joints for plastic pipe and fittings will be made as prescribed by manufacturer. The high chemical resistance of the pipe and fitting compounds specified in the foregoing sections makes it mandatory that an aggressive colored primer, which is a true solvent for (PVC) be used in conjunction with a solvent cement designed for all connections of PVC pipe and fittings. A primer for use on PVC joints to be Weld-On P-7O industrial grade low VOC purple primer or approved equivalent. A heavy bodied industrial grade solvent cement to be used for all classes and schedules of pipe and fittings to be Weld-On 711 gray low VOC PVC solvent cement or approved equivalent.

E. Pipe Thread Sealant:
   1. A non-hardening all purpose sealant and lubricant similar to Permatex #51 or Lasco blue pipe thread sealant which is certified by the manufacturer to be harmless to PVC pipe and fittings. Apply sealant to clean male threads, brushing into grooves and to the first three threads of the female threads as per manufacturer’s recommendations. A good quality grade of Teflon tape (PTFE) recommended by the manufacturer for use with plastics may also be used.
      Minimum 2.5 mil thickness and width of tape to be used is 3/4". A minimum of five wraps to be used. At threaded connections at the irrigation valve, both Teflon paste and tape are to be used.

2.02 VALVES

A. Electric Control Valves: Electric control valves operated by low-power solenoid, normally closed, manual flow adjustment. Sizes and types as shown on drawings. Valve to be Irritrol 100 Series (3 Way Valve) or approved equivalent.

B. Control Wire: Single Solid Copper, AWG-UF type UL approved for direct burial, minimum size #14-1. Common wire to be white, control wire red, spare control wire black, spare common wire blue. Wire shall be no smaller than AWG No. 14.
C. Control Wire Connectors: 3M DBR/Y-6 Direct Bury Splice kit 'or approved equivalent.
D. Control Wire Marking: Christy Enterprises wire marker or approved equivalent.
E. Control Valve Boxes: Christy B-l6 or approved equivalent.
F. Mainline and Quick Coupler valve boxes: Christy GS for gate valves and Christy
G. F8 or approved equivalent.
H. Mainline valve and Blow Off Valve: Nibco F-619-RW cast iron resilient wedge with operating nut or approved equivalent. Conforming to AWWA C509 Standards or approved equivalent.
I. Quick Coupling Valve: Two piece quick coupling valve to be Rainbird 44-NP or approved equivalent with Christy F8 valve box..
J. Control valve box marking: Black painted 2" high letters on concrete lit showing controller letter and station number.

## 2.03 CONTROLLER

A. Solid state microcomputer controller, completely automatic in operation, which shall electrically start the sprinkler cycle and program and time the individual stations. Controller shall have attached instruction booklet, integral 24V transformer, clock indicating time of day and day of week, 24V master valve circuit and terminal connection strip. Controller shall be universal remote ready with pre-installed connectors.

## 2.04 IRRIGATION HEADS

A. Spray Head: Molded plastic body with plastic nozzles to be Rainbird 1800-SAM-PRS Series pop-up spray heads with pop-up height as noted. Refer to pop-up schedule on drawings for nozzles. Manufacturer's numbers are listed with description.
B. Rotor Head: Molded plastic and stainless steel construction, gear driven with memory arc, balanced nozzle sets to be Hunter 125 and 120 rotors with stainless steel riser or approved equivalent. Refer to schedule on drawings. Manufacturer's numbers are listed with description.

## 2.05 SWING JOINT ASSEMBLY

A. All swing joint assemblies for irrigation sprinkler heads are to be fabricated with two Marlex street elbows on each side of the 12” schedule 80 PVC nipple to match the size of the inlet size of the sprinkler head.

## 2.06 DRIP IRRIGATION

A. Drip Emitters: Drip emitters shall be of the type and performance as listed on the drawings.
B. Drip Filter: Filters shall be capable of efficiently removing foreign particles which would clog the emitters.
C. Tubing: Drip tubing shall be of the type as listed on the drawings.
D. Accessory Equipment: Accessory equipment shall be of the types and performance as listed on the drawings.

## 2.07 OTHER MATERIALS

A. Materials not specifically indicated but necessary for proper execution of this work shall be of first quality as selected by the Contractor subject to the acceptance of Design Engineer.
B. All materials appearing in the legend and details of the irrigation drawings are part of this job. Contractor is responsible for installation according to plans and details. The system shall efficiently and uniformly irrigate all areas and perform as required by these plans and specifications.

**PART 3 - EXECUTION**

3.01 SYSTEM DESIGN

A. Design pressure as indicated on drawings.

B. Contractor shall verify design as specified on drawings and inform the Project Inspector and the Design Engineer of discrepancies, incompatibilities or errors of specifications in writing prior to installation of irrigation system. Failure to inform the Project Inspector or Design Engineer of any discrepancy, incompatibilities or errors of specifications seven working days prior to beginning system installation will institute the responsibility of corrective action to the Contractor at no expense to the Owner.

3.02 PIPING INSTALLATION

A. General:

1. Any equipment installed by the Contractor and deemed to be for the use of the Owner in various situations (i.e., control valves, control panels, etc.) shall be so installed to be readily accessible and quickly operable. Equipment deemed by the Owner to be inoperable for its intended purpose shall be reinstalled by the Contractor in an operable position before approval will be given. Any changes made by the Contractor shall be done without any additional cost to the Owner.
2. The Contractor shall be responsible for layout of proposed facilities and any minor adjustments required due to differences between site and drawings. Any such deviations in layout shall be within the intent of the original drawings, and without additional costs to the Owner. The Owner will indicate the proposed precise location of the control panels. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on non-planted areas. Where head spacing is not noted, Contractor is to install sprinkler heads evenly along the irrigation area's perimeter. Flush all lines prior to installation of heads.

3. Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance to manufacturer's recommendations to allow for expansion. Lay on solid sub-base, at uniform depth.

B. The Contractor shall examine all other portions of working drawings and plan trenching and pipe lays so that no conflict will arise between irrigation and any other work. Any

corrective action will be the Contractors responsibility at no further expense to the Owner.

C. Excavations:
   1. Excavations shall be open vertical construction, sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and tamping. The use of a vibratory plow or methods other than open vertical trenching will not be allowed without the written approval of Project Inspector or the Design Engineer. To obtain such approval, a field test must be performed, at the proposed site, with the equipment to be used in the presence of the Design Engineer. The field test is to indicate if the proposed site is favorable to the plowing method. Approval for plowing at one location does not allow the use of plowing at another location. Approval for plowing must be obtained for each location where the use of plowing is proposed. If, at previously approved plowing locations, conditions for plowing become unfavorable as determined by the Project Inspector or Design Engineer, plowing shall be terminated.
   2. Trenches for pipe and equipment shall be cut to required grade lines, and compacted to-provide an accurate grade and uniform bearing for the full length of the line.
   3. When two pipes are to be placed in the same trench, it is required to maintain a minimum four inch (4") horizontal separation between pipes.
   4. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
      a. 24-inch over main lines.
      b. 18-inch minimum over non-pressure (rotary pop-up) lateral lines.
      c. 12-inch minimum over non-pressure (pop-up spray head) lateral lines.
      d. 24-inch minimum over lines located out in road surface area of paved streets.
   5. Maximum cover above the top of the pipe shall not exceed twelve inches (12") greater than the required minimum cover.

D. Assemblies
   1. Routing of pressure supply lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform to details on plans.
   2. Install all assemblies specified herein according to the respective detail drawings or specifications pertaining to specific items required to complete the work. Perform work according to best standard practice, with prior approval.
   3. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.

4. All brass pipe and fittings shall be assembled using an approved Teflon paste to female threads and tape applied to the male threads or approved equivalent. A minimum of five (5) wraps of an approved 2.5 mil by 3%” wide Teflon tape will be required.
5. All plastic and galvanized steel threaded pipe and fittings shall be assembled using an approved Teflon tape applied to the male threads only. A minimum of five (5) wraps of an approved 2.5 mil by 3A” wide Teflon tape will be required.
6. No elbows, tees or valves are to be located closer than five (5') feet of each other without prior approval of the Project Inspector.

E. Line Clearance
   1. All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Plastic to Steel Connections
   1. At all plastic (PVC) pipe connections, the Contractor shall work the steel connections first. Connections shall always be plastic into steel, never steel into plastic. An approved Teflon tape shall be used on all threaded (PVC) to steel, never steel into plastic. An approved 2.5 mil by 3%” wide Teflon tape shall be used on all thread (PVC) to steel pipe joints applied to the male threads only, and light wrench pressure is to be applied. A minimum of five (5) wraps of an approved 2.5 mil by %” wide Teflon tape will be required.
   2. A non-hardening sealant and lubricant similar to Permatex #51 or LASCO blue pipe sealant may be used in lieu of Teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

G. Plastic Pipe
   1. The Contractor shall exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings shall be stored under a weatherproof roofed structure before using and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lie flat so as not to be subject to undue bending or concentrated external load at any point.
      a. All lumber, rubbish, rubble, concrete and rocks shall be removed from the trenches by the Contractor. Pipe shall have a firm uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking under riser tees shall be done only if specified on the plans. Pad trenches with soil as necessary to provide uniform bearing surfaces.

b. Where extensive lengths of pipe are installed, snake pipe in trench from side to side to allow for expansion and contraction. One additional foot per one hundred (100) feet of pipe is the minimum allowance for snaking. Never lay pipe when there is water in the trench or when the temperature is 32 degrees for below.
c. All changes in direction of pipe shall be made with fittings, not by bending.
d. Make solvent weld joints with a non-synthetic bristle brush in the following sequence:
    1) Make sure pipe is cut square and all rough edges and burrs are removed. All connecting surfaces are properly cleaned and dry prior to application of pipe primer.
    2) Apply an even coat of colored primer to pipe and fitting prior to application of solvent.
    3) Apply an even coat of solvent to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
    4) Apply an even light coat of solvent to the inside of the fitting.
    5) Apply a second coat of solvent to the pipe.
    6) Insert the pipe quickly into the fitting and turn pipe approximately one-eighth to one-quarter turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen seconds so the fittings do not push off the pipe.
    7) Using a clean rag, make sure to wipe off all excess solvent to prevent weakening at joint.
    8) Exercise care in going to the next joint so that pipe is not twisted, thereby disturbing the last completed joint.
    9) Allow at least fifteen minutes setup time for each welded joint before moving.
    10) Repairing plastic pipe when damaged shall be done by replacing the damaged portion of pipe.

H. Concrete Thrust Blocks:
1. Concrete anchors or thrust blocks shall be provided on main pipelines at abrupt changes in pipeline grade, changes in horizontal alignment (elbows, tees and crosses), reduction in pipe size (reducers, reducing tees or crosses), end-line caps or plugs, and in-line valve to absorb any axial thrust of the pipeline. The pipe manufacturer's recommendation for thrust control shall be followed. Thrust blocks must be formed against solid unexcavated earth (undisturbed). Do not enclose

entire joint in concrete. Provide a minimum of three (3) cubic feet of 2,000 PSI concrete for each concrete thrust block.

3.03 SPRINKLER HEAD INSTALLATION

A. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on non-planted areas. Flush all lines prior to installation of heads.
B. Rotary pop-up sprinkler heads adjacent to walks or mowstrips shall be set four inches (4") from edge of walk or mowstrips and pop-up spray heads adjacent to walks or mowstrips shall be set one inch (1") minimum/two inches (2") maximum from edge of walk or mowstrips or as noted otherwise on the plans and details.
C. Upon completion of the installation, the Contractor shall adjust sprinkler heads to properly distribute water flow and shall place entire irrigation system in first-class operating condition.
D. Adjustable sprinkler heads shall be adjusted by fully opening the sprinkler furthest from the control. Adjust sprinkler heads which spray toward buildings in shrub areas so that water spray does not contact side of buildings.
E. Install irrigation heads in accordance with details on plans.

3.04 PIPE DEPTH AND BACKF ILL

A. Backfill shall not be placed until the installed system has been inspected and approved by the Project inspector.
B. Backfill material shall be approved soil. Unsuitable martial, such as pipe remnants and wire including clods and rocks over two inches (2") in size, shall be removed from the premises and disposed of legally at no cost to the Owner. Backfill for first six inches (6") around mainline pipe and control wires shall be native soil.
C. All backfilling shall be done carefully and shall be properly tamped. All soil shall be tamped and puddled to eliminate any voids.
D. Surplus earth remaining after backfilling shall be disposed of as directed by the Project Inspector.
E. Backfilling for all pipes shall be carried out in two basic stages.
    1. Stage One Backfilling:
       This shall be accomplished as soon as possible after the pipe is laid. A bedding of uniform depth with no voids must be provided along the entire length of the pipe. The bedding dirt should be placed in the trench and tamped into the areas under the

pipe, using a suitable tool. Joints should be left exposed until hydrostatic tests are completed. Cover only those portions of the pipe necessary to prevent movement or damage.

Stage Two Backfilling:

This shall be completed after all hydrostatic tests are completed and the piping system has been thoroughly checked for the leaks or other defects. Continue to add backfill soil in four inch (4") layers and hand tamp to achieve density similar to adjacent soil. after twelve inches (12") in main line trenches and eight inches (8") in lateral line trenches of hand tamped soil is in place over the pipe and fittings, backfilling can be continued, using light machinery to place dirt in the trenches in six inch (6") layers and to compact the dirt to conform to adjacent soil. Extreme care should be taken to avoid damage to the pipe from machinery that is too heavy.

All trenches shall then be water jetted to assure uniform settling and compaction. Backfilling operations will not be considered complete until the top surface has been graded to conform to the adjacent soil. All rocks uncovered and not used as backfill must be collected and removed from the site.

F. PVC piping and fittings shall not be backfilled during periods of extreme heat or when a sudden lowering of temperature of the pipe may cause separation of joints or fittings.

3.05 CONTROL WIRE

A. Protect wire by running alongside of mainline piping. Bundle wires together and tape at intervals of ten (10) feet. Do not tape wire together when encased in sleeve. Minimum cover shall be 24 inches. Crimp wires together at value manifold with Scotchlok connector. Seal splice with 3M DBR/Y-6 splice kit. Tag all control wire splices and at control valve and controller with approved control wire markers.

B. Wire size shall be determined by the number of valves operating on a given wire and the distance from the controller to the farthest valve, as specified by the charts furnished by the remote control valve manufacturer. Hot wire to be red. Common ground wire must be white. Spare control wires to be black and spare common wires blue. Splices are not encouraged but allowed. All splice connections must be provided in a valve box.

3.06 ELECTRIC CONTROL VALVES

A. Electric control valves shall be adjusted so the most remote heads operate at the pressure recommended by the head manufacturer. Electric control valves shall be

adjusted so a uniform distribution of water is applied by the heads to the planting areas for each individual valve system. The Contractor shall make all necessary connections for operation. Where pressure regulating electric control valves are called for the Contractor shall adjust the valve so a uniform distribution of water is applied by the heads.

B. Valve boxes and lids shall be set to finished grade or as indicated on the Construction Plans. Paint electric control valve identification numbers onto of valve box with two inch (2") high letters. Not more than one electric control valve may be installed in each box.
C. Electric control valves shall be connected and aligned to provide the most efficient flow of water to the irrigation heads. Each valve is to be enclosed in the specified valve box. The valve box shall be secured on firm soil clear of valves and wiring connections with six (6) bricks. Backfill carefully to prevent settlement and subsequent damage.
D. A valve box must be provided at all underground irrigation control wire splice connections.

## 3.07 AUTOMATIC CONTROLLER

A. Install controller, pedestal, and accessories per manufacturer's approved details, construction plans and contract requirements.
B. Contractor shall be solely responsible for all control valve wire landing, wire configuration, scheduling and programming at the irrigation controllers. This requirement shall run from start of work up until final acceptance of the irrigation system. No additional payment will be made to the Contractor for revisions required by the Owner of the controller program scheduling or wiring throughout the project duration.
C. Install automatic controller chart in laminated or watertight plastic envelope inside controller cover showing which valves are connected to which stations on controller.
D. Controller Charts:
    1. The Contractor shall provide one controller chart for each controller supplied.
    2. The chart shall show the area controlled by the automatic controller and shall be the maximum size that the controller door will allow.
    3. The chart may be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.
    4. The chart shall be colored with a different color for each station.

5. The chart shall be a permanent blue line or approved equal and enclosed in a waterproof envelope or laminated.

E. Water Schedule/ Programming Chart:
   1. The Contractor shall provide one Schedule / Programming Chart for each controller supplied.
   2. The chart shall show each control valve station, the type of valve, the area serviced by the valve, water days, water times, start time and controller program.

3.08 ELECTRICAL SERVICE

A. Electrical service shall be provided to control panel, as indicated on the plans. All work shall be in conformance to all local ordinates, codes, regulations and P.G.& E. requirement. All cost for the electrical services is to be the responsibility of the Contractor

3.09 TESTING

A. General Unless otherwise directed, tests shall be witnessed by the Project Inspector. Work to be concealed shall not be covered until prescribed tests are made. Should any work be covered before such tests, the Contractor shall, at his expense, uncover, test and repair his work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired and entire work re-tested. Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the test.

B. Piping Upstream of Control Valves: Maintain 100 PSI water pressure for a duration of four (4) hours. There shall be no drop in pressure during test except that due to ambient temperature changes (+ 5 PSI).

3.10 INSPECTION

A. Inspection of Work:
   1. Installation and operations must be approved by the Project Inspector.
   2. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval of the Project Inspector. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.

B. General Inspection: Periodic inspections shall be required for basic operations and installations during progression of the project. Such inspections will include but not necessarily be limited to the following items:
   1. Layout and flagging of sprinkler heads and system.
   2. Trenching.
   3. Wire placement.
   4. Partial fill compaction of trenches.
   5. Control valve installation.
   6. Irrigation controller installation and operation.
   7. Mainline sustained pressure check.

C. Coverage Test: When the irrigation system is completed, the Contractor in the presence of the Project Inspector shall perform a coverage test of water afforded in the planting and turf areas. The Contractor shall furnish all materials and labor required to correct any inadequacies of coverage disclosed. The Contractor shall inform the Project Inspector and the Design Engineer of any deviation from the plan required due to wind, planting, soil, or site conditions that bear on proper coverage. If such corrections or additions are required in the irrigation system, the Contractor shall make all adjustments and corrections without any extra cost to the Owner.

D. Completion: The work will be accepted in writing when the entire project improvements have been completed satisfactorily to the Design Engineer as stated in Section 02900 - Landscaping Part 3.10. In judging the work, no allowance for deviation from the original plans and specifications will be made unless already approved in writing at proper time. Should it become necessary, due to developed conditions, to occupy any portion of the work before the contract is fully completed, such occupancy shall not constitute acceptance. The Contractor will not be responsible for any damage caused by the Owner's work forces.

E. Submittal of Irrigation Equipment: When the Contractor desires to transfer the required irrigation equipment to the Project Inspector, he must submit along with the equipment an itemized list. The Contractor is solely responsible to obtain a written confirmation by the Project Inspector that all materials received by the Project Inspector matches his material list. Without any written confirmation will mean that no transfer of material has taken place.

## 3.11 MAINTENANCE

A. Adjustments: Irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the 90 day maintenance period. Irrigation system maintenance shall commence upon general inspection following irrigation installation, planting operations and general clean-up. Maintenance shall be continued until final acceptance.
B. After the system has been completed, the Contractor Shall instruct an authorized representative of the Owner in the operations and maintenance of the system and shall set the desired controller irrigation time for each station.

3.12 GUARANTEE

A. The entire irrigation system shall be guaranteed by the Contractor to give satisfactory service and to the quality of materials equipment and workmanship including settling of backfilled areas below finish grade for a period of one (1) year following the date of the final acceptance of all the work by the Design Engineer. If, within one year from the date of completion and final acceptance of all of the work, any trouble develops resulting from inferior or faulty materials or workmanship or settlement occurs and adjustments in pipes, valves, and heads, sod, or paving to the proper level of the permanent grades, the Contractor, as part of the work under his contract, shall make all adjustments and corrections without extra cost to the Owner, including the complete restoration of all damaged planting, paving, or other improvements of any kind.
B. The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.
C. Should any operational difficulties in connection with the irrigation system develop within the specified guarantee period which in the opinion of the Owner may be due to inferior material and/or workmanship, said difficulties shall be immediately corrected by the Contractor to the satisfaction of the Owner at no additional cost to the Owner including any and all other damage caused by such defects.

**END OF SECTION**