STANDARD SPECIFICATIONS

CITIES & COUNTY OF MARIN

DEPARTMENT OF PUBLIC WORKS
JUNE 1992
SCOPE

THESE ARE THE STANDARD SPECIFICATIONS OF THE CITIES AND COUNTY OF MARIN. WHEN INCLUDED BY REFERENCE, THEY APPLY TO ALL PUBLIC WORKS CONSTRUCTION WHETHER PUBLICLY OR PRIVATELY FINANCED AND THE MEASUREMENT AND PAYMENT PROVISIONS OF OTHER SECTIONS WILL BE ENFORCED BY AN AGENCY ONLY ON ITS OWN CONTRACT WORK. THE APPROVED SPECIAL PROVISIONS PREPARED INDIVIDUALLY FOR EACH JOB WILL BE CONSIDERED A PART OF THESE SPECIFICATIONS.
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<td>Asbestos Cement Pipe</td>
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<td>Amer.Std.</td>
<td>American Standard</td>
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<td>American Wire Gage</td>
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<td>BC</td>
<td>Beginning Curve</td>
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<td>Beginning of Curb Return</td>
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<td>Bdry.</td>
<td>Boundary</td>
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<td>BM</td>
<td>Bench Mark</td>
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<td>BVC</td>
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<td>B/W</td>
<td>Back of Walk</td>
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<td>Catch Basin</td>
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<td>Center to Center</td>
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<td>Curb Face</td>
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<td>Cast in Place Concrete Pipe</td>
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<td>Fabricate</td>
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Abbreviations

Inv.  Invert
IP    Iron Pipe
ISM   Imported Subbase Material
JB    Junction Box
Jct.  Junction
JP    Joint Pole
Lab.  Laboratory
LH    Lamp Hole
LL    Live Load
Long. Longitudinal
LP    Lamp Post
LPS   Low Pressure Sodium (Light)
LTB   Lime Treated Base
Maint. Maintenance
Max.  Maximum
Meas. Measure
MH    Man Hole
Mil. Spec. Military Specifications
Misc. Miscellaneous
MON   Monument
MVL   Mercury Vapor Light
OC    On Center
OD    Outside Diameter
Orig. Original
PB    Pull Box
PC    Point of Curvature
PCC   Point of Compound Curvature or Portland Cement Concrete
PCVC  Point of Compound Vertical Curve
PE    Polyethylene
PI    Point of Intersection
PL    Property Line
PMP   Perforated Metal Pipe
POC   Point on Curve
POT   Point on Tangent
PP    Power Pole
PRC   Point on Reverse Curve
PRVC  Point on Reverse Vertical Curve
PVC   Polyvinyl Chloride
PVMT  Pavement
PVT. R/W Private Right of Way
Q     Rate of Flow in Cubic Feet Per Second
Quad. Quadrangle, Quadrant
R     Radius
RAC   Recycled Asphalt Concrete
RAP   Reclaimed Asphalt Pavement
RC    Reinforced Concrete
RCP   Reinforced Concrete Pipe
Abbreviations

RCV  Remote Control Valve
Ref.  Reference
Reinf. Reinforced, Reinforcement
Res.  Reservoir
RET  Return Point
RR  Railroad
R/W  Right-of-Way
RWD  Redwood
S  Slope
SD  Storm Drain
S Dist. Local Sanitary District
SDR  Standard Thermoplastic Pipe Dimension Ratio
      (ratio of pipe O.D. to minimum wall thickness)
SI  International System of Units (Metric)
Spec. Specifications
SS  Sanitary Sewer
Sta.  Station
Std.  Standard
Str. Gr.  Straight Grade
Struct. Structural/Structure
SW  Sidewalk
Tan.  Tangent
TC  Top of Curb
Tel.  Telephone
Topo.  Topograph
TS  Traffic Signal or Transition Structure
TSC  Traffic Signal Conduit
T/W  Top of Wall
Typ.  Typical
URB  Untreated Rock Base (Aggregate Base)
VB  Valve Box
VC  Vertical Curve
VCP  Vitrified Clay Pipe
Vert.  Vertical
VG  Valley Gutter
Vol.  Volume
WI  Wrought Iron
WM  Water Meter
WPJ  Weakened Plane Joint
X-Sec  Cross Section
YD  Yard Drain
DEFINITIONS

Acknowledgment of Completion - A written notice issued by the Agency Engineer acknowledging physical completion of work in accordance with the plans, specifications and agreements - applicable only to private projects. This is not a recorded Notice of Completion.

Addendum - Written or graphic instruments issued prior to the opening of bids which clarify, correct or change the bidding or the contract documents. The term Addendum shall include bulletins and all other types of written notices issued to potential bidders prior to opening of bids.

Agency - Any City, County, or special district which has adopted these specifications and has jurisdiction over the work being performed.

Agency Engineer - The Civil Engineer appointed by the governing body of an Agency to act on its behalf who has authority over construction work performed within its jurisdiction. This term also includes properly authorized agents of the Agency Engineer acting within the scope of their authority.

Agency Project - A project constructed by others under a contract with and paid for by an Agency or Force Account work paid for by an Agency.

Base - A layer of specified material of planned thickness placed immediately below pavement or surfacing.

Bidder - Any individual, firm, corporation, or agent thereof submitting a proposal for work.

Bid Guaranty - The cash, certified check or bidder's surety bond accompanying the bid as a guaranty that the bidder will enter into a contract with the Governing Body for the performance of the Work.

Bond - Bid, performance and payment bond or other instrument of security.

Change Order - A written order to the Contractor signed by the Agency directing an addition, deletion or revision in the work, or an adjustment in the contract price or the contract time issued after the effective date of the contract. A change order may or may not be signed by the Contractor.

Code - The term Government Code, Labor Code, etc. refer to codes of the State of California.

Contract - A written agreement governing the performance of work and the furnishing of plant, labor, tools, equipment and materials.

Contractor - The person, persons, copartnership or corporation who has entered into a contract with an Agency or any Contractor performing work which is governed by Agency permit or agreement.

Contract Price - The total amount of money for which the contract is awarded.

Contract Unit Price - The amount stated in the bid for a single unit of an item of work.
Department of Public Works - The Department of Public Works of the County, or any City or any other agency using these specifications.

Electroluer - Street light assembly complete including foundation, standard, luminaire arm, luminaire, etc.

Engineer - A licensed engineer retained by the owner of a private project to prepare plans and/or act as "Engineer of Work," for that project.

- The Chief Engineer of the Agency, or other person designated by the Agency, acting either directly or through authorized agents.

Governing Body - The City Council, Board of Supervisors, or Board of Directors of any City, County, or Special District with jurisdiction over work performed under these specifications.

House Sewer - A sewer, wholly within private property, proposed to connect any building to a lateral sewer.

Laboratory - The Materials Testing Laboratory maintained by the Agency, or laboratories authorized by the Agency Engineer to test materials and work.

Luminaire - The lamp housing including the optical and socket assemblies (and ballast if so specified).

Luminaire Arm - The structural member, bracket or mast arm, which, mounted on the standard, supports the luminaire.

Major Bid Item - A single contract item constituting 10% or more of the original contract price.

Modification - Includes change orders and supplemental agreements. A modification may only be issued after the effective date of the contract.

Notice of Award - The written notice by the Agency to the successful bidder stating that upon compliance by the bidder with the required conditions, the Agency will execute the contract.

Notice of Completion - A written notice issued by the Agency acknowledging physical completion of the construction of all improvements shown on the plans and required by the contract.

Notice to Proceed - A written notice given by the Agency to the Contractor fixing the date on which the contract time will start.

Owner - In the case of Agency projects, the term owner means the contracting agency. In the case of private projects, the term owner means the person who is working or having work done under permit or agreement with an Agency.

Pavement - The uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with "surfacing."

Person - Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.
Plans - The plans, profiles, typical cross-sections, and working drawings, or reproductions thereof, which show the location, character, dimensions and details of the work to be done, as approved by the Agency Engineer, and which are a part of the contract.

Private Construction of Private Projects - All construction, other than Agency projects, done under permit or agreement with an Agency, and subject to Agency inspection.

Proposal - The offer of the bidder for the work when made out and submitted on the prescribed proposal form, properly signed and guaranteed.

Reference Specifications - Those bulletins, standards, rules, methods of analysis or tests, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the contract documents. These refer to the latest edition, including amendments in effect and published at the time the Agency adopted or approved the plans and specifications for the work, unless specifically referred to by edition, volume, or date.

Rights-of-Way - The full width of land, irrespective of the current use, which by deed, map, conveyance, agreement, easement, dedication, usage or process of law, is reserved for, dedicated to, or used by the general public for street, highway, alley, public utility, drainage or pedestrian walkway purposes.

Roadway - That portion of a right-of-way included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, including all appertaining structures and features necessary for proper drainage and protection.

Sewer - Any conduit intended for the reception and transfer of sewage and fluid industrial waste.

Shoulder - That portion of the completed roadway between the edge of traveled way and the side slopes or ditches.

Soils Engineer - Any soils engineering firm, or authorized representative of such a firm, which is retained by the owner of a project for the purpose of reporting, designing, testing, or controlling grading, installation of pavements, or trench backfill, and/or means to handle subsurface water.

Special Provisions - Supplementary provisions to these specifications which are a part of the contract.

Specifications - The directions, provisions and requirements contained herein and in the Special Provisions pertaining to performance of work, quantities and qualities of materials and labor to be furnished under the contract.

Standard Drawings - Those drawings designated by the Agency Engineer as standard drawings at the time an agency contract or agreement is entered into or permit is issued. If not specifically called otherwise, the standard drawings shall be those titled "Standard Drawings for the Cities and County of Marin."

State - the State of California.
State Specifications - The latest edition of Standard Specifications, State of California, Department of Transportation, at the time of approval of plans by agency.

Storm Drain - Any conduit and appurtenances intended for the reception and transfer of storm water.

Street - The full width of the right-of-way of any traveled way whether or not maintained by a public agency, except streets forming part of the State Highway System.

Subbase - A layer of specified material of planned thickness between a base and the basement material.

Subcontractor - An individual, firm or corporation having a direct contract with the Contractor or with any other subcontractor for the performance of a part of the work.

Subgrade - The portion of the roadway on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

Supervision - Supervision, where used to indicate supervision by the engineer, shall mean the performance of obligations, and the exercise of rights, specifically imposed upon and granted to the Agency in becoming a party to the contract. Except as specifically stated herein, supervision by the Agency shall not mean active and direct superintendence of details of the work or responsibility for quality of work.

Supplemental Agreement - A written amendment of the contract documents signed by both parties.

Surety - An individual, firm or corporation, bound with and for the Contractor for the acceptable performance, execution, and completion of the work and for the satisfaction of all obligations incurred.

Surfacing - The uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with "pavement."

Traveled Way - That portion of the roadway which is used for the movement of vehicles.

Utility - Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, sewers, or storm drains owned, operated, or maintained in or across a public right-of-way or private easement.

Work - That which is proposed to be constructed or done with the contract or permit, including the furnishing of all labor, materials and equipment.
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<thead>
<tr>
<th>Acronym</th>
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<tr>
<td>AAN</td>
<td>American Association of Nurserymen</td>
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<td>ABAG</td>
<td>Association of Bay Area Governments</td>
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<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
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<td>AISC</td>
<td>American Institute of Steel Construction</td>
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<td>AISI</td>
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<td>API</td>
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<td>American Railway Engineering Association</td>
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<td>AWWA</td>
<td>American Water Works Association</td>
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<td>BAAQMD</td>
<td>Bay Area Air Quality Management District</td>
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<td>Bell</td>
<td>Bell Telephone</td>
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<td>BCDC</td>
<td>San Francisco Bay Conservation and Development Commission</td>
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<td>Caltrans</td>
<td>California Department of Transportation</td>
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<td>EIA</td>
<td>Electronic Industries Association</td>
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<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
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<td>MMWD</td>
<td>Marin Municipal Water District</td>
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<td>MTC</td>
<td>Metropolitan Transportation Commission</td>
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<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
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<td>NMWD</td>
<td>North Marin Water District</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>(Department of Commerce)</td>
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<td>OSHA</td>
<td>Occupational Safety and Health Act</td>
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<td>P G &amp; E</td>
<td>Pacific Gas and Electric Company</td>
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<td>UL</td>
<td>Underwriters Laboratories, Inc.</td>
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<td>USA</td>
<td>Underground Service Alert</td>
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<td>USGS</td>
<td>United States Geological Survey</td>
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<td>USASU</td>
<td>United States of American Standards Institute</td>
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CONTRACT PROVISIONS

Section 7. General

7.01 - Contractor shall commence work within five (5) working days after written notice to do so by Engineer. Time for completion of work will be computed from date of said notice to commence work. The allowable time for completion of the work is set forth in the special conditions.

7.02 - Contract documents which shall constitute the entire contract for said work include the following:

1. Notice to Bidders
2. Instructions to Bidders
3. All Addenda Issued
4. Accepted Proposal
5. Subcontractors Statement
6. Non-Collusion Affidavit
7. Contract
8. Faithful Performance Bond and Labor and Material Bond
9. Specifications - Cities and County of Marin

7.03 - The Public Agency will furnish without cost to the successful Contractor sufficient copies of the plans and specifications.

7.04 Coordination of Plans and Specifications - The specifications, the plans, and all supplementary documents are essential parts of the contract. All requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative, to describe, and to provide for a complete work. In case of conflict, plans shall govern over specifications.

7.05 Extra Work - New and unforeseen work will be classed as extra work when such work cannot be covered by any of the various items or combination of items for which there are bid prices.

The Contractor shall not do extra work except upon written order from the Agency Engineer. For such extra work, the Contractor shall receive payment as previously agreed upon in writing, or he shall be paid on force account as provided in Section 9.06 of these specifications.

7.06 Removal of Obstructions - Where the completion of the work requires their removal, the Contractor shall remove and dispose of all structures, debris, or other obstructions encountered in making the improvement. Unless otherwise provided in the Special Provisions, full compensation for performing this work shall be considered as included in the contract payments for other items of work and no additional compensation will be allowed therefor.

7.07 Disposal of Materials - The Contractor shall make his own arrangement for disposing of materials outside the public right-of-way, construction area, or limits of work, and he shall pay all costs involved. Full compensation for all costs involved in disposing of materials shall be considered as included in the price paid for the contract item of work involving such materials.

7.08 Sanitation - The Contractor shall provide all necessary privy accommodations for the use of his employees on the work and shall maintain same in a clean and sanitary condition.
7.09 **Trench Shoring** - If the amount bid for the excavation of any trench or trenches five (5) feet or more in depth is in excess of Twenty-five Thousand Dollars ($25,000.00) then the following requirements shall apply pursuant to Section 6422 of the State Labor Code. Prior to excavation of any trench or trenches five (5) feet or more in depth the Contractor shall submit to and have approved by Agency a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, the plan shall be prepared by a Registered Civil or Structural Engineer. Nothing in this section shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

7.10 **Final Cleaning Up** - Before acceptance and final payment, the Contractor shall clean all streets, roads, borrow pits, and all ground occupied by him in connection with the work, of all rubbish, excess materials, temporary structures, and equipment. All parts of the work shall be left in a neat and presentable condition. Natural ground cover disturbed by haul roads shall be restored to its condition prior to inspection of the work.

7.11 **Errors and Omissions** - If the Contractor, in the course of the work, finds any error or omission in plans or in the layout as given by the plans and the physical conditions of the locality, he shall promptly notify the Engineer. Any work done after such discovery, unless authorized in writing, shall be done at the Contractor’s expense.

7.12 **No Personal Liability** - Neither the Governing Body, Agency Engineer, nor any other officer or authorized agent or assistant of the Agency shall be personally responsible for any liability arising under the contract.

7.13 **Responsibility of Agency** - The Agency shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance, except as expressly provided in these specifications or the Special Provisions.

7.14 **Right-of-Way** - The right-of-way for the work to be constructed shall be provided by the Agency. The Contractor shall make his own arrangements, and pay all expenses for additional area required by him outside of the limits of right-of-way, unless otherwise provided in the Special Provisions.

**Section 8. Progress**

8.01 **Suspension of Contract** - If at any time, in the opinion of the Agency Engineer, the Contractor has failed to supply adequate and suitable equipment, work force, or material, or has failed in any other respect to prosecute the work with the diligence specified and intended in and by the terms of the contract, written notice thereof will be served upon him. If he neglects or refuses to comply with the contract, as directed by the Agency Engineer, within the time specified in such notice, the Agency may suspend operation of the contract. Upon receiving notice of suspension, the Contractor shall discontinue said work, or such parts of it as the Agency Engineer may designate. Upon suspension, the Contractor’s control shall terminate, and the Agency may do all or any combination of the following:

A. Engineer or his duly authorized representative may take possession of all or any part of the Contractor’s materials upon the premises; use same to complete the contract; hire such forces, buy or rent machinery, tools, appliances and equipment; and buy such additional materials and supplies as may be necessary for the proper conduct of the work and completion thereof.
B. Employ other parties to carry the contract to completion, employ the necessary workmen, substitute other machinery or materials, and purchase the materials contracted for, in such manner as the Agency may deem proper.

C. The Agency Engineer may annul and cancel the contract and relet the work or any part thereof.

Any excess of cost arising therefrom over and above the contract price will be charged against the Contractor and his sureties, who will be liable therefor. In the event of suspension, all money due the Contractor, or retained under the terms of this contract, shall be forfeited toward any excess of cost over the contract price, arising from the suspension and completion of work by the Agency as above provided. The Contractor will be credited with any surplus remaining after all just claims for such completion have been paid.

On the completion of the contract, the original Contractor shall be entitled to the return of all his unused materials, and his equipment, tools and appliances, except that he shall have no claim on account of usual and ordinary depreciation, loss, and wear and tear.

The Agency Engineer's determination whether there has been non-compliance with the contract which warrants the suspension or annulment thereof, shall be binding and conclusive.

8.02 Temporary Suspension of Work - The Agency Engineer shall have the authority to suspend the work wholly or in part, for such period as he may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work, or for such time as he may deem necessary for the Contractor to correct portions of the work which are faulty due to the failure on his part to carry out orders given, or to perform any provision of the contract. The Contractor shall immediately comply with the written order of the Agency Engineer to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods corrected, as ordered or approved in writing by the Agency Engineer.

In the event that a suspension of work is ordered, as provided above, by reason of the failure of the Contractor to carry out orders or to perform any provision of the contract; or by reason of unsuitable weather conditions when in the sole opinion of the Agency Engineer any item or items of work could have been performed prior to the occurrence of such unsuitable weather conditions had the Contractor diligently prosecuted the work; the Contractor, at his expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during period of such suspension, as provided in Section 12 of these specifications and as specified in the Special Provisions for the work. In the event that the Contractor fails to perform the work above specified, the Agency will perform such work and the cost thereof will be deducted from moneys due or to become due the Contractor.

In the event that a suspension of work is ordered by the Agency Engineer due to unsuitable weather conditions, and in the sole opinion of the Agency Engineer, the Contractor has prosecuted the work with energy and diligence prior to the time that operations were suspended, the cost of providing a smooth and unobstructed passageway through the work will be paid for as extra work as provided in Section 7.05 of these specifications, or at the option of the Engineer, such work will be performed by the Agency at no cost to the Contractor.

If the Agency Engineer orders a suspension of all of the work or a portion of the work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the work, the days on which the suspension is in effect shall not be considered working days. If a portion of work at the time of such suspension is not a current controlling operation or operations, but subsequently does become the current controlling operation or operations, the determination of working days will be made on the basis of the then current controlling operation or operations.

If a suspension of work is ordered by the Agency Engineer, due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the contract, the days on which the suspension order is in effect shall be considered working days if such days are working days.
within the meaning of the definition set forth in Section 8-1.06 "Time of Completion" of the State Specifications.

In the event of a suspension of work under any of the conditions set forth in this Section, such suspension of work shall not relieve the Contractor of his responsibilities as set forth in Section 12, "Responsibility to the Public" of the State Specifications.

8.03 Utility and Non-Highway Facility Delays - It is anticipated that some or all of the utility and other non-highway facilities, both above ground and below ground, that are required to be rearranged (as used herein, rearrangement includes installation, relocation, alteration or removal) as part of the highway improvements will be rearranged in advance of construction operations. Where it is not anticipated that such rearrangement will be performed prior to construction, or where the rearrangement must be coordinated with the Contractor's construction operations, the existing facilities that are to be rearranged will be indicated on the plans or in the Special Provisions. Where a rearrangement is indicated on the plans or in the Special Provisions, the Contractor will have no liability for the costs of performing the work involved in such rearrangement.

The right is reserved to the Agency and the owners of facilities, or their authorized agents, to enter upon the highway right-of-way for the purpose of making such changes as are necessary for the rearrangement of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with forces engaged in such work and shall conduct his operations in such a manner as to avoid any unnecessary delay or hindrance to the work being performed by such other forces. Wherever necessary, the work of the Contractor shall be coordinated with the rearrangement of utility or other non-highway facilities, and the Contractor shall make arrangements with the owner of such facilities for the coordination of the work.

Any utility or other non-highway facility necessary to be rearranged but not included as a contract item of work shall be rearranged by the Contractor when ordered by the Agency Engineer in writing. Any such work will be paid for as extra work.

Should the Contractor desire to have any rearrangement made in any utility facility, or other improvement, for his convenience in order to facilitate his construction operations, which rearrangement is in addition to, or different from the rearrangements indicated on the plans or in the Special Provisions, he shall make whatever arrangements are necessary with the owners of such utility or other non-highway facility for such rearrangement and bear all expenses in connection therewith.

Attention is directed to the possible existence of underground facilities not known to the Agency or in a location different from that which is shown on the plans or in the Special Provisions. The Contractor shall take steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities or interfere with their service.

Where it is determined by the Agency Engineer that the rearrangement of an underground facility, which is not shown on the plans or in the Special Provisions, is essential in order to accommodate the highway improvement, the Agency Engineer will provide for the rearrangement of such facility by other forces or such rearrangement shall be performed by the Contractor and will be paid for as extra work.

Any delays to the Contractor's operations solely because utility or other non-highway facilities are not rearranged, as provided in this Section, due to a strike or labor dispute, will entitle the Contractor to an extension of time as provided in Section 8-1.07 "Liquidated Damages" of the State Specifications. The Contractor shall be entitled to no compensation for such delay.

8.04 Contractor's Responsibility for the Work and Materials - Until acceptance, the Contractor shall have the charge and care of the work and of the materials to be used therein (including materials for which he has received partial payment or materials which have been furnished by the Agency) and shall bear the risk of injury, loss, or damage to any part thereof by the action of the elements or from any other cause whatsoever, except as provided in Section 8.05, "Relief from
Maintenance and Responsibility. The Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the work or the materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof, except for such injuries, losses or damages to any portion of the work or the materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof, except for such injuries, losses, or damages as are directly and proximately caused by acts of the Federal Government or the public enemy. Where necessary to protect the work or materials from damage, the Contractor shall, at his expense, provide suitable drainage of the roadway and erect such temporary structures as are necessary to protect the work or materials from damage. The suspension of the work from any cause whatever shall not relieve the Contractor of his responsibility for the work and materials as herein specified. If ordered by the Agency Engineer, the Contractor shall, at his expense, properly store materials which have been partially paid for by the Agency or which have been furnished by the Agency. Such storage by the Contractor shall be on behalf of the Agency and the Agency shall at all times be entitled to the possession of such materials. The Contractor shall promptly return the same to the site of the work when requested. The Contractor shall not dispose of any of the stored materials unless authorized in writing by the Agency Engineer.

8.05 Relief from Maintenance and Responsibility - If the Contractor requests, the Agency Engineer may relieve him of the duty of maintaining and protecting certain portions of the work as described below, which have been completed in all respects in accordance with the Agency Engineer. Thereafter, except with his consent, the Contractor will not be required to do further work thereon. Such action by the Agency Engineer will relieve the Contractor of responsibility for injury or damage to the completed portions of the work resulting from use by public traffic, the action of the elements, or any other cause, other than injury or damage resulting from the Contractor's own operations or his negligence.

Portions of the work for which the Contractor may be relieved the duty of maintenance and protection, as provided in the above paragraph, include, but are not limited to, the following:

A. The completion of one-quarter mile of roadway, one-quarter mile of one roadway of a divided highway, a frontage road including the traveled way.

B. Shoulders, drainage control facilities, planned roadway protection work, lighting and required traffic control and access facilities appurtenant to the work.

C. A bridge or other structure of major importance.

D. A complete unit of a traffic control signal system or of a highway lighting system.

E. A complete unit of highway protection work.

F. Required traffic control and access facilities if the roadway or structure is to be used by public traffic before completion of the contract.

G. Non-highway facilities constructed for other agencies.

Nothing in this Section providing for relief from maintenance and responsibility will be construed as relieving the Contractor of full responsibility for correcting defective work or materials discovered at any time before the formal written acceptance of the entire contract.

8.06 Property Rights in Materials - Nothing in the contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or the soil, or after payment has been made for 90 percent of the value of materials delivered to the site of the work, or stored subject to or under the control of the Agency. All such materials shall become the property of the Agency upon being so attached or affixed or upon payment of 90 percent of the value of materials delivered to the site of the work, or stored subject to or under the control of the Agency.
8.07 **Re-examination of Work** - Re-examination of any work may be ordered by the Agency Engineer, and, if so ordered, the work must be uncovered by the Contractor. If such work is found to be in accordance with the contract documents, the Agency shall pay the cost of the re-examination and replacement. If such work does not comply with the contract documents, the Contractor shall pay the costs.

8.08 **Removal of Defective and Unauthorized Work** - All work which has been rejected as defective in its construction, or deficient in any of the requirements of these specifications, shall be remedied or removed and replaced by the Contractor in an acceptable manner. No compensation will be allowed for such correction.

Any work done beyond the lines and grades shown on the plans or established by the Agency Engineer, and any extra work done without order by the Agency Engineer, will be considered as unauthorized and will not be paid for. Work so done may be ordered removed at the Contractor's expense.

If the Contractor fails to comply forthwith with any order of the Agency Engineer made under the provisions of these specifications, the Agency Engineer shall have authority to cause defective work to be remedied or removed and replaced, and unauthorized work to be removed, and to deduct the costs thereof from any monies due or to become due the Contractor.

Section 9. Measurement and Payment

9.01 **Measurement of Quantities** - Measurements of the completed work shall be in accordance with United States Standard Measures and the units of measurement for payment, and the limits thereof, shall be as shown in the contract.

In determining quantities, all measurements shall be made as constructed unless otherwise specified.

Material paid for by the ton shall be weighed on platform scales furnished by the Contractor, or on public scales at the expense of the Contractor. A ton shall consist of 2,000 pounds avoirdupois. Weigh tags shall be turned in to the Agency Inspector on the job at the time weighted materials are delivered. Scale sheets may be required by the Agency Engineer at any time subsequent to delivery of weighted material.

When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or if when requested by the Contractor and approved by the Agency Engineer, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Agency Engineer and shall be agreed to by the Contractor before such method of measurement will be adopted.

All expense incurred in conforming to the above requirements for measuring the weighing materials shall be as included in the contract unit prices paid for the materials being measured or weighed. No additional allowance will be made therefor.

Quantities of material wasted or disposed of in a manner not called for under the contract, rejected loads of material, including material rejected after it has been placed by reason of the failure of the Contractor to conform to the provisions of the contract, material not unloaded from the transporting vehicles, material placed outside the lines indicated on the plans or given by the Agency Engineer, or material remaining on hand after completion of the contract will not be paid for, and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

9.02 **Scope of Payment** - The Contractor shall accept the compensation, as herein provided, as full payment for furnishing all plant, labor, materials, tools, equipment, and incidentals necessary to the
completed work and for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the work, action of the elements, unforeseen difficulties which may be encountered during the prosecution of the work, expenses incurred in consequence of the suspension or discontinuance of the work as herein specified, and for completing the work according to plans and specifications. Neither the payment of any estimate nor retained percentage shall relieve the Contractor of his obligation to correct defective work or material.

9.03 Progress Payments - The Agency Engineer will, once a month, on or about the 25th of each month, make an inspection of the work in progress and prepare an estimate of the amount of work completed since the last such inspection or start of work. Monthly progress payments in the amount of 90 percent of the value of the work will be made to the Contractor based on this estimate and the schedule of prices contained in the accepted bid. The remaining 10 percent will be retained by the Agency as partial security for the fulfillment of the contract except that at any time after fifty (50) percent of the work has been completed, if the Engineer finds that satisfactory progress is being made and the projects critical path of work are on schedule, the City may discontinue any further retention. Such discontinuance will only be made upon the written request of the Contractor. The City may, at any time the Engineer finds that satisfactory progress is not being made, again institute retention of ten (10) percent as specified above. Payment will be made as soon as possible after the preparation of the estimate.

No estimate or payment shall be made if, in the judgment of the Agency Engineer, the work is not proceeding in accordance with the provisions of the contract, or when, in his judgment, the total value of the work done since the last estimate amounts to less than $1,000. No progress payments will be made if the time allotted for the job is 30 working days or less.

9.04 Payment of Withheld Funds - At the request and expense of the Contractor, securities may be substituted for funds withheld by the Agency. Any such securities shall be deposited in escrow with the Agency's Finance Director or with a state or federally chartered bank. The following conditions shall apply to any such deposit of securities.

A. The eligible securities shall be those listed in Section 16430 of the California Code, bank, or savings and loan certificates of deposit.

B. The Contractor shall bear the expense of the Agency and the escrow agent, either the Agency Finance Director or the bank, in connection with the escrow deposit made.

C. Securities or certificates of deposit to be placed in escrow shall be subject to approval of the Agency Finance Director and unless otherwise permitted by the escrow agreement, shall be of a value of at least 110 percent of the amounts of retention to be paid to the Contractor pursuant to this section.

D. The Contractor shall enter into an escrow agreement satisfactory to the Agency Finance Director which agreement shall contain as a minimum the following provisions:

1. The amount of securities to be deposited.

2. The terms and conditions of conversion to cash in case of default by the Contractor.

3. The termination of the escrow upon completion of the contract.

9.05 Final Payment After Completion of Work - The Agency Engineer shall make a final estimate of the amount of work done and the value of such work. The Agency shall pay this entire sum after deducting all previous payments and all amounts to be retained under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment. The final payment shall not be due and payable until 35 days after the recording of the Notice of Completion.
9.06 Force Account Payment - Extra work as herein before defined, when ordered and accepted, shall be paid for under a written work order in accordance with the terms therein provided. Payment for extra work will be made at the unit price or lump sum previously agreed upon by the Contractor and the Agency Engineer, or by force account.

When payment is made on a force account basis the amount shall be determined in accordance with Sections 9-1.03 through 9-1.03D of the State Specifications.
Section 10. Control of the Work

10.01 Authority of the Agency Engineer and Engineer - The Agency Engineer shall decide all questions concerning quality or acceptability of materials furnished and work performed, manner of performance, rate of progress, interpretation of plans and specifications, compensation for work performed and all questions as to the acceptable fulfillment of the contract by the Contractor. The Agency Engineer's decision shall be final, and he shall have authority to enforce and effectuate such decisions and orders as the Contractor fails to carry out promptly.

On all work where a private Engineer has furnished the design or been designated Engineer of Work by the owner; his approval of proposed changes, materials, quality of work, manner of performance, rate of progress, and interpretation of plans and specifications shall be sought and obtained in addition to the approvals granted by the Agency Engineer.

10.02 Plans - All authorized alterations which affect the requirements and information given on the approved plans shall be in writing. No changes shall be made to any plan or drawing after it has been approved by the Agency Engineer, except by his written consent. Working drawings or plans for any structure not included in the plans furnished by the Engineer must be approved by the Agency Engineer before any work involving these plans is performed.

The approval of any drawing or method of work proposed by the Contractor shall not relieve him of his responsibility for errors therein and shall not be regarded as assumption of risk or liability by the Agency or officer or employee thereof. The Contractor shall have no claim under the contract due to failure, partial failure, or inefficiency of any plan or method so approved. Such approval shall be construed only to mean that the Agency Engineer has no objection to the Contractor's using, upon his own full responsibility, the plan or method proposed.

A complete and up-to-date set of approved plans and specifications shall be kept at the job site at all times work is in progress.

10.03 Suggestions to Contractor - Any plan or method for work suggested by the Agency Engineer to the Contractor, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. Neither the Agency Engineer nor the Agency shall assume any responsibility therefor.

10.04 Conformity with Plans and Allowable Deviation - Finished surfaces in all cases shall conform with the lines, grades, cross sections, and dimensions shown on the approved plans. Deviations from the approved plans, as may be required by the exigencies of construction, will be determined, in all cases, by the Agency Engineer.

10.05 Interpretation of Plans and Specifications - If it appears that the work to be done, or any matter relative thereto, is not sufficiently detailed or explained in the specifications and plans, the Contractor shall apply to the Agency Engineer for further explanations as necessary, and shall conform to such explanation or interpretations as part of the contract. In the event of a discrepancy between scaled dimensions and written figures, the figures shall be taken as correct.
10.06 Superintendence - Before initial work is begun, the Contractor and his foreman shall file with the Agency Engineer addresses and telephone numbers where they can be reached during working and non-working hours.

The Contractor shall be on the work constantly during its progress or shall be represented by a superintendent or foreman who is competent to receive and carry out any instructions that may be given him by the proper authorities. The Contractor will be held liable for faithful observance of any instructions which may be delivered to him or his representative, on the work or at the addresses or telephone numbers filed as required by the preceding paragraph.

10.07 Character of Workmen - If any subcontractor or person employed by the Contractor fails or refuses to carry out the directions of the Agency Engineer or appears to the Agency Engineer to be incompetent or acts in a disorderly or improper manner, he shall be discharged immediately on demand by the Agency Engineer, and such person shall not again be employed on the work.

10.08 Lines and Grades - Lines and grades for the work will be given by the Engineer or Agency Engineer. All distances and measurements are given and will be made in a horizontal plane, unless otherwise provided. Grades are given from top of stakes or nails, or other points set by the Engineer or Agency Engineer.

Three consecutive points shown on the same rate of slope must be used together, in order to detect any variation from a straight grade. In case any such variation is found, it must be reported to the Engineer or Agency Engineer. If such a variation is not reported the Contractor shall be responsible for any error in the finished work.

The Contractor shall give at least 2 working days' notice when he will require the services of the Agency Engineer for laying out any portion of the work.

10.09 Preservation of Stakes - The Contractor shall take every reasonable precaution to preserve survey stakes, used for alignment of grade, to facilitate checking by the Agency Engineer. Stakes unnecessarily disturbed shall be re-set by the Engineer or Agency Engineer at the Contractor's expense or by the owner's Engineer. In case of disputed grades, it shall be assumed that any lost or disturbed stake was set at the proper grade and alignment was properly marked.

10.10 Inspection - The Agency Engineer shall have access to the work at all times during construction, and shall be furnished with every reasonable facility to determine the progress, workmanship, and character of materials used and employed in the work.

The Contractor shall give the Agency Engineer notice of the time when he or his subcontractor will start the various units or operations of the work, or resume said units or operations when properly suspended. Notice shall be given at least 1 working day in advance of the starting or resumption time. Any work performed by the Contractor or his subcontractors outside the scope of the notice shall be removed if so ordered by the Agency Engineer, or his representative on the work.

10.11 Right of Access to Street - The right is reserved to the Agency, street, railroads, water, sewer, gas, electric, telephone, T.V. and telegraph companies to enter upon the street for the purpose of making repairs, changes and new installations necessitated by the improvement thereof, or for necessary maintenance.
Making of repairs, changes and new installations necessitated by the improvement causing delays to the Contractor shall be approved by the Agency Engineer. The Agency Engineer and Contractor shall agree upon any time delay or monetary damage in writing as a supplemental agreement.

10.12 Placing Portions of Work in Service - If requested by the Agency, portions of the work, as completed, shall be placed in service. The Contractor shall give proper access to the work for this purpose. Such use and operation shall not constitute an acceptance of the work, and the Contractor shall be liable for defects due to faulty construction until the entire work under the contract is finally accepted.

10.13 Extent of Trench to be Opened Up - In existing roadways, no more than 500 feet of trench shall be open at any given time. An open trench is a trench which has not been completely backfilled, satisfactorily compacted, and in paved areas, capped with at least 1 inch of temporary paving. This requirement may be modified only upon written permission from the Agency Engineer, unless otherwise specified in the Special Provisions.

10.14 Restoration of Damaged Property - The Contractor shall restore all damaged property, including curbs, gutters, pavements, sidewalks, pipes, conduits, sewers, and other public and/or private property to a condition as good as, or better than, it was when he entered upon the work.

10.15 Monuments - The Contractor shall not disturb any survey monument until the monument rivet, disc, or reference mark therein has been "tied out" by a field survey party of the Agency. The Contractor shall salvage and deliver to the Agency, all monument castings removed during the progress of the work. The Agency will, at its expense, do the necessary surveying and all Agency Survey monuments necessarily reconstruct disturbed by the Contractor's operations. In the event that the Contractor disturbs any Agency survey monument before same has been "tied out" by the Agency or unnecessarily disturbs any Agency survey monument during construction operations, the Agency will reset such monuments at the expense of the Contractor.

10.16 Stop Work Order - Whenever work is proceeding contrary to plans or specifications, or in violation of applicable ordinances or laws, or in such way as to endanger life or property, the Agency Engineer may order the work stopped by notice in writing served on any persons engaged in doing or causing such work to be done, and such persons shall forthwith stop such work until authorized to proceed by the Agency Engineer.

10.17 Final Inspection - Whenever the work provided and contemplated by the contract shall have been completed and the final cleaning up performed, the Agency Engineer will make the final or completion inspection.

Section 11. Control of Material

11.01 Source of Materials - Prior to commencement of any work, the Contractor shall submit to the Agency Engineer, a list of the suppliers or sources of all materials to be incorporated in the work. This list shall be approved by the Agency engineer before any of the materials are brought to the job site.

Notwithstanding any prior inspection or approval, only materials conforming to the requirements of these specifications and the Special Provisions shall be incorporated in the work. The materials
furnished and used shall be new, except as may specifically be provided on the plans or in the Special Provisions. The materials shall be manufactured, handled, and used in a workmanlike manner to insure completed work in accordance with the plans and specifications.

11.02 Samples and Tests - Submittal of representative preliminary samples of materials to be used in the work may be required by the Agency Engineer if specified in the special provisions.

All tests of materials furnished or work done by the Contractor shall be made, in accordance with the methods in use by the laboratory of Caltrans or by commonly recognized standards of national organizations, and such special methods and tests as are prescribed in these specifications. Whenever a reference is made in the specifications to a test method, it shall mean the test method in effect on the day the Agency adopted or approved the plans and specifications for the work unless specifically referred to by edition, volume or date. Materials may be tested at any time during the progress of the work, and defective materials will be rejected.

11.03 Agency Furnished Materials - Materials furnished by the Agency will be made available at locations designated in the Special Provisions. The cost of handling and placing Agency furnished materials shall be considered as included in the price paid for the contract item involving such materials. The Contractor will be held responsible for all materials furnished to him, and he shall pay all demurrage and storage charges. Agency furnished materials lost or damaged by the Contractor shall be replaced by the Contractor. The Contractor will be liable to the Agency for the cost of replacing Agency-furnished material and such costs may be back-charged to the Contractor or deducted from any monies due or to become due.

11.04 Storage of Materials - Materials shall be stored in a manner which will insure the preservation of their quality and fitness for the work. When considered necessary by the Agency Engineer, materials shall be placed on platforms or other hard, clean surfaces and covered when directed. Materials shall be stored so as to facilitate inspection.

No materials, or other obstructions, shall be placed within 15 feet of, nor obstruct access to, fire hydrants, nor within 5 feet of United States mailboxes.

11.05 Defective Materials - All materials which do not conform to the requirements of these specifications shall be considered as defective, and such materials, whether in place or not, shall be rejected and immediately be removed from the site of the work, unless otherwise permitted by the Agency Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used until approved by the Agency Engineer.

If the Contractor fails to comply with any order made under the provisions of this article, the Agency Engineer shall have authority to remove and replace the defective material, to charge the Contractor, or to deduct the cost of removal and replacement from any monies due or to become due.

11.06 Trade Names, Alternatives and Substitutions - For convenience in designation on the plans or in the specifications, certain articles or materials to be incorporated in the work may be designated under a trade name or the name of a manufacturer and his catalog information. Such designation shall, in accordance with Govt. Code Section 4380, be deemed followed by the words "or equal."
The use of an alternative article or material which is of equal quality and of the required characteristics for the purpose intended will be permitted, subject to the following requirements:
A. The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor. He shall furnish all necessary information as required by the Engineer or Agency Engineer.

B. The Agency Engineer shall be the sole judge as to the quality and suitability of alternative articles or materials and his decision shall be final.

C. Requests for substitution of equivalent materials or articles shall be submitted to the Agency Engineer in writing along with the required supplementary data within 7 days following award of the contract or as specified in the Special Provisions.

11.07 Substitutions - The Contractor shall furnish such information, test data, samples or references requested by the Agency Engineer so that an accurate appraisal of any proposed substitution can be made. Approval of substitutes will be in writing.

11.08 Certificates of Compliance - A Certificate of Compliance shall be furnished prior to the use of any materials for which these specifications or the Special Provisions require that such a certificate be furnished. In addition, when so authorized in these specifications or in the Special Provisions, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the specifications. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the plans and specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The Agency reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

Section 12. Responsibilities to the Public

12.01 Laws to be Observed - The Contractor shall keep himself fully informed of all State and Federal laws and County and Municipal ordinances and regulations which, in any manner, affect those engaged or employed in the work, the materials used in the work, the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. He shall at all times observe and comply with, and shall cause all his agents and employees to observe and comply with all such existing and future laws, ordinances, regulations, orders, and decrees of bodies or tribunals having any jurisdiction or authority over the work; and shall protect and indemnify the Contracting Agency, and all officers and employees thereof connected with the work, including but not limited to the Agency Engineer against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or
his employees. If any discrepancy or inconsistency is discovered in the plans, drawings, specifications, or contract for the work in relation to any such law, ordinance, regulation, order or decree the Contractor shall forthwith report the same to the Agency Engineer.

12.02 Vehicle Code - Pursuant to the authority contained in Vehicle Code Section 591, the Agency has determined that within such areas as are within the limits of the project and are open to public traffic, the following requirements of the Vehicle Code will apply. The lighting requirements in Section 25803; the brake requirements in Chapter 3, Division 12; the splash apron requirements in Section 27600; and, when operated on completed or existing treated base, surfacing, pavement or structures except as otherwise provided in Section 12.05 "Weight Limitations" of these specifications, the weight limitation requirements contained in Division 15.

Attention is directed to the statement in said Section 591 that this section shall not relieve him or any person from the duty of exercising due care. The Contractor shall take all necessary precautions for safe operation of his equipment and the protection of the public from injury and damage from such equipment.

Any other requirements set forth in Division 11, 12, 13, 14 and 15 of the Vehicle Code which the Agency, pursuant to the Authority contained in Vehicle Code Section 591, will require compliance with, will be set forth in Special Provisions.

12.03 Air Pollution - The Contractor's attention is directed to Regulations of the Bay Area Air Pollution Control District regarding disposal of debris or other materials, not used in the work including any air pollution control rules, regulations, ordinances and status, specified in Section 11017 of the Government Code.

12.04 Water Pollution - The Contractor shall protect streams, lakes, reservoirs, bays, and coastal waters from pollution with fuels, oils, bitumens, calcium chloride and other harmful materials and shall conduct and schedule his operations so as to avoid or minimize muddying and silting of said streams, lakes, reservoirs, bays and coastal waters.

Nothing in the terms of the contract nor in the provisions in this Section 12 shall relieve the Contractor of the responsibility for compliance with the Fish and Game Code and the Water Quality Control Board or other applicable statutes relating to prevention or abatement of water pollution.

Erosion control features shall be constructed concurrently with other work at the earliest practicable time. Care shall be exercised to preserve roadside vegetation beyond the limits of construction. The Manual of Standards for Surface Runoff Control Measures as published by the Association of Bay Area Governments (ABAG) is a good reference source. The Special Provisions will provide details of any special erosion or stream protection required of the Contractor.

When borrow material is obtained from other than commercially operated sources, erosion of the borrow site during and after completion of the work shall not result in water pollution. The material source shall be finished, where practicable, so that water will not collect or stand within.

The requirements of this section shall apply to all work performed under the contract and to all non-commercially operated borrow or disposal sites used for the project.
The Contractor shall also conform to the following provisions:

A. Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams. During construction of such barriers, muddying of streams shall be held to a minimum.

B. Removal of material from beneath a flowing stream shall not be commenced until adequate means, such as a bypass channel, are provided to carry the stream, free from mud or silt, around the removal operations.

C. If the Contractor's operations require transportation of materials across live streams, such operations shall be conducted without muddying the stream. Mechanized equipment shall not be operated in the stream channels of live streams unless absolutely necessary to construct crossings or barriers and fills at channel changes.

D. Wash water from aggregate washing or other operations containing mud or silt shall be treated by filtration or retention in a settling pond, or ponds, adequate to prevent muddying water from entering live streams.

E. Oily or greasy substances originating from the Contractor's operations or work site shall not be allowed to enter or be placed where they will later enter a live stream.

F. Fresh portland cement or fresh portland cement concrete shall not be allowed to enter flowing water of streams.

G. When operations are completed, the flow of streams shall be returned to the greatest possible extent to a meandering thread without creating a possible future bank erosion problem.

H. Material derived from roadway work shall not be deposited in a live stream channel where it could be washed away by high stream flows.

I. Where there is possible migration of anadromous fish in streams affected by construction on the project, the Contractor shall conduct his operations to insure free passage of such migratory fish.

Full compensation for conforming to the provisions herein shall be considered as included in the prices paid for the contract items of work involved in compliance with said provisions and no additional compensation will be allowed therefor.

12.05 Weight Limitations - Unless expressly permitted in the Special Provisions, construction equipment or vehicles of any kind which, laden or unladen, exceed the maximum weight limitations set forth in Division 15 of the Vehicle Code, shall not be operated over completed or existing treated base, surfacing, pavement or structures in any areas within the limits of the project, whether or not such area is subject to weight limitations under Section 12.02, "Vehicle Code," except as hereinafter provided in this section 12.05.

Within the limits of the project, subject to the control of the Agency Engineer, provided that the Contractor, at his expense, provides such protective measures as are deemed necessary by the
Agency Engineer and repairs any damage caused by such operations, the Contractor will be permitted to:

A. Make transverse crossings of portions of an existing public road or street which are within the highway right-of-way, with construction equipment which exceeds the size or weight limitations set forth in Division 15 of the Vehicle Code.

B. Make transverse crossings of treated bases, surfacing or pavement, which are under construction or have been completed, with construction equipment which exceeds the size or weight limitations set forth in Division 15 of the Vehicle Code.

C. Cross bridge structures that are not open to public traffic, designed for H2O and alternative live loading (culverts and pipes excluded), with construction equipment which exceeds the size of weight limitations set forth in Division 15 of the Vehicle Code.

12.06 Permits and Licenses - The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work. Each City in Marin County requires a city business license.

12.07 Safety Provisions - The Contractor shall conform to the safety rules and regulations established by the California Division of Industrial Safety and OSHA.

12.08 Use of Explosives - When the use of explosives is necessary for the prosecution of the work, the Contractor shall not endanger life or property. Only competent reliable men, working under experienced supervision shall be permitted to use explosives. In advance of any blasting work, the Contractor shall obtain all necessary permits and clearances and shall comply with all Federal, State and local laws regulating the use of explosives. Any requirements imposed by ordinance or permit to the contrary notwithstanding, the Contractor shall blast only between the hours of 8:00 a.m. and 5:00 p.m. Blasting at any other time, or on Sundays and holidays is specifically prohibited.

12.09 Preservation of Property - Due care shall be exercised to avoid injury to existing highway improvements or facilities, utility facilities, adjacent property, and roadside trees, shrubs, and other plants that are not to be removed.

Roadside trees, shrubs, and other plants that are not to be removed, and pole lines, fences, signs, markers and monuments, buildings and structures, under or above ground, all highway facilities, and any other improvements or facilities within or adjacent to the highway shall be protected from injury or damage. If ordered by the Agency Engineer, the Contractor shall provide and install suitable safeguards, approved by the Agency Engineer, to protect such objects from injury or damage. If such objects are injured or damaged by the Contractor's operations, they shall be replaced or restored at the Contractor's expense. The facilities shall be replaced or restored to a condition as good as when the Contractor entered upon the work, or as good as required by specifications accompanying the contract, if any such objects are a part of the work being performed under the contract. The Agency Engineer may make or cause to be made temporary repairs required to restore any damaged highway facility to service. The cost of such repairs shall be borne by the Contractor and may be deducted from any monies due or to become due to the Contractor under the contract.

See Section 13 "Underground Obstructions" of these General Provisions regarding underground utilities, sewer, water and storm conduits.
Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in protecting or repairing property as specified in this Section 12.09 shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

12.10 Responsibility for Damage - The Agency and all officers and employees thereof connected with the work shall not be answerable or accountable in any manner: for any loss or damage that may happen to the work or any part thereof; for any loss or damage to any of the materials or other things used or employed in performing the work; for injury to or death of any person either workmen or the public; or for damage to property from any cause which might have been prevented by the Contractor, or his workmen, or anyone employed by him.

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person or damage to property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance.

The Contractor shall indemnify and save harmless the Agency and all officers and employees thereof connected with the work: from all claims, suits or actions of every name, kind, and description brought for or on account of, injuries to or death of any person or damage to property resulting from the construction of the work or by or in consequence of any negligence in guarding the work; use of improper materials in construction of the work; or by or on account of any act or omission by the Contractor or his agents during the progress of the work or at any time before its completion and final acceptance.

In addition to any remedy authorized by law, so much of the money due the Contractor under and by virtue of the contract as shall be considered necessary by the Agency Engineer may be retained by the Agency until disposition has been made of such suits or claims for damages as aforesaid.

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person or damage to property and shall indemnify and save harmless any county, city or district, its officers and employees connected with the work, within the limits of which county, city or district the work is being performed hereunder, all in the same manner and to the same extent as provided above for the protection of the Contracting Agency and all officers and employees thereof connected with the work, except that no retention of money due the Contractor under and by virtue of the contract will be made by the Agency pending disposition of suits or claims for damages brought against a county, city, or district other than the Agency.

12.11 Disposal of Material Outside the Right-of-Way - The Contractor shall make his own arrangements of disposing of material outside the right-of-way and he shall pay all costs involved.

When any material is to be disposed of outside the right-of-way, the Contractor shall first obtain a written permit from the property owner on whose property the disposal is to be made and file a copy with the Agency Engineer together with a written release from the property owner absolving the Agency from any and all responsibility in connection with the disposal of material on said property. Before any material is disposed of on said property, the Contractor shall also obtain permission from the Agency Engineer to dispose of the material at the location designated.
When the disposal location is visible from any street, highway, or other public area, the Contractor shall dispose of the material in a neat and uniform manner to the satisfaction of the Engineer or Agency Engineer. Disposal of hazardous waste material shall be made per State requirements.

Methods of removal, equipment and location of disposal must be approved by the Agency Engineer. Any additional cost not included in the bid must be approved by the Agency Engineer in writing before the work is started.

12.12 Public Safety - Whenever the Contractor’s operations affect normal conditions for traffic, or for the public, he shall furnish, erect, and maintain, at his expense, all fences, barricades, lights, signs and other devices necessary to prevent accidents or damage or injury to the public.

Construction area signs shall be furnished, installed, maintained and removed when no longer required in accordance with the provisions in Section 12-3.01 through 12-3.11 of the State Specifications and any requirements of the Special Provisions. The Contractor shall also furnish, at his own expense; flaggers and guards necessary to give adequate warning to traffic or to the public of the construction conditions. Flaggers and guards, assigned to warn the public that the highway is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties, and shall be provided with necessary equipment, in accordance with the current Caltrans publication “Instructions to Flaggers.” The equipment shall be furnished and kept clean and in good repair by the Contractor at his expense. Signs, lights, flags and other warning and safety devices shall conform to the requirements set forth in the current Caltrans "Manual of Traffic Controls for Construction and Maintenance Work Zones," and any signs furnished and erected by the Contractor at his expense, as above provided, shall be in addition to such signs as are furnished by the Agency as provided in the Special Provisions. Signs shall not obscure the visibility of, nor conflict in intent and meaning with, Agency-furnished signs and the size and wording shall be approved by the Agency Engineer.

The Contractor shall place traffic signs and devices as required by the applicable plans and/or special provisions or as required by the Agency engineer to provide adequate traffic control and public safety.

Should the Contractor appear to be negligent in furnishing warning and protective measures, the Agency Engineer may direct his attention to such conditions. The necessary warning and protective measures shall thereupon be furnished and installed by the Contractor at his expense. No such action by the Agency Engineer shall relieve the Contractor from the primary responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

The installation of general roadway illumination shall not relieve the Contractor of his responsibility for furnishing and maintaining any of the protective facilities herein before specified.

No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, and at the end of each day’s work and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from that portion of the roadway open for use by public traffic.

Except as otherwise provided in the Special Provisions, full compensation for conforming to all of the provisions in this Section 12.12 and in the Special Provisions shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.
Where any items or facilities required under the provisions of this Section are not provided or are out of service, and an emergency exists that necessitates protective measures, the Agency Engineer, or his representative, may provide such facilities during the emergency, and the cost thereof shall be paid by the Contractor, or deducted from monies due him on his contract. The Agency Engineer or his representative, before taking emergency action, shall endeavor to notify the Contractor or his foreman of the conditions, and to allow the Contractor to correct them with his own crew, provided he acts promptly and expeditiously.

12.13 Public Convenience - The Contractor shall conduct his operations in a manner which will result in the least possible obstruction and inconvenience to the public. He shall undertake no greater length or amount of work than he can prosecute properly with due regard to the rights of the public.

Unless otherwise provided in the Special Provisions, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by the Contractor at his expense.

Existing traffic signal and highway lighting systems shall be kept in operation for the benefit of the traveling public during progress of the work and other forces will continue routine maintenance of existing systems.

Construction operations shall be conducted in a manner which will cause as little inconvenience as possible to abutting property owners.

Convenient access to driveways, house, and buildings along the line of the work shall be maintained. Temporary approaches to crossings or intersecting streets shall be provided and kept in good condition. When the abutting property owner's access across the right-of-way line is to be eliminated, or to be replaced under the contract by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

Roadway excavation and the construction of embankments shall be conducted in a manner which will provide a reasonably smooth and even surface satisfactory for use by public traffic, at all times. Sufficient fill at culverts and bridges to permit traffic to cross shall be placed in advance of other grading operations. If ordered by the Engineer or Agency Engineer, roadway cuts shall be excavated in lifts and embankments shall be constructed part width at a time, construction being alternated from one side to the other and traffic routed over the side opposite the one under construction. Culvert installation or culvert construction shall be conducted on one-half the width of the traveled way at a time. That portion of the traveled way being used by public traffic shall be kept open and unobstructed until the opposite side of the traveled way is ready for use by traffic. Upon completion of rough grading at the grading plane, or placing any subsequent layer thereon, the surface of the roadbed shall be brought to a smooth, even condition, free of humps and depressions, satisfactory for the use of public traffic.

After subgrade preparation for a specified layer of material has been completed, the Contractor shall, at his expense, repair any damage to the roadbed or completed subgrade, including damage caused by his operations or by use by public traffic.

While subgrade and paving operations are under way, public traffic shall be permitted to use the shoulders and, if half-width paving methods are used, shall also be permitted to use the side of the
roadbed opposite the one under construction. When sufficient width is available, a passageway wide enough to accommodate at least 2 lanes of traffic shall be kept open at all times at locations where subgrade and paving operations are in active progress.

Water or dust palliative shall be applied, if ordered by the Agency Engineer, for the alleviation or prevention of dust nuisance as provided in Section 14, "Dust Control" of these specifications.

In order to expedite the passage of public traffic through or around the work, and where ordered by the Agency Engineer, the Contractor shall install signs, lights, flares, barricades, and other facilities for the convenience and direction of public traffic. Also, where directed by the Agency Engineer, the Contractor shall furnish competent flaggers whose sole duties shall consist of directing the movement of public traffic through or around the work. The cost of furnishing and installing such signs and flaggers shall be considered as included in the prices paid for the various contract items of work and no additional compensation shall be allowed therefor unless specified otherwise in the Special Provisions.

12.14 Maintenance of Traffic - Three days prior to start of work, the Contractor shall furnish the Engineer with a schedule of operations. During the contract period, the Contractor shall coordinate his activities daily with the Engineer and make every effort to minimize the disruption of normal traffic and parking. Normal movement of traffic shall be maintained at all times during project construction.

The Contractor shall be responsible for placing "No Parking" barricades and signs 48 hours prior to roadway excavation, placement of asphalt concrete, concrete work or any work requiring such traffic control. At least one-way traffic shall be maintained on all streets within the limits of work during normal working hours. During periods other than normal working hours, all street lanes shall be free of obstructions and hazards, and shall be made available for use by traffic.

In those areas designated in the plans, specifications, or permits as "Limit Operations Area," all normal street lanes shall be free of obstructions and hazards and shall be made available for use by traffic at all times, except between the hours specifically allowed by the Agency Engineer, or as stated in the Special Provisions.

Should the Contractor fail to provide for public safety as specified, or if in the opinion of the Engineer, the signs and warning devices furnished by the Contractor are not adequate, the Agency may place any signs, warning lights or barricades to protect or warn the public of any condition connected with the Contractor's operations and the Contractor shall become liable to the Agency at the rate of 1.75 times the Agency's actual costs.

The Agency will be entitled to assess such charges against the Contract and deduct the cost thereof from any money due or that may become due to the Contractor under this contract. The action of the Agency in placing any warning devices shall not be construed as relieving the Contractor from any of the Contractor's obligations to provide adequate warning of construction conditions.

Pedestrian Traffic - The Contractor shall provide for the safe and convenient passage of pedestrian traffic throughout the limits of the job site.

12.15 Street Closures and Detours - No street shall be completely closed to through traffic at any time unless permitted in writing by the Agency Engineer. The Agency Engineer may require that
detours be set up when streets are closed or partially closed. All detour routes and their signing shall be approved by the Agency Engineer before they are set up.

The Contractor shall notify police and fire departments, the School District, and ambulance services of the hours and dates of the street closures and detour routes at least 24 hours in advance of their occurrence, and immediately upon their discontinuance.

12.16 Haul Routes - The Agency Engineer may require the Contractor to use only roads designated by him as haul routes for passage of heavy vehicles carrying materials or supplies to or from the job. Special haul routes will be as set forth in the Special Provisions.

Section 13. Underground Obstructions

13.01 Existing Utilities Shown on Plans - Utility locations and depth shown on the plans were supplied by the respective utility companies and are approximate. Every effort has been made to assure their accuracy and completeness but no guarantee is implied. The Contractor shall excavate all possibly conflicting underground facilities before commencement of work which may affect their safety. The Contractor shall make his own arrangements for the utility companies to have their facilities marked in the field. Use of USA is recommended.

13.02 Notification of Utilities - The Contractor shall notify each utility company 2 working days in advance of commencing each phase of the work which may endanger any utility, in order that the utility companies may do such work as is required to maintain uninterrupted service.

13.03 Damage to Utilities and Sewers - The work shall be prosecuted in a manner which will protect and avoid doing damage to all utility mains, services, and appurtenances, and sewers. If damage occurs, the Contractor shall notify the owner immediately. Storm drains and sanitary sewers will be repaired by the owner, or the Contractor will be directed to make the necessary repairs. All other utility repairs will be made by the utility owner or his Contractor. All repairs will be made to the satisfaction of the owner.

On Agency projects, if damage was UNAVOIDABLE, the repairs will be made by the owner at no expense to the Contractor, or by the Contractor and compensated for as extra work. Avoidable damage will be repaired at the expense of the Contractor.

13.04 Utility Relocation - On Agency projects where utility mains and services conflict with the proposed improvements the Agency will have such conflicting utilities relocated at no expense to the Contractor, or pay the Contractor to make such relocations in accordance with any contract prices.

Attention is directed to the possible existence of underground facilities not known to the Agency or in a location different from that which is indicated on the plans or in the Special Provisions. The Contractor shall take reasonable steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities or interfere with their service. If the Contractor discovers underground facilities not indicated on the plans or in the Special Provisions, he shall immediately give the Agency Engineer written notification of the existence of such facilities. Such facilities shall be protected from damage as directed by the Agency Engineer, and the Contractor will

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be paid for such work as extra work, as provided in Section 9-1.03 through 9-1.03D of the State Specifications.

If the Contractor desires to have any utility or other improvement moved for his convenience in order to facilitate his construction operation, and should such a move not be necessitated by a conflict in line or grade, he shall make whatever arrangements are necessary with the owners of such utility or improvement and bear all necessary expenses. No extension of time will be permitted for this type of relocation.

Adjustments to grade of monument covers, storm or sanitary sewer manholes, castings, cleanouts or other access opening castings made necessary by changing street or grade of ground in the course of work done on Agency projects shall be performed by the Contractor at no expense to the Agency or Sanitary District. The cost of such work shall be included in other items of work and no extra compensation will be allowed therefor unless specified in the Special Provisions. All such work shall be done in a manner satisfactory to the owner of the affected facility.

13.05 Tree Roots - No tree root shall be unnecessarily cut in trenching operations. Excavation around roots shall be performed by hand. Where a root conflicts with the grade of the conduit being installed, the root shall be trimmed neat at the edge of the excavation or trench, and shall be painted with an approved tree seal, as directed by the Engineer or Agency Engineer.

Section 14. Dust Control

The Contractor shall conduct his operations in a manner which will protect adjacent property from annoyance or damage from dust caused by his operations. When necessary, he shall take steps to control dust by the application of water, dust palliative, salt or other suitable means. The Contractor shall be responsible for dust control during both working and non-working hours. On Agency projects, no separate payment shall be made for dust control, and its cost shall be included in the prices paid for contract items.

When extreme conditions exist which make it impossible to control the dust, the Contractor shall cease grading operations until conditions improve.

If Contractor fails to comply with the above requirements, the Agency Engineer may order the work to be stopped under the provisions of Section 10 "Control of the Work" of these specifications, and may take whatever action is necessary to reduce the dust problem; the cost thereof shall be paid by the Contractor.

Section 15. Water

The Contractor shall be responsible for developing water supply and furnishing all water required for the work, including water used in the performance of work paid for as extra work, and applying all water.
Section 16. Reference to State Specifications

All work shall be performed in conformance with the Special Provisions, these specifications and the stated sections of the latest edition of the Standard Specifications of the State of California, Department of Transportation (Caltrans), at the time of approval of plans by Agency. Said stated sections will be designated in these specifications and/or the Special Provisions as Section ____ of the State Specifications.
TECHNICAL PROVISIONS

GRADING

Section 20. General Requirements

20.01 Scope - All clearing and grubbing, earthwork and subgrade shall be done in conformance with the following general requirements. Compliance with these requirements shall be considered a part of other items of work covered under clearing and grubbing, earthwork and subgrade, and no separate payment shall be made therefor.

20.02 Specifications - Where a Soils Engineer is retained by the owner for the purpose of controlling grading, the Soils Engineer’s specifications, when approved by the Agency Engineer included by reference in the Special Provisions, shall take precedence over these specifications. However, the Soils Engineer specifications shall only modify certain paragraphs of these specifications and all paragraphs not modified shall remain in full effect.

All work not covered by these specifications or the Soils Engineer’s specifications shall be governed by the provisions of Sections 16 and 19 of the State Specifications; except that Section 19-3, Structural Excavation and Backfill, shall not apply unless structure backfill is specifically called for in the Special Provisions.

20.03 Seasonal Limits - No fill shall be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the Soils Engineer indicate that moisture content of fill materials is satisfactory for resumption of the filling operation, or Soils Engineer’s approval of resumption is approved by the Agency.

20.04 Tree Preservation - Trees not shown on the plans or designated in the field for removal shall be saved and no work nor storage of equipment or material shall be permitted within the drip line. As used in this specification “tree” shall mean any woody plant having a single trunk of a circumference of twelve inches or more measured twenty-four inches above the ground or having multiple trunks the largest of which has a circumference of eight inches or more measured twelve inches above its separation from the other trunks.

Trees shall be protected by suitable fences, rails, or barriers if so ordered by the Agency Engineer. Trees needlessly damaged shall be repaired as directed by the Agency Engineer at the Contractor’s expense. Trees needlessly removed or damaged beyond repair shall be replaced with specimen size trees at the Contractor’s expense.

20.05 Drainage - No grading which will in any way affect natural or artificial drainage shall be commenced until the Contractor or his Engineer has submitted to the Agency Engineer a plan showing the proposed re-routing of storm water runoff and until that plan is approved by the Agency and re-routing work accomplished.
Temporary debris and silt basins shall be constructed at locations designated by the Agency Engineer to protect all public rights-of-way, adjoining properties, and drainage facilities from eroding materials.

20.06 Restoration of Natural Terrain - Before completion of the grading work, temporary drainage structures and ditches shall be removed or filled. Areas filled shall be compacted to a minimum relative compaction of 90 percent. Haul roads shall be regraded as directed by the Agency Engineer in such a way as to blend in with the surrounding topography and to eliminate erosion and drainage problems. All disturbed areas shall be planted in conformance with Section 71 of these specifications.

20.07 Hazardous Material - The Contractor shall notify the Agency Engineer immediately if any hazardous material is encountered or if any hydrocarbon odors are detected. The Agency Engineer will determine the proper disposal of this material. Extra work shall be paid for per Section 7.05.

20.08 Inspection - No work shall progress without the knowledge and approval of the Soils Engineer who will ultimately be required to certify its compliance with these specifications and the Special Provisions.

In the event that any unusual conditions not covered by these specifications are encountered during grading operations, the Soils Engineer and/or the Contractor shall immediately notify the Agency Engineer.

20.09 Tests and Reports - The tests used to determine compliance with these specifications shall be those stated in the latest edition of the Caltrans Materials Manual unless otherwise specified in the Special Provisions.

The Soils Engineer shall deliver 2 copies of all pertinent reports to the Agency Engineer promptly upon their completion.

On private projects, the owner shall instruct the Soils Engineer to perform all tests or retests at locations or on materials as directed by the Agency Engineer whether such tests are normal routine or not.

Section 21. Clearing and Grubbing

21.01 Scope - This work shall consist of removing all timber, logs, trees, stumps, brush, abandoned underground lines, debris, rubbish, obstructions, and other objectionable or perishable material within the limits of the public right-of-way shown on the plans and from all other areas to be graded, and the disposal or hauling away of same. All areas used for the storage or disposal of timber, logs, trees, stumps, brush debris and rubbish other than public or commercial disposal areas, shall be shown on the plans and approved by the Agency Engineer. Greenbelt and open areas may not be used as storage or disposal areas.

Tree branches extending over the roadway which hang within 13 feet of finished grade shall be cut off close to the boles in conformance with the provisions of Section 73 of these specifications.
Trees, stumps, and large roots within areas where fills will exceed 3 feet in height may be cut flush with the existing ground. The removal of the remaining stump will not be required, except at locations where trenches are to be excavated or unsuitable material is to be removed.

The Agency Engineer may designate certain trees and shrubs within the right-of-way or areas to be graded to be preserved. Such trees and shrubs shall be fully protected from injury by the Contractor at his own expense.

As part of the clearing work, existing concrete, brick or masonry foundations, walls, piers, slabs and floors, and existing curbs, gutters, pavement, sidewalk and driveways shall be broken out to a depth of at least 1 foot below subgrade elevation. All basement and pit floors on which filling material is to be deposited shall be thoroughly broken up in order to provide drainage.

As a part of the preparation work, the Contractor shall stockpile all topsoil obtained in stripping operations in those locations designated by the Engineer or Agency Engineer. This topsoil shall be used for filling planter strips and for final grading in yard and slope areas.

Unless otherwise shown on the plans, the Contractor shall, as part of the clearing work, carefully remove and store on the adjacent private property all fences not on proper line and grade. The Contractor shall protect all fences or portions of fences that are to remain in place and he shall be held alone responsible for damage resulting from his grading or construction operations.

The Contractor shall salvage all signs, barricades, castings, frames, covers, reusable culvert materials or other materials specified, and stockpile them at locations on the job where the Agency can claim and remove them.

If so indicated on the plans, and as part of the clearing work, the Contractor shall remove existing manholes, catch basins, drop inlets, and turning structures to a depth of at least 1 foot below subgrade, plug the existing conduits with concrete or brick and mortar, and fill all such structures with clean sand, pea gravel or drain rock. On Agency projects, payment for such removals shall be included in the price paid for clearing and grubbing.

21.02 Measurement - Clearing and grubbing will be paid for at a lump sum price. Unless otherwise specified in the Special Provisions, the work of clearing and grubbing disposal sites or material sites will not be paid for when such sites are outside the right-of-way and the Contractor is permitted to exercise his own option as to whether or not he elects to use such disposal sites or material sites.

21.03 Payment - The lump sum price paid for clearing and grubbing as shown on the plans, specified in these specifications and the Special Provisions, and directed by the Agency Engineer, including the removal and disposal of all resulting material.

When the contract does not include a contract pay item for clearing and grubbing as above specified, and unless otherwise specified in the Special Provisions, full compensation for any necessary clearing and grubbing required to perform the construction operations specified shall be considered as included in the price paid for the earthwork involved and no additional compensation will be allowed.
Section 22. Earthwork

22.01 Scope - This work shall consist of construction of cuts and fills, removal and disposal of all surplus material which may result from the grading operations, and all subsidiary work necessary to complete the grading to conform with the lines, grades, and slopes shown on the plans.

As part of the grading work, the Contractor will be required to raise or lower the tops or frames and covers of all storm drain structures and appurtenances which are not now at the required grade. He shall also be required to arrange with the owners for the adjustment of all utility frames, covers, and appurtenances not in conformance with finished grades. All such adjustments will be made at the Contractor's expense and no additional compensation will be allowed therefor.

22.02 Preparation of Ground to be Filled - All vegetation shall be removed from the areas to be filled. Existing grass sod shall be removed to a depth of at least 4 inches.

Existing soils underlying areas to be filled which are in the opinion of the Soils Engineer or Agency Engineer unsuitable as a foundation for the fill shall be removed to a depth as required by the Soils Engineer or Agency Engineer and the resulting space refilled with approved material compacted to a relative compaction of at least 90 percent.

Where a fill is to be constructed on relatively level ground, the total width on which the fill is to be placed shall be plowed or scarified and finely broken up to a depth of at least 6 inches. It shall then be brought to the proper moisture content by adding water or aerating, and compacted to at least 90 percent relative compaction.

Where fill material is to be placed on existing street surfaces, all pavement, curbs, gutters, concrete sidewalk, etc., shall be thoroughly broken up. No piece over 4 inches in size will be permitted in the upper 2 feet immediately below subgrade in the proposed street areas.

Where the slope of the original ground is steeper than 5 horizontal to 1 vertical, fills shall be keyed into the original ground per the soils report and construction site inspection. The Special Provisions and/or soils report may also require construction of subdrains. In the absence of a soils report the base key at the toe of the fill shall be at least 12 feet wide cut into firm natural ground. It shall slope back into the hillside at a gradient of not less than 2 percent. Subsequent keys should be placed at vertical heights of not more than 15 feet, and shall have a width of not less than 10 feet.

Where embankments are to be constructed across low, swampy ground which will not support the weight of trucks or other hauling equipment, the lower part of the fill may be constructed by dumping successive vehicle loads in a uniformly distributed layer of a thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers as specified.

22.03 Fill Material - Prior to the commencement of grading operations, the material to be used for fill shall be approved by the Agency Engineer who, at his option, may require concurrence from a Soils Engineer and/or supporting data from a qualified materials testing firm. It shall be free of organic matter, trash, and other deleterious material.

The fill shall not contain rocks or lumps over 4 inches in diameter in the upper 2 feet. In lower portions of the fill, larger material may be used in locations approved by the Soils Engineer, so long
as sufficient fine material is available to fill the voids, the rocks are not allowed to nest, and are not in the way of future trenching. Fills must be constructed with soils having a plasticity index of 15 or less.

22.04 Placing and Compacting Fill Material - All fills shall be compacted to at least 90 percent relative compaction.

The fill material shall be placed and compacted in layers. The maximum thickness of each layer shall be determined by the Soils Engineer or Agency Engineer and shall be based on consideration of achieving the specified compaction with the equipment used. The soil to be compacted shall be brought to the proper moisture content by adding water or aerating as required.

Field density tests shall be made by the Soils Engineer. At least one test shall be made for each 500 cubic yards or fraction thereof placed with a minimum of 2 tests in isolated areas. Where the total volume of a particular fill exceeds 30,000 cubic yards, the number of tests may be reduced to 1 test per 1,000 cubic yards if deemed appropriate by the Agency Engineer. Where sheepfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below the required compaction, the particular layer or portion shall be reworked until the required density is obtained.

Fill slopes shall be compacted by means of sheepfoot rollers or other suitable equipment. Compacting operations shall be continued until the slopes are stable. While no appreciable amount of loose soil will be permitted on the slopes, compaction shall not be so dense as to prohibit planting. Compacting of slopes shall be done progressively in increments of 3 to 5 feet in fill height.

When fill slopes steeper than 2 horizontal to 1 vertical are permitted, they shall be placed 1 to 2 feet beyond the limit of finished grade, measured normal to the slope, and then cut to the design finish grade.

22.05 Allowable Variation from Design Grade - In all roadway areas and other public rights-of-way rough grading shall be within 0.10 foot, plus or minus.

Cut and fill banks shall be graded to within 1 foot, plus or minus, measured normal to the slope. Greater variations may be allowed by the Agency Engineer on cut slopes in rock.

All other finish elevations shall be within the following tolerances:

<table>
<thead>
<tr>
<th>Slope of Finish Grade</th>
<th>Allowable Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1%</td>
<td>±0.10 ft.</td>
</tr>
<tr>
<td>1% to 5%</td>
<td>±0.30 ft.</td>
</tr>
<tr>
<td>Over 5%</td>
<td>±0.50 ft.</td>
</tr>
</tbody>
</table>

22.06 Slope Rounding and Contour Grading - All cut and fill slopes shall be rounded except those slopes with separate graded or flat house pads. Slope rounding shall extend a minimum horizontal distance of 1/4 the vertical height of the cut or fill bank measured from the normal break point. The quantities involved in this rounding will not be included in the quantities of fill and excavation to be paid for. This work will be considered as a part of finishing the slopes and no additional compensation will be allowed therefor.

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22.07 Contour Grading - Cut or fill slopes that are in the public view and have a vertical height of 10 feet or greater shall be graded to conform to the natural contour of the surrounding area. Contour grading shall extend a minimum horizontal distance twice the vertical height of bank measured from the normal edge of slope or as directed by the Agency Engineer. On Agency projects the quantities involved will be determined by the Agency Engineer and paid for at the unit price for excavated material.

22.08 Measurement - The following earthwork operations will be measured and paid for as excavation or fill by the cubic yard; excavation and fill within the limits of the public right-of-way; excavation of unsuitable material when shown on the plans or directed by the Agency Engineer; excavation and fill for private road approaches and driveways; excavation of drainage ditches; and other earthwork shown on the plans or directed by the Agency Engineer.

Quantities for roadway excavation will be computed by means of average end areas and distances between these areas; except as provided in the following paragraph or in the Special Provisions. End areas will be determined from the cross sections prepared by the Agency Engineer. These cross sections will be made available to the Contractor for his inspection in the Agency Engineer's office. Volumes will be measured to the nearest whole cubic yard. Quantities of cut shall be measured in the cut area. Quantities of fill will be measured compacted in place in the fill area.

Where, due to changed conditions or the nature of a particular operation or for any other reason, it is impossible or impractical to measure quantities of earthwork by means of average areas, the Agency Engineer will compute the quantities of material excavated by a method which in his opinion is best suited to obtain an accurate determination.

When quantities of roadway excavation are computed by means of average end areas and centerline distances, a correction for curvature will not be applied to quantities within the roadway prism.

Excavation in excess of the planned or authorized cross section will not be paid for. The Contractor shall backfill and compact unauthorized excavated areas to the original ground level as directed by the Agency Engineer.

22.09 Payment - The price paid per cubic yard for excavation or fill shall include full compensation for furnishing all plant, labor, materials, tools, equipment; and incidental for doing all work involved in preparing ground to be filled, stockpiling topsoil, furnishing fill material and water, compacting original ground and fill material, excavating and disposing of cut material, finishing of banks, adjusting structures, and all other work necessary to construct fills and excavations complete, in place, as specified.

When a given project includes both excavation and fill, the basis of payment will be the larger of the two, unless otherwise specified in the Special Provisions.

When there is no contract item for excavation or fill, full compensation in the prices paid for any necessary excavating or filling shall be included in the prices paid for other items of work.
Section 23. Subgrade

23.01 Description - Subgrade is that portion of the roadbed on which pavement, surfacing, base, subbase, or a layer of any other material which may be specified is to be placed. The preparation of subgrade may be required at various elevations, depending on the number of layers of material specified to support the final wearing course of pavement or surfacing.

23.02 Subgrade Preparation - The finish subgrade immediately prior to placing subsequent material thereon shall have a relative compaction of not less than 95 percent for a depth of 6 inches as determined by California Test Method No. 231 or 216, unless otherwise specified in the Special Provisions.

The subgrade shall be free of segregated material and shall be smooth and true to the required grade and cross section within the tolerance hereinafter specified. The Contractor shall repair at his expense, any damage to the prepared subgrade caused by his operations or by the use of public traffic. No material shall be placed on the prepared subgrade until the subgrade meets the requirements of this section and has been approved by the Agency Engineer.

23.03 Construction - If the Contractor elects to remove rocks, lumps, or to break up hard material in order to facilitate this subgrade preparation, such work shall be at his expense. All materials removed shall be disposed of in such a manner that an unsightly appearance will not be created.

If the subgrade is prepared on an existing subbase, base, or other material, those portions of the subbase, base or other material which may have become damaged or destroyed shall be repaired or reconstructed to the specified tolerance requirements for the material previously placed for grade and cross section immediately prior to placing any subsequent layer. The surface shall be thoroughly cleaned of any loose material by brooming or other approved methods, if required by the Agency Engineer, immediately prior to placing new material.

The finish subgrade shall not vary more than 0.10 foot above or below design grade. Subgrade that does not meet this requirement shall be reshaped and recompacted, all at the Contractor's expense.

23.04 Payment - No separate payment will be made for preparing subgrade and full compensation for furnishing all plant, labor, materials, tools, equipment and incidentals, and for doing all the work and compacting involved in preparing subgrade as shown on the plans, specified in these specifications, and directed by the Agency Engineer shall be considered as included in the contract price paid for the material to be placed on the subgrade. No separate payment shall be made for supplying water.

Section 24. Subgrade Stabilization

24.01 Description - When the Contractor has completed roadway grading to the lines and grades shown on the plans, areas of unstable subgrade may be encountered. Upon specific direction of the Agency Engineer or Soils Engineer, the unstable area shall be over excavated to the depth and within the limits directed. The excavated material shall be disposed of in the same manner as other excavated material resulting from work on the project. The excavation will be filled with aggregate subbase with an R-Value of at least 50. The soils report or Special Provisions may also provide for

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the use of geotextile during this filling operation. The subbase material, handling, and compacting, shall conform in every way with the provisions of Section 28 of these specifications.

This Section shall pertain to areas of excavation only. In areas where the Contractor has placed fill material and the subgrade is unstable, these corrections shall be made by the Contractor at his expense.

24.02 Measurement - Subgrade stabilization shall be measured by the cubic yard of excavation, measured in place. No payment shall be made for excavation in excess of that specified by the Agency Engineer or Soils Engineer, and such over excavated areas shall be filled with aggregate subbase at the Contractor's expense.

24.03 Payment - The price paid per cubic yard of subgrade stabilization shall include full compensation for furnishing all plant, labor, materials, tools, and equipment required for excavating and disposing of unsuitable material and installing aggregate subbase complete, in place, as specified.

The estimated quantity shown in the proposal is for bidding purposes only. This quantity may be increased or decreased as determined by the Agency Engineer, and no adjustment will be made in contract unit prices therefor.

When the contract contains no item for subgrade stabilization, this work will be paid for as roadway excavation by the cubic yard at the contract price and as aggregate subbase at a price per ton.
Section 27. General Requirements

27.01 Scope - All construction of subbases and bases shall conform to the provisions of this section and to the requirements of the sections pertaining to the type of subbase or base used. Payment for each type of subbase or base shall include full compensation for conforming to the requirements of this section.

27.02 Utilities - Subbase or base shall not be placed until all underground utility lines and structures in the street area have been installed.

The Contractor shall supply the Agency Engineer with written notice from each utility company that this requirement has been met.

27.03 Subgrade - No subbase or base material shall be placed until the Agency Engineer has inspected and approved the subgrade for compaction, trench compaction, and geometric section.

No base material shall be placed until the Agency Engineer has inspected and approved the subbase for compaction and geometric section.

27.04 Testing - Compaction tests shall be made by the Soils Engineer at all locations designated by the Agency Engineer. Tests shall be made on each layer of material placed at intervals of not more than 500 feet and in no case shall fewer than two tests be made on any single street.

The following test methods shall be used in determining conformance with these specifications:

<table>
<thead>
<tr>
<th>Test</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Compaction</td>
<td>Test Method Ca.#231 or #216</td>
</tr>
<tr>
<td>Rapid Sugar Method (% CaOH)</td>
<td>ASTM C25</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>Test Method Ca. #204</td>
</tr>
<tr>
<td>Sand Equivalent</td>
<td>Test Method Ca. #217</td>
</tr>
<tr>
<td>Resistance Value (R-Value)</td>
<td>Test Method Ca. #301</td>
</tr>
<tr>
<td>and Expansion Pressure</td>
<td>Test Method Ca. #312</td>
</tr>
<tr>
<td>Compressive Strength of C.T.B.</td>
<td></td>
</tr>
</tbody>
</table>

On private jobs, the Soils Engineer shall perform sufficient tests on the materials to be incorporated into the roadway structural section (subbase and base) to enable him to certify to the Agency that these materials meet the requirements of these specifications.

The Soils Engineer shall be instructed by the owner to deliver two copies of all pertinent reports to the Agency Engineer promptly upon their completion.

27.05 Measurement - Quantities of subbase and base will be measured either by the ton or square foot of surface area in place for the various thicknesses and types of material involved, whichever is indicated in the Special Provisions or proposal. Measurement by square foot will be to the nearest
10 square feet. No payment will be made for material placed outside the limits shown on the plans or in excess of the thicknesses stated unless directed by the Agency Engineer.

Section 28. Aggregate Subbase

28.01 Description - This work will consist of furnishing, spreading, and compacting aggregate subbases as specified in these specifications and the Special Provisions.

28.02 Materials - Aggregate subbase shall meet the requirements for "R-Value" stated in the Special Provisions or in the supplementary soils reports approved by the Agency engineer. It shall be clean and free from vegetable matter and other deleterious substances and shall also meet the minimum requirements set forth below. No materials shall be placed on the grade until samples have been presented to the Agency Engineer and the material approved by him.

Gradation after Compaction - The maximum size shall be 1 inch less than the compacted thickness of the layer in which it is laid. Between 40 and 90 percent by weight shall pass the Number 4 sieve and no more than 25 percent shall pass the Number 200 sieve.

Sand Equivalent - The sand equivalent shall be no less than twenty.

Plasticity Index - The plasticity index shall be no more than fifteen.

Expansion Pressure - The expansion pressure shall be no more than 60 P.S.F.

The Agency Engineer reserves the right to retest materials at any time after placement and compaction on grade. Materials failing to pass such retesting shall be removed, disposed of, and replaced at the Contractor's expense.

28.03 Spreading - Aggregates for subbases shall be delivered to the roadbed as uniform mixtures and shall be spread in layers or windows. Segregation shall be avoided and the subbase shall be free from pockets of coarse or fine materials.

Where the required thickness of subbase is less than 0.50 foot, the material may be spread and compacted in one layer. Where the required thickness is greater than 0.50 foot, the material shall be spread and compacted in two or more uniform layers of equal thickness none of which shall exceed 0.50 foot in compacted thickness.

28.04 Compacting and Tolerances - Each layer shall be compacted to a relative compaction of at least 95 percent, and to a point where no movement (pumping) or rutting can be observed under the load of normal construction equipment.

The surface of the finished subbase at any point shall not vary more than 0.08 foot above or below the design grade, and the completed thickness shall be no more than 0.10 foot less than design thickness at any point.

Subbase which does not conform to the above requirements shall be reworked as necessary.
28.05 Payment - The price paid per ton or square foot for aggregate subbase shall include full compensation for furnishing all plant, labor, materials (including water), tools, equipment, and incidentals for doing all work involved in hauling, constructing, and compacting the imported subbase, complete in place, as specified.

Section 29. Aggregate Base

29.01 Description - This work shall consist of furnishing, spreading, and compacting aggregate base as specified in these specifications and the Special Provisions.

29.02 Materials - Aggregate base material shall conform to Section 26-1.02B of the State Specifications for Class 2 Aggregate Base.

The combined aggregate shall conform to the grading specified for 1 1/2 inch maximum size unless otherwise specified in the Special Provisions.

29.03 Spreading - Aggregates for base shall be delivered to the roadbed as uniform mixtures and shall be spread in layers or windrows. Segregation shall be avoided and the base shall be free from pockets of coarse or fine material.

When the required thickness is 0.50 foot or less, the base may be spread and compacted in one layer. Where the required thickness is greater than 0.50 foot, the material shall exceed 0.50 foot in compacted thickness.

29.04 Compaction and Tolerances - Each layer shall be compacted to a relative compaction of not less than 95 percent and to a point where no movement (pumping) or rutting can be observed under the load of normal construction equipment.

The surface of the finished base at any point shall not vary more than 0.05 foot above or below the design grade, and the completed thickness shall be no more than 0.08 foot less than design thickness at any point. Pockets of loose rock on the surface will not be accepted. Base which does not conform to the above requirements shall be reworked.

29.05 Payment - The price paid per ton of square foot for aggregate base shall include full compensation for furnishing all plant, labor, materials (including water), tools, equipment, and incidentals for doing all work involved in hauling, constructing and compacting the imported base, complete in place, as specified.

Section 30. Lime-Treated Subbase and Base

30.01 Description - This work shall consist of furnishing material to be treated (if imported material is required in the Special Provisions), furnishing lime, furnishing water, preparing material to be treated, mixing, spreading, compacting, curing and doing all other work in constructing lime-treated base and subbase as are required in these specifications.
30.02 Preliminary Testing - On Agency projects the results of initial testing to determine the feasibility of lime treatment and the percentages of lime required to meet given R-Value requirements under laboratory conditions will be on file in the Agency Engineer's office and will be available for the inspection of prospective bidders.

On private projects lime-treated subbase and base will be permitted only if recommended by a Soils Engineer and approved by the Agency Engineer.

30.03 R-Value Requirements - On Agency projects the Agency will specify the amount of lime to be used and will assume responsibility for low R-Value due to insufficient lime. The Contractor will be responsible for seeing to it that at least the specified amount of lime is used, for the quality of the lime, and for the uniform, adequate, and proper spreading, mixing, watering, compacting, and curing of the lime and lime-treated material. Where the resulting R-Value falls below that stated in the Special Provisions for any reason other than improper design percentage of lime, the Contractor shall take remedial action as described in section 30.04 at no additional cost to the Agency.

On private projects it shall be the responsibility of the Contractor and/or developer to guarantee that the R-Value will not fall below that required. Remedial action shall be taken as described in Section 30.04 of these specifications.

The R-Value requirements as described above shall be met within 7 days after compacting the treated material.

30.04 Remedial Action - In the event that the treated material fails to meet the R-Value requirements as stated above, the Contractor shall take one or more of the corrective actions listed below:

A. If the R-Value of treated base material falls below that specified but by no more than 10 points, the Contractor may request the Agency to redesign the pavement section using a greater thickness of asphalt concrete. If approved, the Contractor will remove the excess thickness of treated material, dispose of same in an acceptable manner, and replace the removed thickness with asphalt concrete. All this will be done at no extra expense to the Agency, and the Agency will pay only for the originally specified thicknesses of lime-treated base and asphalt concrete surfacing.

B. If the R-Value of treated subbase material falls below that specified but is no more than 10 points low, the Contractor may request the Agency Engineer to redesign the pavement section considering thicker layers of base or asphalt or a base with higher gravel equivalent such as cement-treated base. If approved, the Contractor will furnish all materials, and equipment and do all work, including the disposal of excess materials, to construct the redesigned pavement section to the finish lines and grades shown on the plans. All of this will be done at no extra expense to the Agency, and the Agency will pay only for the originally specified thicknesses of lime-treated subbase, base and asphalt.

C. Retreat the material adding more lime and water as needed. Whenever the cause of low R-Value can be assigned to inadequate mixing, correction by remixing must be accompanied by the addition of lime in an amount equal to at least 50 percent of the amount used for the original treatment. No extra compensation will be allowed for this additional lime.
30.05 **Material to be Treated** - On Agency projects, the material to be treated will be native material inside the public right-of-way unless otherwise stated in the Special Provisions.

On private projects the material to be treated may consist of any imported or native material for which preliminary testing indicates lime treatment will produce the R-Value required in Section 30.03.

30.06 **Lime** - The lime used for lime-treated subbases and bases shall be a commercial, dry, hydrated lime conforming to the definitions in ASTM Designation: C51. When sampled by the Engineer at the point of delivery, the sample of lime shall conform to the following requirements:

A. The lime shall contain not less than 85% of calcium hydroxide, \((\text{Ca(OH)}_2)\), as determined by Test Method No. Calif. 414.

B. The lime shall leave a residue of not more than 3 percent by weight on a No. 30 sieve and not more than 25 percent by weight shall be retained on a No. 200 sieve as determined by ASTM Designation: C110 except that the wash grading time shall be 15 minutes.

C. The lime shall be protected from exposure to moisture until used and shall be sufficiently dry to flow freely when handled.

A Certificate of Compliance in accordance with the provisions in Section 11.08, "Certificates of Compliance" of these specifications shall be furnished with each delivery of lime and shall be submitted to the Agency Engineer with a certified copy of the weight of each delivery.

Water shall be added during the mixing and remixing operations during the curing period, and to keep the cured material moist until covered. The amount of water added shall be under the control of the Agency Engineer at all times.

On Agency projects, the Contractor shall deliver a 5 pound sample of the lime to be used to the Agency Engineer at least 2 weeks prior to the commencement of any lime treatment operations.

30.07 **Subgrade Preparation** - Where imported material is used for lime treatment the subgrade shall be prepared in conformance with the provisions of Section 23 of these specifications. Where inplace material is to be mixed in place, the subgrade requirements shall be deleted.

If in-place material is to be treated, it shall be scarified and thoroughly broken up to the full depth of the lime-treated section. Any existing oil treated or asphalt concrete surfacing shall be removed.

30.08 **Spreading** - Lime shall be spread uniformly over the material to be treated at the rate stated in the Special Provisions. The spread per lineal foot shall not vary more than 10 percent from the designated rate.

Spreading shall be accomplished by one of the following methods:

A. **Slurry Placing** - Slurry may be prepared either in a central mixing tank or tank trucks. The amount of water and lime may be determined by weight, metering or according to volumetric calibrations. Lime slurry shall be placed on the grade from a tank truck with distributor, which will provide uniform distribution for full width of distributor.
The lime shall be applied so as to provide the amount specified in the Special Provisions. This may be accomplished by one or more passes of the distributor. The distributor truck shall be equipped with a circulating device to prevent settling of the lime prior to depositing on the grade and with a device to determine the amount of lime placed into the mixing tank.

B. Dry Placing - Dry lime shall be spread uniformly in bulk or by bags placed systematically on the road. Watering of the dry lime may be required by the Engineer to reduce dusting of the lime. Tailgate spreading will not be permitted.

30.09 Mixing - The mixing operation shall be such that the variation of lime content in the samples taken from the completed mixture spread on the roadbed shall not have a variation below the required percent of the in-place material of more than 0.5 percent, based on the weight of the treated material, as determined by Calif. Test Method No. 338, on at least 75% of the tests taken. A variation of more than 1 percent of the specified percentage of any test will not be permitted. In the event that the mixture of the in-place material with the lime does not meet the above percentage requirements, the mixture shall be remixed, with the addition of lime as necessary and at no additional cost to the Agency.

The lime-soil material shall be pulverized and mixed or remixed until all the soil particles will pass a one inch sieve with at least 60 percent passing the #4 sieve. Mixing operations shall be performed in such a manner and shall continue until they has produced a homogeneous, uniform mixture of lime, soil and water. Streaks and pockets of lime shall be considered as evidence of inadequate mixing. The absence of lime may be detected by the use of chemical indicators. Water shall be added during the mixing process until the water content of the mixture is approximately 2 percent above the optimum moisture content for the soil. The initial mixing shall pulverize the soil such that individual agglomerates shall not exceed one inch in minimum dimension. At the discretion of the Engineer, mineral aggregate, asphalt concrete or other aggregations may exceed one inch maximum dimension.

The mixing shall be accomplished with a traveling mixer approved by the Agency Engineer. Adequacy of the equipment used for mixing and watering shall be determined by its ability to uniformly mix the lime, water and soil to the full depth of pulverized layer.

30.10 Compacting - After pulverizing and mixing is approved, the lime-soil material shall be compacted to a minimum relative compaction of 95 percent within 36 hours. Compaction equipment shall include a sheepfoot roller or a type of segmented wheel roller which will produce surface indentations on each compacted layer.

Where the required compacted thickness is 0.50 foot or less, the material may be mixed, spread and compacted in one layer. Where the required compacted thickness is more than 0.50 foot, the mixture shall be spread and compacted in two or more layers of approximate equal thickness. The maximum compacted thickness of any layer shall not exceed 0.50 foot, unless otherwise permitted by the Agency Engineer.

30.11 Finishing - Each layer shall be placed and compacted to provide a finished surface, within 0.1 foot, prior to placing subsequent layers. The final finished surface shall not vary more than 0.10 foot from planned thickness, except that surface indentations such as those produced during compaction will be permitted. All loose material will be removed from the surface prior to placing subsequent layers of material.
The top surface of the lime-treated base course shall be rolled smooth with either a rubber tire or steel wheel roller. It shall then be roughened by making two passes with a sheepfoot roller or segmented roller over the entire surface just prior to paving. If after the surface is roughened, loose material or rocks are evident, another blanket with a tandem steel wheel roller may be required by the Agency Engineer.

If there is an excess of material on the grade, it shall be trimmed and disposed of off the roadway section and the roadway surface shall be recompressed.

If there is a deficiency of material on the grade, it shall be filled by increasing the thickness of the next pavement layer. No additional compensation will be paid for areas so filled.

30.12 Curing - The surface of the compacted mixture shall be kept moist until such time as it is covered by succeeding layers of structural section, or until the final compacted surface is sealed. Until the compacted layer is covered by succeeding layers of structural section, no traffic will be allowed to travel over the lime-treated material unless allowed by the Agency Engineer. The Contractor will be responsible for repairing any damage to the compacted layer.

The completed lime-treated base shall be covered with a bituminous curing seal. The curing seal shall consist of SS or CSS grade asphalt emulsion and shall be furnished and applied in accordance with the provisions in Section 94 of the State Specifications. Application shall be at a rate of between 0.10 and 0.20 gallons per square yard of surface.

30.13 Testing - Compaction tests shall be performed by the Soils Engineer at all locations specified by the Agency Engineer. Test shall be performed on each layer of material placed at intervals of not more than 500 feet, and in no case shall fewer than two tests be taken on any single street.

The Soils Engineer shall take sufficient R-Value tests to enable him to verify to the Agency that the specifications have been met. On private jobs he shall take any additional tests required by the Agency Engineer and the owner shall bear the cost thereof.

Under no circumstances shall the Contractor proceed to place successive layers of material until the underlying layer has been compacted to the required density.

Should the Contractor elect to place material on top of lime-treated subbase before he is notified by the Agency Engineer that the required R-Value has been obtained in the subbase, he shall do so at his own risk. Should the subbase so covered fail to meet the R-Value requirements within 7 days after compacting, the Contractor shall remove, at his expense, all material which has been placed on top of the subbase and take remedial action as outlined in Section 30.04 of these specifications.

Under no circumstances shall the Contractor place asphalt concrete or concrete paving on top of the lime-treated base before he is notified, by the Agency Engineer, that the base meets the requirements of these specifications.

30.14 Payment - The price paid per square foot for lime-treated subbase or lime-treated base shall include full compensation for furnishing all materials (including material to be treated and water), plant, tools, and equipment, and doing all work involved in constructing lime-treated subbase or base, complete, in place, as specified, except that the lime will be paid for as a separate item as described in Section 30.15.
30.15 Payment for Lime - The furnishing, transporting, and incidental handling of lime shall be paid for as furnishing of lime. Lime will be measured by the dry ton to the nearest one-tenth of a ton. Where lime is delivered to the job in the form of a slurry, the specific gravity of each load shall be determined and measurement will be based on the weight of dry solids. The price paid per dry ton shall include all costs in furnishing, transporting and handling lime.

Section 31. Cement Treated Base (CTB)

31.01 Description - This work shall consist of furnishing and spreading, compacting, and curing plant-mixed cement-treated bases as specified in these specifications and the Special Provisions.

31.02 Materials - Materials of cement-treated base shall conform to Section 27-1.02 of the State Specifications. Only Class A cement-treated base with a minimum of 4 percent cement by weight shall be used unless otherwise noted in the Special Provisions. Proportioning and mixing of plant-treated base shall conform to Section 27-1.05 through Section 27-1.05c of the State Specifications.

The Contractor shall supply the Agency Engineer with a signed certificate of compliance from the supplier of the cement-treated material stating that it conforms to the requirements of these specifications. The Soils Engineer shall take samples of the cement-treated base and test them for compressive strength whenever directed by the Agency Engineer.

31.03 Handling of Cement-Treated Base - Mixed materials shall be protected against moisture loss both while in transit to the job site and after delivery to the site before placement and compaction. Trucks transporting cement-treated base must be equipped with covers and the covers must be used. Uncovered loads will be rejected.

31.04 Spreading - Immediately prior to spreading, the area to be covered shall be moistened and kept moist, but not excessively wet.

The mixture shall be deposited on the roadbed at a uniform quantity per linear foot, which quantity will provide the required compacted thickness without resorting to spotting, picking up or otherwise shifting the mixture. Segregated material as evidenced by pockets of coarse or fine aggregates shall be removed from the roadway and no payment will be made therefor. The mixed materials shall be spread across the full width of the roadway in one continuous operation. The spreading of materials by lanes will not be permitted, and there will be no longitudinal construction joints.

Where the required thickness is 0.50 foot or less, the mixture may be spread and compacted in one layer. Where the required thickness is more than 0.50 foot, the mixture shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one-layer shall not exceed 0.50 foot. Work on each layer shall be performed in a similar manner and the surface of the compacted material shall be kept moist until covered with the next layer.

The finished surface of cement treated base shall be uniform and shall not deviate at any point more than 0.03 foot from the bottom of a 12 foot straightedge laid in any direction.

The surface of the finished cement treated base at any point shall not vary more than 0.05 foot above or below the established grade.
Cement-treated base shall not be mixed or placed while the atmospheric temperature is below 35 degrees F., or when conditions indicate that the temperature may fall below 35 degrees F. within 24 hours.

All cement-treated base shall be protected from freezing for a period of 5 days after placing, whenever the atmospheric temperature falls below 35 degrees F.

31.05 Compacting - Compacting equipment shall be adequate to produce the required compacting within the operation time limit specified in Section 31.06, "Operation Time Requirements" of these specifications.

Compaction of cement-treated base shall consist of at least 2 separate operations, initial compaction and final compaction after trimming. Initial compaction shall follow the spreading operation immediately, and shall be performed with steel tired roller.

When the finished surface after initial compaction is outside the tolerance specified all high spots shall be trimmed off to within the specified tolerance. Filling of low areas by drifting or hauling of trimmed material is prohibited.

Pneumatic tired rollers shall be used following completion of initial rolling and trimming.

Rolling shall be performed in such a manner that bumps and irregularities will be eliminated, and the finished surface shall be true to the required grade and cross section within the surface tolerances specified in Section 31.04 of these specifications.

Rolling shall commence by completely covering the outer edge of the material. Subsequent rolling shall lap at least 25 percent of previously compacted material.

Following such trimming, the finished surface shall be thoroughly compacted so that the entire layer of cement-treated base conforms to the compaction requirements hereinafter specified. Final compaction shall be accomplished in such a manner that no loose material remains on the surface and all tear marks are eliminated.

The relative compaction of the cement-treated base shall not be less than 95 percent.

When the finished surface of cement-treated base is outside the specified tolerance and before placing any course of material thereon, all high spots on the finished surface shall be trimmed off to within specified tolerance. The excess materials shall be removed and disposed of immediately after trimming and no loose material shall be left on the base. Low areas shall be filled with A.C. Full compensation for trimming high spots, disposing of the trimmed material, and filling low spots shall be considered as included in the price paid for cement-treated base and no additional compensation will be allowed therefor.

31.06 Operation Time Requirements - Not more than 2 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of initial rolling. Not more than 2 1/2 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of final compaction after trimming.

31.07 Construction Joints - At the end of each day's work and when cement-treated base operations are delayed or stopped for more than 2 hours, a construction joint shall be made, in
thoroughly compacted material, normal to the centerline of the roadbed, with a vertical face. Additional mixture shall not be placed until the construction joint has been approved by the Agency Engineer.

Where cement-treated base has been finally compacted more than one hour, longitudinal joints shall be constructed by cutting vertically into the existing edge for approximately 3 inches; the material cut away may be disposed of in the adjacent lane to be constructed. The face of the cut joints shall be moistened in advance of placing the adjacent base.

31.08 Curing - The completed cement-treated base shall be covered with a bituminous curing seal.

The curing seal shall be applied on the same day that final compaction is performed and as soon after said compaction as is practicable. The surface shall be kept moist until the seal is applied.

Curing seal will be required only for the top layer of cement-treated base. It shall consist of liquid asphalt, MC-250 or emulsified asphalt SS-1, unless otherwise specified in the Special Provisions. The liquid asphalt shall conform to the provisions of Sections 92, 93, and 94 of the State Specifications and shall be applied at the rate of 0.25 gallons per square yard. It shall be applied as soon as possible after the completion of final rolling. The surface shall be kept moist until the seal is applied.

No equipment or traffic shall be permitted on the cement-treated base during the first 3 days after applying the curing seal, unless otherwise permitted by the Agency Engineer.

When equipment or traffic is permitted on the cement-treated base and such permission is granted for the convenience of the Contractor, he shall protect the curing seal as directed by the Agency Engineer at his expense.

The Contractor shall, before the pavement is placed on the surface, completely remove any sand which has been spread to protect the treated surface and he shall apply additional curing seal to any areas where the curing seal has been destroyed. Full compensation for furnishing, spreading, and removing such sand and for furnishing and applying the additional curing seal will be considered as included in the price bid for cement-treated base and no additional compensation will be made therefor.

31.09 Defective Work or Materials - CTB which fails to obtain a 7-day compressive strength of at least 750 pounds per square foot as determined from core samples taken from the in-place material or which shows evidence of breaking up or pumping shall be considered defective. Defective areas shall be removed and replaced or shall be retreated with 6 percent cement by weight thoroughly road mixed with the aggregate. All other normal requirements for CTB shall be met in doing this work. The repair of defective areas shall be at the Contractor's expense and no extra compensation shall be allowed therefor.

31.10 Payment - The price paid per ton of square foot for cement-treated base shall include full compensation for furnishing all plant, labor, materials (including water), tools, equipment, and incidentals for doing all work involved in hauling, constructing, compacting, and curing the cement-treated base, complete in place as specified.
SURFACING AND PAVEMENTS

Section 36. Asphalt Concrete Construction

36.01 Description - This work shall consist of furnishing and applying prime coat and tack coat, furnishing, spreading, and compacting asphalt concrete, furnishing and applying seal coats, and performing all incidental work as specified in these specifications and Special Provisions involved in applying asphalt concrete surfacing to previously unpaved bases.

36.02 Requirements to be met before Construction of Asphalt Concrete Surfacing - No asphalt concrete shall be placed until the Agency Engineer has inspected the base course for compaction, moisture content, and geometric section and has approved same.

No asphalt concrete shall be placed until the Agency Engineer has inspected the curb and gutter and all damaged portions designated by him have been replaced or repaired to his satisfaction.

No asphalt concrete shall be placed until all underground utility lines and structures have been installed and tested to the satisfaction of the utility agencies involved. The Contractor shall supply the Agency Engineer with oral or telephone notice followed by written notice from each utility company that this requirement has been met.

No asphalt concrete shall be placed until all redwood headers shown on the plans have been installed.

36.03 Penetration Treatment (Prime Coat) - Bases other than cement or lime-treated shall be treated with a prime coat conforming to the requirements below:

Immediately in advance of applying the prime coat the surface of the base shall be cleaned of all dirt and loose material.

The liquid asphalt to be used shall be SC70 conforming to the provisions of Sections 92 and 93 of the State Specifications, unless otherwise directed by the Agency Engineer. It shall be spread uniformly over the area to be paved at a rate of approximately 0.25 gallon per square yard. The exact rate to be determined by the Agency Engineer. Excess liquid asphalt which has failed to penetrate the base shall be covered with fine sand. All loose sand shall be removed from the treated areas before placing any surfacing material thereon. Liquid asphalt shall not be applied when the atmospheric temperature is below 50 degrees F. The prime coat shall be applied at least 48 hours in advance of paving.

Immediately in advance of placing asphalt concrete, additional prime coat shall be applied, as directed by the Agency Engineer, to areas where the prime coat has been damaged. Prime coat may be deleted or conditionally deleted by the Agency Engineer.

36.04 Paint Binder (Tack Coat) - Whenever asphalt concrete is to be placed over or against existing asphalt surfacing or concrete, the surface on or against which it is to be placed shall be treated with a tack coat conforming to the requirements below. The application of a tack coat on newly placed asphalt concrete prior to placing another layer on top may be deleted only with the permission of the Agency Engineer.
Immediately in advance of applying the tack coat, the surface to be covered shall be cleaned of all dirt and loose material. The emulsified asphalt to be used shall be RS-1, SS-1, CSS-1 or CSS1-K, conforming to the provisions of Sections 92 and 94 of the State Specifications. It shall be spread uniformly over the area to be paved at a rate of 0.10 gallons per square yard. Emulsified asphalt shall not be applied when the atmospheric temperature is below 40 degrees F.

36.05 Raising of Valves and Castings - On new street construction and street reconstruction projects, valve risers, manhole and monument castings, etc., may be raised to finish grade either during or after paving, at the discretion of the Agency Engineer. They must, however, match the adjacent surface after paving. When the finish surface is to be asphalt concrete, and when manholes, valve risers and monument castings are encased in concrete, the top of the concrete shall be flush with the finished surface.

This work shall be considered a part of the other items of work, and no extra compensation will be allowed therefor, unless a separate contract item is shown.

36.06 Asphalt Concrete Materials - The asphalt concrete mix shall conform to the provisions of Sections 39 and 92 of the State Specifications. The surface course shall be constructed using 1/2 inch maximum (medium) graded aggregate unless otherwise stated in the Special Provisions. Lower courses shall be constructed using 3/4 inch maximum (medium) graded aggregate.

Conformance testing of aggregates and the design of the asphalt concrete mix will be performed by the Agency's laboratory on Agency projects. On private projects, it shall be the Contractor's responsibility to provide for the asphalt concrete mix design at his expense. Testing and design shall be done by a recognized materials testing and design company acceptable to the Agency. Copies of all reports made by said company shall be delivered to the Agency Engineer and approved by him prior to the placing of any asphalt concrete on the job. Samples of materials proposed for use in the work shall be delivered to the laboratory not less than two (2) weeks prior to job site need.

The asphalt concrete mix shall be designed to meet the specifications set forth in Section 39-2.01 (Asphalts) and Section 39-2.02 (Aggregates) of the State Specifications and the Special Provisions. Optimum bitumen content shall be obtained by utilizing California Test Method 367.

Each and every load of asphalt concrete mix delivered to the job shall be accompanied by a weight tag which shows the asphalt content.

For each job the asphalt concrete supplier shall supply the Agency Engineer with a certificate stating the mix supplied conforms to the specifications and the mix design.

36.07 Spreading - Asphalt concrete shall be placed by a self-propelled asphalt paver conforming to the requirements of Section 39-5.01 of the State Specifications except as provided below:

A. On small jobs where the total width to be paved is less than 10 feet or the total length of the job is less than 100 feet, spreader boxes may be used for placing asphalt concrete provided approval is first obtained from the Agency Engineer.

B. On trench jobs where the width of trench is less than 4 feet, the asphalt concrete may be spread in any manner which will produce results conforming to the provisions of Section 39-6 of State Specifications.
All mixtures, except open graded mixture, shall be spread at a temperature of not less than 250 degrees F. and all initial rolling or tamping shall be performed before the temperature of the mixture drops below 200 degrees F.

If the temperature of the mixture leaving the plant drops more than 20 degrees F. between the time it leaves the plant and is placed on the road, or when the job to plant distance is greater than 10 miles, the Contractor shall furnish and use tarpaulins to cover all loads.

Open graded mixtures may be placed only when the atmospheric temperature is above 60 degrees F., and all other mixtures shall be placed only when the atmospheric temperature is above 50 degrees F.

Asphalt concrete shall be spread and compacted in layers as set forth in Section 39-6.01 of the State Specifications.

The mixture shall be deposited on the roadbed at a uniform quantity per linear foot, which quantity will provide the required compacted thickness without resorting to spotting, picking up, or otherwise shifting the mixture. Segregation shall be avoided, and the surfacing shall be free from pockets of coarse or fine material.

In advance of spreading asphalt concrete, if ordered by the Agency Engineer, surface course mixtures shall be spread as directed by him to level irregularities, dips, depressions, sags and excessive crown, and to provide a smooth base of uniform grade and cross section, in order that subsequent layers of base or surfacing will be uniform thickness.

Before placing the top layer of surfacing at cold construction joints or at locations adjoining existing surfacing, the existing surfacing shall be cut vertically along a straight line laid out by the Agency Engineer, and the old surfacing material stripped out to its base. The new surfacing shall overlay the older base and shall form a butt joint with the older surfacing.

Asphalt concrete shall be placed in such a way that the finish surface next to the gutter lip of Type "A" curb shall be 1/4 inch to 1/2 inch above the gutter lip after the asphalt has been compacted.

Longitudinal joints in the top course shall correspond with the edges of the proposed traffic lanes. Longitudinal joints in all other courses shall be offset, not less than 0.5 foot alternately on each side of the edges of traffic lanes.

36.08 Compacting - Initial or breakdown rolling shall consist of one complete coverage of the asphalt mat as soon as possible after it has been laid, and in no case after the temperature of the mixture has fallen below 200 degrees F. Breakdown rolling shall be done with a pneumatic tired roller or a steel wheel, two-axle roller with a compression on the rear wheel of at least 325 pounds per linear inch. Two rollers will be required when the area to be paved exceeds 20,000 sq. ft. or when the amount of asphalt to be placed exceeds 400 tons in one normal working day.

Three rollers will be required when the amount of asphalt to be placed exceeds 1200 tons in one normal working day. When more than one roller is required the second roller shall be a pneumatic-tired roller conforming to Section 39-5.02 of the State of California Standard Specifications.

Rolling shall commence, after rolling of joints and outside edge, at the lower edge and shall progress toward the highest portion. Check surface after breakdown rolling and repair displaced areas with new hot mixture. Under no circumstances shall the center be rolled first. The initial or breakdown
rolling shall be followed by additional rolling consisting of one complete coverage of the asphalt mixture while the mixture is at or above 150 degrees F.

The final rolling of the uppermost layer of asphalt concrete to iron out roller marks shall be performed with an 8 ton two-axle tandem roller, or if there is no 8 ton tandem roller available, with a 10 ton two-axle roller.

On trench jobs where the width of trench is less than 4 feet, rolling may be done with any steel wheel roller as long as it compacts with a pressure of 300 pounds per lineal inch or more.

Rolling shall be performed in such a manner that cracking, shoving or displacement will be avoided.

The completed surfacing shall be thoroughly compacted, smooth, and true to grade and cross section, and free from ruts, humps, depressions or irregularities. When a straight edge 12 feet long is laid on the finished surfacing and parallel with the centerline of the street, the surface shall not vary more than 0.01 foot at any point along the straight edge. The transverse slope of the finished surface shall be uniform to a degree such that no depression greater than 0.01 foot is present when tested with a straight edge 12 feet long laid in a direction transverse to the centerline. The completed thickness shall be no more than 0.01 foot less than design thickness.

Any ridges, indentations, or objectionable marks left in the surface of the asphalt concrete by equipment shall be eliminated by rolling or other means. The use of any equipment that leaves ridges, indentations or other objectionable marks in the asphalt concrete shall be discontinued and other acceptable equipment shall be furnished by the Contractor.

During rolling operations, when directed by the Agency Engineer, the asphalt concrete shall be cooled by applying water.

For those paving projects which the Agency Engineer deems to be significant, due to factors such as size or location, special compaction standards and/or testing may be required. For Non-Agency projects, such testing shall be the responsibility of the private party performing the works.

36.09 Miscellaneous Areas - Surfacing of median strips, islands, sidewalks, berms, gutters, gutter flares, ditches, spillways, aprons at the end of drainage structures, and other designated areas outside the traveled way shall conform to the provisions herein before specified for asphalt concrete and as herein specified.

The combined aggregate grading for asphalt concrete placed on miscellaneous areas shall conform to that specified for surface courses on the traveled way, except that the amount of asphalt binder used in the asphalt concrete shall be increased by not less than 1 percent by weight of the aggregate over the amount of asphalt binder used in the asphalt concrete placed on the traveled way, and 3/8 inch maximum aggregate shall be used.

The asphalt concrete placed in median strip areas, island areas, sidewalks, berms, gutters, gutter flares, ditches, spillways, aprons at the end of drainage structures, and other designated areas outside the traveled way may be spread in one layer. The material shall be compacted to the required lines, thicknesses, grades, and cross sections.

Berms shall be shaped and compacted with an extrusion machine capable of shaping and compacting the material to the required cross section.
36.10 Seal Coat - Unless otherwise stated in the Special Provisions, all new asphalt concrete surfacing shall be sealed with an application of a mixture of asphalt emulsion and added water per Section 37-1.01 through 37-1.05 of the State Specifications, using the rate of application stated below.

Before spreading, the asphalt emulsion shall be cut back with water so that the resulting mixture will contain one part asphalt emulsion and not more than one part added water. The combined mixture shall be spread at the approximate rate of 0.10 gallon of the original emulsion per square yard. The exact rate of application will be determined by the Agency Engineer.

Payment shall be in accordance with Section 37-1.09 of the State Specifications.

36.11 Seal Coat (Trench Restoration) - Unless otherwise stated in the Special Provisions, all asphalt concrete surfacing shall be sealed with a sand seal using the materials and rates of application listed below:

Bituminous binder shall be RS-1 or SS-1 emulsified asphalt conforming to the provisions of Section 94 of the State Specifications. It shall be applied uniformly at a rate of approximately 0.10 gallon per square yard.

Sand used for sealing shall be clean river sand free from all organic matter and other deleterious substances. It shall meet all the requirements for Portland Cement Concrete fine aggregate as specified in Section 90-2.02B of State Specifications. Sand shall be spread uniformly and in sufficient quantity that no bleeding of the binder may be seen.

36.12 Measurement - Asphalt concrete surfacing will be measured either by weight or by the surface area in place whichever is stated in the Special Provisions or proposal. Where measurement is based on weight, it will be made to the nearest 0.10 ton. Where measurement is based on surface area, it will be made to the nearest whole square foot.

Asphalt concrete placed in miscellaneous areas as defined in Section 36.09 of these specifications will be measured by the means indicated in the Special Provisions or proposal. Where payment is based on lineal or square feet measure, such payment will include the furnishing of all materials and no weight measurement or payment will be made in addition thereto.

36.13 Payment - The price paid per ton, per square foot, or per lineal foot shall include full compensation for furnishing all plant, labor, materials, tools, equipment, and incidentals for doing all work involved in constructing prime coat or tack coat, hauling, spreading, compacting and finishing asphalt concrete, and applying a seal coat complete in place to the thicknesses, lines, and grades shown on the plans and in conformance with these specifications. No separate payment will be made for prime coats, tack coat, sand seal, fog seal, or for furnishing such flaggers, detour signs, or warning devices as required by the Agency Engineer. Full compensation for the above items shall be included in the prices paid for asphalt surfacing.
Section 37. Asphalt Concrete Overlay

37.01 Description - This work shall consist of furnishing and applying tack coat, furnishing, spreading, and compacting asphalt concrete, applying seal coats, and performing all incidental work as specified in these specifications and Special Provisions involved in overlaying existing pavements.

37.02 Maintaining Traffic - At locations where traffic is being routed over a street which is to be overlaid, the overlay shall not be applied to more than one-half the width of the traveled way at a time, and the remaining width shall be kept free of obstructions and open for public use until the overlay first applied is ready for use by traffic.

The Contractor shall provide for the passage of public traffic through the work in accordance with the applicable provisions of Section 12 of these specifications and, when directed by the Agency Engineer, traffic shall be routed through the work under one-way control.

It shall be the Contractor's responsibility to protect the new overlay from traffic damage until it is sufficiently cooled and compacted.

37.03 Surface Preparation - Prior to application of the tack coat the street surface shall be thoroughly cleaned by brooming or other means producing results comparable to those of careful hand brooming. Should the Contractor elect to clean the street surface by washing it with water, such washing shall be done well in advance of tack coat application so that the tack coat is applied to a dry surface.

On Agency projects, Agency forces will remove weeds and large debris which cannot be reasonably removed by sweeping. The Contractor will still be responsible for normal cleaning.

37.04 Paint Binder (Tack Coat) - Prior to placing asphalt concrete overlay, the existing pavement shall be treated with a tack coat of SS-1, SS-1H, CSS-1 or CSS-1H emulsified asphalt, conforming to the provisions of Sections 92 and 94 of the State Specifications, applied at the rate of 0.10 gallons per square yard. Emulsified asphalt shall not be applied when the atmospheric temperature is below 40 degrees F.

37.05 Temperature and Surface Condition - Asphalt concrete overlay shall not be placed when the atmospheric temperature is lower than 50 degrees F. or when there is any evidence of moisture on the surface or in the cracks of the surface to be overlaid.

37.06 Raising of Valve Covers and Castings - Storm and sanitary sewer manholes, lampholes, rodholes, cleanouts, and other frames and castings and water valve covers within the area to be overlaid shall be adjusted to match the new pavement surface. The Contractor shall furnish all labor, tools, equipment and materials and do all work necessary to accomplish these adjustments to the satisfaction of the Agency and the jurisdiction having authority over them. This work shall be considered a part of the other contract items, and no extra compensation will be allowed therefor unless a separate contract item is shown.

37.07 Asphalt Concrete Materials - The asphalt concrete mix shall conform to the provisions of Section 36.06 of these specifications. Aggregate size and gradings shall conform to Section 36.06 and the table below:
Average thickness to be laid | Grading to be used
---|---
Greater than 1 inch | 1/2 inch max. medium grading
1 inch to 1/2 inch | 3/8 inch max.
less than 1/2 inch | No. 4 max.

37.08 Leveling Course - A leveling course may be required by the Agency Engineer to level irregularities, dips, depressions, sags, and excessive crown, and to provide a smooth base of uniform grade and cross section. The leveling course may be laid with a self-propelled paving machine, spreader box, or blade. Paving machines and blades must conform to the provisions of Section 39-5.01 of the State Specifications. All other requirements of Sections 37.09 and 37.10 of these specifications shall remain in full effect for the leveling course.

On Agency projects leveling course will be a separate pay item.

37.09 Spreading - Asphalt concrete shall be placed by a self-propelled asphalt paver conforming to the requirements of Section 39-5.01 of the State Specifications. All mixtures shall be spread at a temperature of not less than 250 degrees F. and all initial rolling or tamping shall be performed before the temperature of the mixture drops below 200 degrees F.

If the temperature of the mixture leaving the plant drops more than 20 degrees F. between the time of leaving the plant and placing on the road, the Contractor shall furnish and use tarpaulins to cover all loads.

Asphalt concrete shall be spread and compacted in layers as set forth in Section 39-6.01 of the State Specifications.

The mixture shall be deposited on the roadbed of a uniform quantity per linear foot, which quantity will provide the required compacted thickness without resorting to spotting, picking up, or otherwise shifting the mixture. Segregation shall be avoided, and the surfacing shall be free from pockets of coarse or fine materials.

37.10 Compacting - Initial or breakdown rolling shall consist of one complete coverage of the asphalt mat as soon as possible after it has been laid and in no case after the temperature of the mixture has fallen below 200 degrees F. Breakdown rolling shall be done with a pneumatic tired roller or a steel wheel, two-axle roller with a compression on the rear wheel of at least 325 pounds per linear inch. Two rollers will be required when the area to be paved exceeds 20,000 sq. ft. or when the amount of asphalt to be placed exceeds 400 tons in one normal working day.

Three rollers will be required when the amount of asphalt to be placed exceeds 1200 tons in one normal working day. When more than one roller is required, the second roller shall be a pneumatic-tired roller conforming to Section 39.5.02 of the State Specifications.

Rolling shall commence at the lower edge and shall progress toward the highest portion. Under no circumstances shall the center be rolled first. The initial or breakdown rolling shall be followed by additional rolling consisting of one complete coverage of the asphalt mixture while the mixture is at or above 150 degrees F.

The final rolling of the uppermost layer of asphalt concrete to iron out roller marks shall be performed with an 8 ton, two-axle tandem roller, or if there is no 8 ton tandem roller available, with
a 10 ton, two-axle roller. Rolling shall be performed in such a manner that cracking, shoving or displacement will be avoided.

The completed surfacing shall be thoroughly compacted, smooth, and true to grade and cross section, and free from ruts, humps, depressions or irregularities.

Any ridges indentations or objectionable marks left in the surface of the asphalt concrete by equipment shall be eliminated by rolling or other means. The use of any equipment that leaves ridges, indentations or other objectionable marks in the asphalt concrete shall be discontinued and other acceptable equipment shall be furnished by the Contractor.

During rolling operations, when directed by the Agency Engineer, the asphalt concrete shall be cooled by applying water.

37.11 Seal Coat - Asphalt concrete overlays shall be sealed with an asphalt emulsion and water mixture conforming to the provisions of Section 36.10 of these specifications.

37.12 Measurement - Asphalt concrete surfacing will be measured either by weight or by the surface area in place, whichever is specified in the Special Provisions or on the proposal. Where measurement is based on surface area, it will be made to the nearest whole square foot.

37.13 Payment - The price paid per ton or per square foot shall include full compensation for furnishing all plant, labor, materials, tools, equipment, and incidentals for doing all work involved in raising castings to grade, constructing tack coat, hauling, spreading, compacting, finishing asphalt concrete, and applying a seal coat complete in place to the thicknesses shown on the plans and in conformance with these specifications. No separate payment will be made for tack coat, sand seal or for furnishing such flaggers, detour signs, or warning devices as required by the Agency Engineer. Full compensation for the above items shall be included in the prices paid for asphalt surfacing.

37.14 Keycutting - At the location shown on the plans, the Contractor shall perform keycutting along the existing lip of gutter and at cross-intersections where asphalt concrete overlay will conform.

Keycutting shall conform with the details shown on the plans. The purpose of the gutter cuts is to allow exact conform with the lip of gutter or existing pavement. Extra raking or other work required to fulfill this requirement is hereby specified at no extra cost to the Agency.

At keycut pavement conforms, the Contractor shall place cutback asphalt to provide a smooth ramp for vehicular traffic. The cutback asphalt shall be maintained by the Contractor until overlay work has begun, at which time he shall remove and dispose of all cutback asphalt.

Keycutting shall be accomplished by a cold planing machine having a cutter head at least thirty inches wide and shall be operated as not to produce excessive fumes or smoke.

Residue from grinding shall be removed from the roadbed by sweeping.

Concrete gutter chipped by the keycutting operation shall be epoxy patched.

37.15 Measurement and Payment - Keycutting of existing asphalt concrete pavement shall be measured by the linear foot. The quantity to be paid for shall be actual plan length of grinding
irrespective of the number of passes required to conform with the depth requirement shown on the plans. The contract price paid per linear foot for grinding of existing asphalt concrete pavement shall include full compensation for furnishing labor, materials, tools, equipment, incidentals and for doing all work involved in grinding of existing asphalt concrete surfacing and disposing of material removed as specified in these specifications, the Special Provisions, and as directed by the Engineer.

37.16 Pavement Reinforcing Fabric - Pavement reinforcing fabric shall be placed on the existing pavement to be surfaced or between layers of asphalt concrete when such work is shown on the plans, or specified in the Special provisions, or ordered by the Engineer.

Pavement reinforcing fabric shall conform to Section 88-1.02 of the State Specifications.

Placement of the fabric shall be done only under the following conditions:

1. The ambient air temperature is at least 50°F and increasing.
2. The pavement temperature is at least 40°F and increasing.

Before placing the pavement reinforcing fabric, a binder of AR4000 as specified in Section 92 of the State Specifications shall be applied to the surface to receive the fabric at an approximate rate of 0.25 gallons per square yard of surface covered. The exact rate will be determined by the Engineer. The binder shall be applied to a width equal to the fabric width plus 3 inches on each side.

Surface cleaning shall be as specified in Section 37.03 and repairs of large cracks and chuckholes in the existing surface shall be as specified in the Special Provisions.

The fabric shall be aligned and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric exceeds 1/2 inch, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving.

Pavement reinforcing fabric shall not be placed in areas of conform tapers where the thickness of the overlaying asphalt concrete is 0.08 foot or less.

Adjacent borders of the fabric shall be lapped 2 to 4 inches. The preceding roll shall lap 2 to 4 inches over the following roll in the direction of paving at ends of rolls or at any break. At fabric overlays, both the tack coat and the fabric shall overlap the previously placed fabric by the same amount.

Sealing of the fabric with rolling equipment is allowed if care is taken to avoid tracking binder material onto the fabric or distorting the fabric. If necessary, lightly cover exposed binder material with sand.

Small quantities of asphalt concrete may be spread over the fabric to prevent the fabric from being picked up by construction equipment. Turning of the paving machine and other vehicles shall be gradual and kept to a minimum to avoid fabric damage.

Public cross traffic will be allowed, under traffic control, after the Contractor has placed a small quantity of asphalt concrete over the fabric.

37.17 Measurement and Payment - Pavement reinforcing fabric will be measured and paid for by the square yard complete and in place, or as specified in the Special Provisions.
Section 38. Chip Seal

38.01 Description - This work shall consist of an application or applications of bituminous binder and a cover of screenings, applied as herein specified.

The type of chip seal coat to be applied will be designated on the plans or specified in the Special Provisions. The bituminous binder to be used will be specified in the Special Provisions.

The rates of application for the screenings and bituminous binders for the various types of chip seal shall be within the ranges specified in the following table:

<table>
<thead>
<tr>
<th>Chip Seal Types</th>
<th>Size of Screenings</th>
<th>Screening (pounds)</th>
<th>Bituminous Binder (gal.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine</td>
<td>1/4&quot; x No. 10</td>
<td>12 to 20</td>
<td>0.15 to 0.30</td>
</tr>
<tr>
<td>Medium Fine</td>
<td>5/16&quot; x No. 8</td>
<td>16 to 25</td>
<td>0.20 to 0.35</td>
</tr>
<tr>
<td>Medium</td>
<td>3/8&quot; x No. 6</td>
<td>20 to 30</td>
<td>0.20 to 0.35</td>
</tr>
<tr>
<td>Coarse</td>
<td>1/2&quot; x No. 4</td>
<td>23 to 30</td>
<td>0.30 to 0.40</td>
</tr>
<tr>
<td>Double Coat:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Application</td>
<td>1/2&quot; x No. 4</td>
<td>23 to 30</td>
<td>0.20 to 0.35</td>
</tr>
<tr>
<td>2nd Application</td>
<td>1/4&quot; x No. 10</td>
<td>12 to 20</td>
<td>0.20 to 0.30</td>
</tr>
</tbody>
</table>

38.02 Materials - The bituminous binders and screenings shall conform to the provisions of Section 37, 93 and 94 of the State Specifications.

38.03 Maintaining Traffic - At locations where public traffic is being routed over surface upon which a chip seal is to be applied, the chip seal shall not be applied to more than one-half the width of the traveled way at a time, and the remaining width shall be kept free of obstructions and open for use by public traffic until the seal coat first applied is ready for use by traffic.

The Contractor shall provide for the passage of public traffic through the work in accordance with the applicable provisions of Section 12 of these specifications and, when directed by the Agency Engineer, traffic shall be routed through the work under one-way control.

38.04 Preparation for Chip Seal - Immediately before applying the bituminous binder, the surface to be sealed shall be cleaned of all dirt and loose material.

When chip seals are to be applied to an untreated material, a prime coat consisting of liquid asphalt of the type specified in the Special Provisions shall be applied to the material in place at a rate of from 0.20 to 0.33 gallon per square yard.

38.05 Applying Bituminous Binder - Paving asphalt, liquid asphalt, and asphalt emulsion shall be applied in accordance with Sections 92, 93 and 94 of the State Specifications.

Bituminous binder shall not be spread when weather conditions are unsuitable. Chip seals shall not be applied until sufficient screenings are on hand to immediately cover the bituminous binder, or when the atmospheric temperature is below 60 degrees F. or when the pavement temperature is below 80 degrees F.
Spreading bituminous binder shall be discontinued sufficiently early in the day to permit the termination of traffic control prior to darkness. Bituminous binder shall not be spread a greater distance than can be immediately covered by screenings, unless otherwise permitted by the Agency Engineer.

The cut off of bituminous binder shall be made on building paper, or similar material spread over the surface. Paper shall also be placed over the treated surface for a sufficient length at the beginning of a spread so that the nozzles are spreading properly when the uncovered surface is reached. The building paper shall then be removed and disposed of in a manner satisfactory to the Agency Engineer.

38.06 Spreading Cover Material - Screenings shall be spread by means of a chip spreader, equipped with a mechanical device which will spread the screenings at a uniform rate over the full width of a traffic lane in one application. The joint between adjacent applications of screenings shall coincide with the line between designated traffic lanes. The chip spreader shall be equipped with a device and so operated that the coarse particles of the screenings shall be deposited on the bituminous binder before the finer particles.

Operating the chip spreader at speeds which cause the chips to roll over after striking the bituminous covered surface will not be permitted.

The transverse cut-off of screenings shall be complete and any excess screenings shall be removed from the surface prior to resuming operations. Stockpiling of screenings prior to placing will be permitted; however, any contamination resulting during storage or from reloading operations will be cause for rejection.

Screenings shall be surface damp at the time of application, but excess water on the aggregate surface will not be permitted. When directed by the Agency Engineer redampening of screenings in the vehicles at the point of delivery will be required.

Asphalt emulsion binders applied shall be covered with screenings before setting or "breaking" of the binder occurs.

38.07 Finishing - After the screenings have been spread on the bituminous binder, any piles, ridges, or uneven distribution shall be carefully removed to insure against permanent ridges, bumps or depressions in the completed surface. Additional screenings shall be spread in whatever quantities that may be required to prevent picking up by the rollers or traffic, after which the surface shall be rolled.

Rollers shall be of the steel-tired tandem type and pneumatic-tired type. Tandem-type rollers shall weigh not less than 5 tons and not more than 10 tons. Pneumatic-tired rollers shall conform to the provisions in Section 39-5.02 of the State Specifications.

Initial rolling shall consist of one complete coverage performed with a steel wheel tandem type roller and shall begin immediately behind the spreader. When chip seals are applied over existing pavement the initial rolling shall be done by pneumatic-tired rollers. Spreading of binder and screenings more than 1,500 feet ahead of completion of initial rolling operations will not be permitted. Pneumatic-tired rolling shall begin immediately after completion of the initial rolling. The amount of pneumatic-tired rolling shall be sufficient to adequately seat the screenings, and in no case shall it be less than 2 complete coverages.
On completion of pneumatic-tired rolling, traffic will be permitted to travel over seal coats. The traffic shall be controlled by pilot cars at a speed of not to exceed 15 miles per hour for a period of from 2 to 4 hours. The exact time will be determined by the Agency Engineer.

After screenings are set in the bituminous binder, but not earlier than the following day, any loose screenings forming corrugations shall be redistributed over the surface. At the end of 4 days any excess screenings shall be removed by a rotary sweeper in such a manner that the screenings set in the binder will not be displaced. Excessive rolling or brooming will not be permitted.

Any excess screenings remaining on the surface after the first application of a "double" seal coat shall be uniformly distributed over the surface prior to the second application of bituminous binder.

When directed by the Agency Engineer on Agency projects, excess screenings shall be salvaged and stockpiled at locations designated by him. Excess screenings which in the opinion of the Agency Engineer are not salvable shall be removed and disposed of by the Contractor at his expense.

After the surface has been opened to public traffic, any excess of bituminous binder that comes to the surface shall be immediately covered with additional screenings or clean sand. The use of roadside material will not be permitted. The completed surface shall present a uniform appearance and shall be thoroughly compacted, and free from ruts, humps, depressions, or irregularities due to an uneven distribution of bituminous binder or screenings.

38.08 Measurement - Quantities of chip seal will be measured by the square yard of surface area in place for the various types of seal specified.

Measurement will be made to the nearest whole square yard. No payment will be made for materials placed outside the limits shown on the plans unless directed by the Agency Engineer.

38.09 Payment - The price paid per square yard for chip seals shall include full compensation for furnishing all plant, labor, materials, tools, equipment, and incidentals for doing all work involved in constructing the chip seal complete and in place as specified.

Section 39. Slurry Seal

39.01 General - The work shall conform to the provisions of Section 37.2 of the State Specifications except as modified herein.

39.02 Emulsion - Emulsion shall conform to the provisions in Section 37-2.02A of the State Specifications.

39.03 Aggregate - Aggregate shall conform to the provisions in Section 37-2.02C of the State Specifications. Aggregate grading type I, II or III will be as specified in the Special Provisions.

39.04 Proportioning and Mixing - Proportioning and mixing shall conform to the provisions in Section 37-2.4 of the State Specifications.
39.05 **Placing** - Placing shall conform to the provisions in Section 37-20.6 of the State Specifications except that slurry seal shall not be placed when the atmospheric temperature is below 50 degrees F. or during unsuitable weather. Placement techniques that result in a corrugated or otherwise rough or irregular surface will not be permitted. Any areas of corrugated, rough or irregular surfaces identified by the Agency Engineer shall be removed to a smooth surface and the slurry seal reapplied to the Agency Engineer’s satisfaction at the Contractor's expense.

39.06 **Measurement** - Measurement shall be based on the in place area (measured in square feet) of slurry seal placed in accordance with the plans and specifications.

39.07 **Payment** - The contract unit price paid per square foot of slurry seal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all of the work involved in constructing the slurry seal, complete in place including application of 0.10 gallon to 0.20 gallon of water per square yard of surface prior to placing slurry mix, finishing surface, cleaning up all excess materials, and supervision of the protection of the seal from traffic damage until the mixture is cured.

**Section 40. Portland Cement Concrete Pavement**

40.01 **Description** - This work shall consist of constructing a pavement of portland cement concrete on a prepared subgrade or base as specified in these specifications and the Special Provisions.

40.02 **Concrete** - The concrete used shall conform to the requirements of Section 90 of the State Specifications. It shall be of the class shown on the plans, specified in the Special Provisions, or approved Soils Engineer’s report. The nominal slump of the concrete shall be 0 to 2 inches as determined by either Test Method No. Calif. 519 (slump cone) or by Test Method No. Calif. 520 (Kelly Ball). Concrete having a slump of 3 inches or more will be rejected and no payment will be made therefor. No admixtures will be used without permission of the Agency Engineer, except as otherwise provided in the Special Provisions. All admixtures and their use shall conform to the provisions of Section 90 of the State Specifications.

40.03 **Reinforcement** - Concrete pavement shall be reinforced at structure approaches and other locations shown on the plans or directed by the Agency Engineer.

Bar reinforcement shall conform to the provisions in Section 52 of the State Specifications, excluding Sections 52-0.10 and 52-1.11.

Bar reinforcement shall be held accurately and firmly in position during the placing and compacting of the concrete without sagging by means of supporting devices which shall be left in place. The supports shall be specially manufactured for the purpose and each support shall be capable of supporting a vertical load of 200 pounds.

40.04 **Subgrade** - The preparation of subgrade to receive concrete pavement shall conform to the provisions of Section 23 of these specifications. No concrete shall be placed until the Agency Engineer has inspected and approved the subgrade for compaction, trench compaction, and geometric section.
No concrete paving shall be placed until the Agency Engineer has inspected the curb and gutter and all damaged portions designated by him have been repaired or replaced to his satisfaction.

The subgrade shall be thoroughly wetted immediately prior to placing concrete.

40.05 Forms - Forms may consist of steel forms or slip forms as specified in Sections 40-1.07A or 40-1.07B of the State Specifications. Concrete curb and gutter may also be used as a form.

40.06 Placing - The Contractor shall make adequate advance arrangements for preventing delay in delivery and placing of concrete. An interval of more than 45 minutes between placing of any 2 consecutive batches or loads shall constitute cause for stopping paving operations and the Contractor shall make a contact joint, at his expense, at the location and of the type directed by the Agency Engineer.

Unless otherwise specified in these specifications or in the Special Provisions, concrete pavement shall be placed in 12-foot traffic lane widths separated by contact joints as shown on the plans, or, at the option of the Contractor, the concrete pavement may be placed monolithic, 2 or more traffic lanes wide, without a contact joint, but with a longitudinal weakened plane joint at each traffic line.

All concrete shall be used within 45 minutes of the time water is first added to the mix. The use of water for retempering any concrete will not be permitted.

Any concrete showing improper proportions of materials, including water, shall not be used in the pavement and any such unsatisfactory concrete shall be removed and disposed of by the Contractor at his expense.

The Contractor shall protect freshly placed concrete from damage by any cause, and any damage shall be repaired by the Contractor at his expense.

Expansion joint material shall be protected while depositing fresh concrete adjacent thereto.

Concrete work shall be adequately barricaded in all directions to protect the work.

40.07 Spreading, Compacting and Shaping - Where a slip-form paver is used its use shall conform to the requirements of Section 40-1.07B of the State Specifications. Where stationary metal or concrete forms are used, the work shall conform to the requirements below.

The concrete shall be distributed uniformly with a mechanical spreader. The spread concrete shall be vibrated, screeded and tamped by machine or by hand.

The number and capacity of machines or men furnished shall be adequate to perform the work required at a rate equal to the progress of placing the concrete. Any delay in excess of 15 minutes in vibrating, screeding, and tamping shall constitute cause for stopping the placing until the machines or men performing such work are again in proper position in the paving train.

The concrete for the full paving width shall be vibrated by means of surface vibrators with internal vibrators adjacent to each longitudinal edge or by some method of vibration that produces equivalent results without segregation.
Screeding and tamping shall be performed with 2 reciprocating screeds between which is mounted a tamping bar actuated at each end by positive displacement devices, or by hand methods which will produce equivalent results. When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface shall be off-set to run a sufficient distance from the edge of the pavement to avoid breaking or cracking the pavement edge.

Screeding and tamping shall be performed by making at least 2 complete passes over the entire area of the pavement. On the first pass the tamper shall be adjusted to produce the proper tamping action and the tamping bar shall not be operated during the second pass unless otherwise directed by the Agency Engineer. The screeds shall be adjusted to an elevation slightly above grade so that when properly consolidated and finished, the completed surface of the pavement will be at the established grade, true to the cross section shown on the plans, and the contact surface of the crawler tracks or wheels shall be kept clean by effective devices attached to the machine...The travel of the machine shall be maintained true without lift, wobble, or other variation tending to affect precision screeding. The machine shall be of ample strength to withstand severe use and shall be fully and accurately adjustable to compensate for wear. During each pass of the machine, a roll of concrete shall be maintained ahead of the front screed for the entire width of pavement being placed and except when making an expansion joint, the machine shall not be operated beyond that point where the roll of concrete can be maintained. The intent of this specification is that the equipment shall produce a surface requiring minimum cutting during the floating and final finishing.

Concrete placed in widths less than a traffic lane may be compacted and shaped by a powered mechanical compacting and shaping machine, supplemented by hand methods as necessary. Where hand compaction is performed, the tamper shall be constructed of a heavy plank whose length exceeds the width of pavement by a minimum of one foot; shall be shod with a heavy strip of metal for a tamping surface; and shall be stiffened adequately to maintain the required shape during use. When concrete production is in excess of 40 cubic yards per hour, and where all compaction is performed by hand methods, not less than 2 tampers shall be used.

The hand tamper shall be used with a combined tamping and longitudinal motion raising it from the side form and dropping it to consolidate the concrete. A surplus of concrete shall be kept in front of the hand tamper and tamping shall continue until the required cross section is obtained and the mortar flushes slightly to the surface.

Where hand compaction is performed on grades in excess of 5 percent, a light strike board constructed similar to the heavy tamper shall be used following the heavy tamper or tampers to correct any displacement caused by flow of the concrete.

The temperature of mixed concrete, immediately before placing, shall be not less than 50 degrees F. nor more than 90 degrees F. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 150 degrees F. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

40.08 Joints - Joints shall be constructed at locations shown on the plans, directed by the Agency Engineer, and stated in these specifications. All joints shall conform to the provisions of Sections 40-1.08 through 40-1.08B(3) of the State Specifications.
40.09 Preliminary Finishing - Unless adequate lighting facilities are provided by the Contractor, the placing of concrete pavement shall cease at such time that finishing operations can be completed during daylight hours.

Necessary workmen shall remain at work long enough to complete the finishing and curing of the pavement.

In case fine cracks or hair checks appear in newly placed concrete before it is thoroughly set, water shall be applied to the concrete surface, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the finishing operations are completed and the curing is applied.

Where machine floats or slip-forms are used, the finishing shall conform to the provisions of Section 40-1.09A(1) or 40-1.09B of the State Specifications. Where hand float methods are used, they shall conform to the following requirements.

The surface of the concrete shall be finished smooth and true to grade with 2 suitable floats 16 feet long and 4 inches wide, rigidly ribbed, and with adjusting screws between the rib and float at not more than 2-foot centers, to insure a true and flat surface on the under side at all times. Each float shall be operated from the side of the pavement and the float shall be parallel with the centerline of the pavement. The edge of the float shall be used to cut down all high areas, and the material so removed shall be floated into the depressions until a true surface is obtained. Each successive passage of the float shall just lap the previous path and upon its completion the float shall be brought and the overlap between the 2 passages smoothed.

The float shall be operated as far back of the tamping machine as the concrete remains workable and the number of passes shall be sufficient to remove all perceptible inequalities.

At least one spare float in good condition shall be available on the work at all times.

40.10 Final Finishing - After the preliminary finishing has been completed the edges of an initial pavement lane, transverse contact joints, expansion joints, and joints adjacent to an existing pavement shall be rounded to a 1/4 inch radius.

In advance of curing operations, the pavement shall be textured by brooming with a stiff broom. Brooming shall be done in a direction normal to the centerline. The operation shall be performed at a time and in a manner to produce a hardened surface having a coefficient of friction of not less than 0.25 as determined by Test Method No. Calif. 342. Completed pavement that is found to have a coefficient of friction less than 0.25 shall be ground or scored by abrasive means by the Contractor at his expense to provide the required coefficient of friction.

When a straight edge of 12 feet long is laid on the finished pavement in a direction parallel to the centerline, the surface shall not vary more than 0.01 foot from the lower edge of the straight edge. The transverse slope of the pavement shall be uniform to a degree such that no depressions greater than 0.02 foot are present when tested with a straight edge 12 feet long laid in a direction transverse to the centerline and extending from edge to edge of a 12 foot traffic lane. Upon completion of the pavement, any points that are high in excess of the tolerances set forth above, shall be removed by abrasive means.
40.11 Curing and Protecting - Concrete pavement shall be cured and protected in accordance with the provisions of Section 90-7.02 of the State Specifications, except that no extra payment will be made for any of the work included therein.

40.12 Measurement - Quantities of portland cement concrete pavement will be measured by the square foot of surface area in place for the various thicknesses and types unless otherwise specified in the Special Provisions. No payment will be made for concrete placed outside of the limits shown on the plans or in excess of thicknesses stated unless otherwise directed by the Agency Engineer.

40.13 Payment - The price paid per square foot of portland cement concrete pavement shall include full compensation for furnishing all plant, labor, materials, tools, equipment, and incidentals for doing all work included in constructing subgrade, furnishing, hauling, placing, finishing, curing and protecting concrete pavement, constructing all types of joints, and furnishing and placing all reinforcement, complete in place as specified.
CONCRETE WORK

Section 43. Curb, Gutter, Sidewalk, Driveway Approach and Valley Gutter

43.01 Description - This work shall consist of constructing concrete curbs and gutters, sidewalks, driveway approaches, and valley gutters on a prepared subgrade at the locations and to the lines, grades and dimensions shown on the plans and Agency Standard Drawings.

43.02 Concrete - The concrete to be used shall conform to the provisions of Section 90 of the State Specifications, Class "B" (5 sack mix) with 1 inch maximum aggregate.

Concrete shall contain 2 pounds of lamp black per cubic yard.

The slump of the concrete shall be no more than 4 inches as determined by Test Method Calif. No. 519 (slump cone) or Test Method No. 520 (Kelly Ball).

No admixtures shall be used without the permission of the Agency Engineer. If the use of Calcium Chloride is permitted, no more than 2 pounds per sack of cement shall be used. Calcium chloride shall not be used in any concrete containing steel reinforcement or other embedded metals unless otherwise specified.

Unless otherwise specified in the Special Provisions, all cement used shall be "Type II Modified." All cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements shall be of the same brand.

43.03 Subgrade - The subgrade for curbs, gutters, sidewalks, driveways, and valley gutters shall be constructed true to grade and cross section as shown on the plans and standard drawings. It shall be compacted to a relative compaction of at least 95 percent for a depth of at least 6 inches. All soft and spongy material shall be removed and the resulting space filled with compacted earth, sand, or gravel, or with concrete. The subgrade and forms shall be wetted immediately in advance of placing concrete.

43.04 Expansive Subgrade - Concrete curbs, gutters, sidewalks, driveways, and valley gutters shall not be placed directly on subgrades made up of soils with an expansion pressure in excess of 50 pounds per square foot as determined by Test Method No. Calif. 301.

On private projects, when this subgrade condition is encountered, the owner's Soils Engineer or the Agency Engineer will analyze the situation and determine the remedial action required. When the owner's Soils Engineer makes such a determination, it shall be subject to the approval of the Agency Engineer.

On Agency projects, such conditions will be, insofar as possible, anticipated in advance, and the remedial action will be incorporated in the design or detailed on the plans in the Special Provisions.

43.05 Existing Curbs and Sidewalks - Where the plans provide for the reconstruction or removal of a portion of an existing curb, sidewalk, or other concrete flatwork, the existing section shall be cut to a depth of at least 1 1/2 inches with an abrasive type saw at the first scoring line at or beyond the
planned joint or at the location marked by the Agency Engineer, and the entire section to be reconstructed shall be removed.

The portion of concrete to be removed shall be taken out in such a manner as to leave an even edge without chips or breaks on the remaining concrete. Cutting of the boundary line with picks or pneumatic pavement breakers will not be permitted. If, for any reason, the concrete does not break on the line marked by the Agency Engineer, the Contractor shall saw out the broken portion and new concrete shall be placed in this area without payment.

43.06 Forms - Forms shall be smooth on the side placed next to the concrete, shall have a true smooth upper edge, and shall be adequately braced and rigid enough to withstand the pressure of fresh concrete without distortion. All forms shall be thoroughly cleaned and coated with form oil to prevent the concrete from adhering to them.

Lumber forms of nominal dimension may be used. However, the Contractor must allow enough distance between the bottom of forms and subgrade or gutter surface to obtain the full dimensions in concrete shown on the plans. Warped, cracked, or checked lumber forms shall not be used. Lumber forms shall be at least a nominal 2 inches thick except where the curvature required is unobtainable with this thickness.

No facilities or obstructions such as concrete access boxes for underground utilities, power poles, or sign posts shall be placed in the sidewalk area without the written consent of the Agency Engineer unless shown on the plan approved by him.

No concrete shall be placed until the Agency Engineer has inspected the forms for conformance with the above requirements as well as vertical and horizontal alignment, and has approved same.

No concrete shall be placed until all underground utility lines are in place and properly backfilled. No form inspection will be made until the Agency Engineer has received notice from the Soils Engineer that all trenches passing under the areas in which the concrete is to be placed have been satisfactorily compacted.

All sidewalk which is to be constructed adjacent to curb and gutter may be formed and poured monolithic with the curb and gutter.

43.07 Joints - Expansion joints shall be filled with a 1/4 inch thick premolded joint filler conforming to the provisions of Section 51-1.12C of State Specifications. They shall extend through the full thickness of the concrete section, be shaped to the cross section of the section in which placed, and be constructed at right angles to the face of the curb and normal to the top surface. Expansion joints shall be placed at the locations shown on the plans and standard drawings and at all other locations indicated by the Agency Engineer.

Weakened plane joints shall be no less than 1 1/2 inches deep and no wider than 1/8 inch at the top surface. They may be constructed either by forming with thin strips or by saw cutting within 24 hours after the concrete is placed. They shall be constructed at the locations shown on the plans and standard drawings and at all other locations indicated by the Agency Engineer.

43.08 Reinforcement - Steel bar reinforcement, dowels, and wire mesh reinforcement shall conform to the requirements of Section 52 of the State Specifications (excluding Section 52-1.11) and shall be placed in accordance therewith.
Steel shall be placed at all locations shown on the plans and standard drawings, and at all other locations designated by the Agency Engineer. No concrete shall be placed until the Agency Engineer has checked and approved the steel.

Full compensation for furnishing and placing steel reinforcement, in conformance with the above requirements, shall be included in the prices paid for the concrete structure in which it is placed.

**43.09 Placing Concrete** - No concrete shall be placed until the Agency Engineer has approved the subgrade, forms and steel.

The temperature of mixed concrete, immediately before placing, shall be not less than 50 degrees F. nor more than 90 degrees F. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 150 degrees F. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F., or above, a time less than 1 1/2 hours will be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of concrete is 85 degrees F., or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

All concrete that has been frozen, or damaged by other causes, as determined by the Agency Engineer shall be removed and replaced by the Contractor at his expense.

No concrete shall be placed unless a representative of the Agency Engineer is present at the site. At times when it is impossible for the representative to be present during a given pour, he shall so inform the Contractor and approve pouring in his absence. All concrete placed without such inspection and without aforementioned waiver shall be rejected, and replaced at the Contractor's expense.

In depositing the concrete against the forms, care shall be taken to work the fine portions of the aggregate to the surface to leave said surface in a uniform and smooth condition. The concrete shall be tamped, or worked with a flat spade or similar tool, sufficiently to produce a dense mass. Holes or pockets appearing in the concrete surfaces, after removing the forms, shall be filled with mortar composed of 1 part portland cement to 2 parts of sand.
Immediately after the concrete has been tamped, if there is not sufficient mortar on the surface to give a satisfactory finish, the Contractor shall add a dry mixture of cement and sand having the same cement ratio as the mortar in the concrete mix. This mixture shall be spread over all exposed surfaces in sufficient quantity to take up all of the surplus water and, when troweled, to make a smooth even-colored surface.

43.10 Finishing - Exposed concrete surfaces shall be floated to give a smooth plane surface free of local humps and depressions. Gutters and valley gutters with a flowline grade of less than 1 percent shall be water tested during the finishing operation and all high or low spots which cause water to pond shall be eliminated.

Exposed corners shall be rounded with a steel tool with a 1/2 inch radius. Expansion joints shall be finished with a steel tool with a 1/4 inch radius.

All other exposed surfaces shall be broom finished. Curb and gutter shall be broomed parallel to the direction of the curb. Sidewalk shall be broomed perpendicular to the direction of the curb. Valley gutters shall be broomed parallel to the direction of the flowline.

Where the curb and gutter and sidewalk are poured monolithically, there shall be a scoreline placed 6 inches in back of the face of curb running parallel with the face of curb. Sidewalks 6 feet wide or less shall be scored perpendicular to the face of curb at intervals equal to the width of the sidewalk. Sidewalks in excess of 6 feet shall be marked with a score line which is parallel to the face of curb and divides the sidewalk in half and with score lines perpendicular to the face of curb spaced at a distance equal to half the width of the sidewalk. All score lines shall be constructed with a scoring tool and shall be at least 1/4 inch deep. They shall be either straight or uniformly curved and shall match the line of the curb. Sidewalk with irregular score lines will be rejected.

The form on the front of curbs shall not be removed in less than one nor more than six hours from the time concrete has been placed. In no event shall it be removed when the concrete is sufficiently plastic to slump. Side, back and edge forms for concrete curbs and sidewalks shall not be removed sooner than twelve hours after the concrete has been placed.

The top and face of finished curb shall be true and straight and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge of 10 feet long is laid on the curb or gutter, the surface shall not vary more than 1/4 inch from the edge of the straightedge except at grade changes or curves.

43.11 Curing - Concrete shall be cured in conformance with the provisions of Section 90-7 of the State Specifications. Concrete shall be maintained at a temperature of not less than 45 degrees F. for 72 hours after placing and at not less than 40 degrees F. for an additional 4 days. When required by the Engineer, the Contractor shall submit a written outline of his proposed methods for protecting the concrete.

43.12 Backfilling - Curb and gutter, sidewalks and driveway approaches shall be backfilled within 7 days after pouring.

43.13 Measurement - Quantities of curb and gutter will be measured by the linear foot as measured along the face of curb to the nearest whole foot for the various types of curbs and gutters. Depressed curb in front of driveway approaches will be measured as and included in the total for the
type of curb adjacent thereto, unless there is a separate item for depressed curb and gutter in the contract.

Quantities of sidewalk will be measured by the square foot to the nearest whole square foot. If there is no item in the contract for driveway approaches they will be measured and paid for as sidewalk and no additional compensation for the extra thickness of concrete will be paid therefor.

Quantities of driveway approach, when a separate item in the contract, will be measured by the square foot to the nearest whole square foot.

Quantities of valley gutter will be measured by the square foot to the nearest whole square foot. That portion of curb and gutter adjacent to the valley gutter apron and included between curb and return points will be measured and paid for as valley gutter.

43.14 Payment: The price paid per linear foot or per square foot for concrete curbs and gutters, sidewalks, driveway approaches and valley gutters shall include full compensation for furnishing all plant, labor, materials, tools, equipment and incidentals required for construction of any of the above on a prepared subgrade in conformance with these specifications. The cost of construction of joints and providing reinforcement in accordance with these specifications, shall be included in the price paid for the various concrete items involved.

Section 44. Retaining Walls and Drainage Structures

44.01 Description - This work shall consist of constructing concrete retaining walls and drainage structures including, but not limited to manholes, catch basins, curb inlets, drop inlets, turning structures, endwalls, headwalls, curb outlets, sidewalk underdrains, and collars at the locations and to the dimensions shown on the plans and Standard Drawings.

44.02 Concrete - The concrete to be used shall conform to the provisions of Section 90 of the State Specifications for Class "A" (6 Sack Mix) concrete with 1 inch maximum aggregate, except that Class "B" (5 Sack Mix) may be used for minor drainage structures such as catch basins and turning structures not exceeding four feet in the greatest horizontal dimension. The maximum slump of the concrete shall be 4 inches as determined by Test Method Calif. No. 519 (slump cone) or Test Method Calif. No. 520 (Kelly Ball).

No admixtures shall be used without permission from the Agency Engineer. If the use of Calcium Chloride is permitted, no more than 2 pounds per sack of cement shall be used. Calcium Chloride shall not be used in any concrete containing steel reinforcement or other embedded metals unless otherwise specified.

Unless otherwise specified in the Special Provisions, all cement used shall be "Type II Modified."

When approved by the Agency Engineer, drainage structures may be furnished and installed as precast units provided the structures in place are equivalent to cast-in-place construction as specified in these specifications and the standard drawings.

Concrete block or brick construction may be substituted for plain concrete or reinforced concrete construction only when approved or specified by the Agency Engineer. Such construction shall
conform to any and all additional requirements imposed by the Agency Engineer, and the materials used shall meet the requirements of Section 44.03 of these specifications.

44.03 Materials for Brick and Concrete Block Construction

A. Brick shall conform to either (a) "Standard Specifications for Building Brick (made from clay or shale)," A.S.T.M. Serial Designation C62, for Grade MW brick, or (b) "Standard Specifications for Concrete Building Brick, A.S.T.M. Serial Designation C55" for Grade A brick.

B. Concrete Block shall conform to the requirements of A.S.T.M. Specification C90 for Grade N-1 Units.

C. Cement Mortar shall be made using 1 part by volume of portland cement to 2 parts by volume of sand to which 1/4 to 1/2 part hydrated lime or lime putty has been added, mixed dry and thoroughly. After mixing, just enough water shall be added to provide a plastic, workable mix. No mortar shall be placed after 1 hour has elapsed since the time of adding water, and no mortar shall be retempered. Mortar shall attain a minimum compression strength of 1,800 psi in 28 days.

D. Sand for mortar shall be free from deleterious coatings, clay balls, roots, bark, stitches, rags and other extraneous material thoroughly and uniformly washed. Sand shall conform to Section 90-2.02B of the State Specifications.

44.04 Reinforcement - Steel bar reinforcement, dowels and wire mesh reinforcement shall conform to the requirements of Section 52 of the State Specifications and shall be placed in accordance therewith. Steel shall be placed at all locations shown on the plans and standard drawings, and at all other locations designated by the Agency Engineer. No concrete shall be placed until the Agency Engineer has checked and approved the steel.

No splices in vertical or transverse bars will be allowed except as shown on plans. Splices will be allowed in longitudinal bars approximately midway between expansion joints where the distance between said joints (and boundary of the wall) is greater than 30 feet and shall be made by lapping the bars a length of 35 diameters.

Full compensation for furnishing and placing steel reinforcement, in conformance with the above requirements, shall be included in the prices paid for the concrete structures in which it is placed.

44.05 Reinforced Concrete Pipe and Taper Sections - When used for manholes shall be manufactured to comply with all the requirements of AASHTO, Designation D199. Portland cement and aggregate shall conform to the requirements in Section 90-2 of the state specifications except that mortar strength relative to Ottawa sand and grading requirements shall not apply to the aggregate. No "D Load" test will be required. The pipe sections shall be embedded at least 1 inch in the concrete base. The sections of pipe, taper sections, and rings shall be set in concrete mortar or other approved material.

44.06 Iron and Steel Work - All iron castings shall be made of good quality gray iron, tough and of even grain, free from blow of sandholes or other defects conforming to A.S.T.M. Designation A48, Class 30B. Covers and frames of said structures shall be machined to fit accurately so that
covers will not rock. The castings shall be thoroughly cleaned and then coated with coat tar pitch heated to 200 degrees F. Castings shall be set on masonry work in cement mortar.

All steel for gratings, frames and angles shall be fabricated from either structural steel conforming to the requirements of A.S.T.M. Designations A36 or A576, Grades 1021, 1022, 1026, 1029 or 1030.

**Galvanizing** - All steel gratings, frames and angles, cast iron spreaders, and manhole steps shall be hot dip galvanized, in accordance with the standard specifications for Zinc (hot galvanized) Coatings on Structural Steel Shapes, Plates and Bars, and their Products, A.S.T.M. Designation A123.

The machine work, die work, punching, shearing, bending and welding shall be done before galvanizing. No member shall be galvanized that is out of alignment, and straightening of members will not be allowed after galvanizing. All members, bolts, and nuts shall be galvanized before the structural unit is assembled. Uncoated spots due to poor workmanship, rough handling, or any other reason shall be cause for rejection.

**44.07 Forms and Falsework** - All forms shall be built without warps or irregularities and shall be absolutely rigid and unyielding during the placing and tamping of concrete. They shall be carefully erected so as to be easily removed without scarring of concrete and all joints must be close enough to prevent leakage of grout and offsets in the exposed finished concrete surfaces. The planking used in the forms controlling exposed surfaces of concrete shall be placed smooth and be free from knot holes or other imperfections affecting surfaces so exposed. Forms shall be built to sizes that permit the finished concrete structure to conform to the dimensions and contours shown upon the plans. Lumber once used in forms shall be cleaned before being used again.

Bolts or form clamps shall be positive in action and shall be either entirely removed or of such type that they can be removed at least 1 inch below the finished surface of the concrete. All forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and all form clamps shall extend through and fasten to such wales.

Unexposed outside and rear surfaces of catch basin type structures and retaining walls may be formed by undisturbed earth provided the full thickness of concrete can be obtained.

The following pre-molded fiberglass forms as manufactured by Santa Rosa Cast Products Company or equivalent may be used where permitted by the applicable Agency:

<table>
<thead>
<tr>
<th>Standard Drawing</th>
<th>Fiberglass Form</th>
</tr>
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<tbody>
<tr>
<td>Type &quot;A&quot; Catch Basin, Dwg. No. 220</td>
<td>Pelican Dwg. No. C54P1</td>
</tr>
<tr>
<td>Type &quot;B&quot; Catch Basin, Dwg. No. 221</td>
<td>Pelican Dwg. No. C86P1</td>
</tr>
<tr>
<td>Gallery Inlet for Catch Basin, Dwg. No. 226</td>
<td>Pelican Dwg. No. C6P1</td>
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</tbody>
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**44.08 Placing Concrete** - Before placing concrete, the forms shall be thoroughly inspected and all dirt and chips removed, all temporary bracing and cleats taken out, all openings for pipes properly boxed, all forms properly secured in their correct position and made tight, all reinforcement secured in its proper place and any steel which shows scale or rust shall be satisfactorily cleaned. Any concrete which may be on the forms or reinforcement and is set and dry in advance of the completed work, shall be cleaned or and removed. Forms and reinforcing shall be washed clean before fresh concrete is deposited.
All concrete shall be compacted by means of high frequency internal vibrators of a type, size, and number approved by the Agency Engineer. The number of vibrators employed shall be ample to consolidate the incoming concrete to a proper degree within fifteen minutes after it is deposited in the forms. In all cases, at least two vibrators shall be available at the site of structures in which more than 25 cubic yards of concrete is to be placed. The vibrators shall not be attached to or held against the forms or the reinforcing steel. The location, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete, free from voids and proper texture of exposed surfaces when the forms are removed. Fresh concrete shall be spread in horizontal layers insofar as practicable and the thickness of the layers shall not be greater than can be satisfactorily consolidated with the vibrators. Spades or wedge-shaped tampers shall be provided and used if necessary to secure a smooth-even texture of the exposed surface.

Care shall be taken to remove all laitance thoroughly and to roughen surfaces of concrete before again pouring at joints. This cleaning and roughening shall be done to the satisfaction of the Agency Engineer. Layers of concrete shall not be tapered off in wedge-shaped slopes, but shall be built with square end and level tops. On major structures laitance shall be removed by sandblasting.

Concrete, when mixed, shall be deposited immediately without segregation of its ingredients and shall be consolidated with internal vibrators in layers until it is thoroughly compacted, all voids are filled, and free mortar appears on the surface. The concrete shall be placed as nearly as possible in its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without the use of adjustable length pipes or "elephant trunks."

The use of chutes in conveying or depositing concrete will be allowed only at the discretion of the Agency Engineer, and wherever they are used they shall be laid at such inclination as will permit the flow of concrete of such consistency as is required. Where necessary in order to prevent separation, chutes shall be provided with baffle boards or a reversed section at the outlet. The use of additional water in mixing the concrete to promote free flow in chutes of low inclination will not be allowed. Chutes of aluminum will not be permitted.

All holes, pockets or other irregularities showing in the surface of the concrete after removal of forms shall be entirely filled and smoothed with cement mortar composed of 1 part portland cement to 2 parts sand.

No concrete shall be placed in water and should water collect in the excavations or forms the Contractor shall remove same at his own expense before placing concrete.

The temperature of mixed concrete, immediately before placing, shall be not less than 50 degrees F. nor more than 90 degrees F. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 150 degrees F. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F., or above, a time less than 1 1/2 hours will be required.
When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F., or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

All concrete that has been frozen, or damaged by other causes, as determined by the Agency Engineer, shall be removed and replaced by the Contractor at his expense.

Concrete in each integral part of retaining walls shall be placed continuously without stopping work more than 20 minutes, and the Contractor shall not commence work on any such part unless he has sufficiently inspected and approved material on hand and an adequate force to complete the part without interruption in the placing of concrete.

The top portions of catch basins, inlets, curb outlets and under-drains shall not be poured before adjacent curb and gutter or sidewalk.

44.09 Construction Joints - When joining new concrete with concrete already set, the surface shall be cleaned, roughened, and watered. All laitance shall be thoroughly removed to sound concrete before depositing new concrete.

Construction joints shall be mechanically bonded by means of keys cast into the surfaces in contact if so shown on plans, or if required by the Agency Engineer. The area of keys shall be at least 25 percent of the cross-sectional area of the section. Keys shall be formed by beveled strips or boards laid longitudinally and shall be at least 2 inches in depth.

44.10 Finish - A Class I Surface finish as described in Section 51-1.18B of the State Specifications shall be applied to all surfaces visible from the traveled way, all surfaces designated in the Special Provisions, plans, and standard drawings, and to all other surfaces designated by the Agency Engineer.

An Ordinary Surface Finish as described in Section 51-1.18A of the State Specifications shall be applied to all other interior and exterior surfaces except those which are to be backfilled.

44.11 Curing - Concrete shall be cured in conformance with the provisions of Section 90-7 of the State Specifications.

Concrete shall be maintained at a temperature of not less than 45 degrees F. for 72 hours after placing and at not less than 40 degrees F. for an additional 4 days. When required by the Agency Engineer, the Contractor shall submit a written outline of his proposed methods for protecting the concrete.
44.12 Weepholes and Filter Material - Weepholes or drains shall be constructed as shown on the plans and standard drawings and at the locations specified by the Agency Engineer.

Continuous filter material shall be placed at the back of the weepholes as shown on plans. The filter material shall consist of 1 1/2 inch maximum course concrete aggregate conforming to the provisions of Section 90-3.04 of the State Specifications.

44.13 Backfilling - All structures shall be backfilled in accordance with Section 19-3.06 of the State Specifications. Compensation for backfilling shall be included in other items of work and no separate payment will be made therefor.

44.14 Measurement - Drainage structures will be measured and paid for on the basis of a lump sum price per each unless otherwise stated in the Special Provisions.

Retaining walls will be measured by the lineal foot, as measured along the base of the exposed face, to the nearest whole foot for the various heights stated in the proposal, unless otherwise stated in the Special Provisions.

No separate payment will be made for filter material required and used behind retaining walls and structures. The cost of filter material shall be included in the unit or lump prices paid for such walls and structures.

44.15 Payment - The prices paid for each drainage structure or per linear foot of retaining wall shall include full compensation for furnishing all plant, labor, materials, tools, equipment and incidentals required for construction of each structure in conformance with the plans, standard drawings and specifications. Payment for excavation, backfill and furnishing and placing reinforcing steel, grates and castings shall be included in the unit prices or lump sum prices for each and no extra compensation will be allowed therefor.

Section 45. Concrete Ditches, Aprons and Slope Protection

45.01 Description - This work shall consist of constructing concrete lined ditches and concrete or rubble aprons and slope protection at the locations and to the dimensions shown on the plans and standard drawings.

45.02 Materials

A. Poured in Place Concrete shall conform to the requirements of Section 44.02 of these specifications except that Class B (5 sack mix) may be used.

B. Air Blown-Mortar (Gunnite) shall conform to the requirements of Section 53 of the State Specifications.

C. Pumped Concrete shall be made using 3/8 inch aggregate with 6 1/2 sacks of cement per cubic yard. Pozzolity shall be added in the ratio of 1 part pozzolity to 5 parts cement by weight. Only enough water shall be used to enable the mixing to be pumped.

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D. Rubble shall consist of broken concrete or stone, each piece having minimum dimensions of 12 inches in length, 8 inches in width and 4 inches in thickness, except for spalls used to chink interstices. The broken concrete or stone shall meet minimum requirements specified for stone in Section 72 of the State Specifications.

E. Sacked Concrete shall consist of sacks (1 1/4 cu. ft. capacity) filled with Class "C" (4 sack mix) concrete per Section 72-3.02 of the State Specifications. Placement shall be in conformance with Section 72-3.03 of the State Specifications.

45.03 Concrete Lined Ditch - Concrete lined ditches may be constructed by poured-in-place concrete, air-blown mortar, or pumped concrete. Ditches shall conform to the dimensions and requirements shown on the plans and standard drawings.

Ditches may be formed against the ground, but the sides of the ditch must be formed as shown on the standard drawings. Ground on which concrete is to be placed shall be thoroughly moistened and compacted prior to concrete placement. No concrete shall be placed prior to form and subgrade inspection by the Agency Engineer. When the ditch is to be placed across land which has been filled, no concrete shall be placed until the compaction of the fill has been approved.

The exposed surfaces of the concrete shall by light broom finished without irregularities which might inhibit the flow of water.

Concrete shall be cured in conformance with the provisions of Section 90-7 of the State Specifications.

Concrete lined ditches shall be backfilled within 7 days after pouring.

45.04 Rubble Aprons and Slope Protection - Rubble structures may be constructed from either stone or broken concrete. Concrete may be substituted for rubble if permission is granted by the Agency Engineer. Sack riprap, if used, shall consist of sacks filled with Class "C" (4 sack mix) ready-mixed concrete, as described in Section 45.02E. Rubble aprons and slope protection shall be constructed to the dimensions shown on the plans and as directed by the Agency Engineer.

Rocks and broken concrete shall be thoroughly wetted before placement, and shall be laid in a full bed of mortar or covered with Class "C" concrete.

45.05 Measurement - Quantities of concrete lined ditch will be measured by the linear foot as measured along the centerline of the ditch to the nearest whole foot for the various types of ditches. Quantities of rubble apron and slope protection will be measured by the square foot of exposed surface area to the nearest square foot. No payment will be made for rubble placed outside the limits shown on the plans unless directed by the Agency Engineer.

45.06 Payment - The price paid per linear foot for concrete lined ditch shall include full compensation for furnishing all plant, labor, materials, tools, equipment and incidentals required for doing all work involved in excavating for, constructing, curing and backfilling concrete lined ditches in accordance with the plans and these specifications.

The price paid per square foot for rubble aprons and slope protection shall include full compensation for furnishing all plant, labor, materials, tools, equipment and incidentals required for doing all work.
in constructing rubble aprons and slope protection complete and in place as shown on the plans and specified in these specifications.

Section 46. Removal and Patching of Concrete

46.01 Description - This work shall consist of the removal of sections of concrete surface improvements to facilitate the construction of new improvements, and the patching or building up of concrete surfaces to cover nicks and chips or to change grades.

46.02 Removal - Concrete removal shall be accomplished in conformance with the provisions of Section 15-3.01 and 15-3.02 of the State Specifications. Depth of removal shall be as specified in the Special Provisions.

46.03 Patching - Only those portions of curb and gutter, sidewalk, valley gutter and other concrete structures which the Agency Engineer designates as repairable will be patched. All other damaged concrete shall be removed and replaced.

Where patching is permitted the following procedures shall be used:

A. All areas to be patched shall be cleaned with a stiff wire brush and all loose pieces or cracked pieces of concrete shall be removed.

B. The areas to be patched shall be etched with muriatic acid. This etching shall be done no more than two hours in advance of patching.

C. Immediately prior to the application of the patching material, the area to be patched shall be blown free of all dust with air supplied by a compressor.

D. The area to be patched shall be painted with an epoxy adhesive used in accordance with the manufacturer's directions.

E. The patching mix shall be mixed with an epoxy binding agent in conformance with the manufacturer's directions.

F. Patched areas shall be sacked with portland cement to obtain a color which matches adjacent concrete surfaces.

G. The patched areas shall be cured by covering with wet burlap or rugs for a period of at least 48 hours.

The epoxy adhesive and binding agent shall be approved in writing by the Agency Engineer before its use.

The completed patches must match adjacent concrete surfaces in both color and texture. Any concrete with patches that "stand out" will be removed and replaced at no additional cost to the Agency.

No patching work is to be done unless a representative of the Agency Engineer is present.
46.04 Measurement and Payment - Since this work will be done only to facilitate the construction of new improvements or to replace or repair defective or damaged work no separate payment will be made therefor, unless specified in the Special Provisions.
UNDERGROUND FACILITIES

Section 50. Construction in New Streets

50.01 Description - This work encompasses the construction of water, gas, sanitary sewer, storm sewer, electric, telephone and television mains, services, and appurtenances underground within public rights-of-way upon which surface improvements are to be constructed.

50.02 Installation Requirements - Each facility shall be installed in conformance with the provisions of these specifications and the specifications and requirements of the agencies having jurisdiction over each particular utility.

50.03 Minimum Cover - Storm and sanitary sewers shall be constructed at the grades shown on the plans. The minimum cover for sewer mains shall be 36 inches as measured from finish grade or 24 inches as measured from design subgrade whichever depth is greater. The minimum cover for sewer laterals, gas and water mains and laterals shall be 30 inches as measured from finish grade or 18 inches as measured from design subgrade, whichever depth is greater, except that minimum cover for gas and water facilities may be reduced to 24 inches when these facilities are installed under sidewalk.

Electric, telephone, television and other mains and laterals shall have a minimum cover of 30 inches as measured from finish grade or 18 inches as measured from design subgrade, whichever is greater.

This cover may be reduced to a minimum of 18 inches if the lines are encased in concrete. Encased lines when placed under the sidewalk area, may have a minimum cover of 6 inches measured from the top surface of the sidewalk to the top surface of the encasement.

50.04 Completion and Testing - Water, gas, sanitary sewer and storm sewer mains, services, and appurtenances in the street area shall be completed prior to the placing of subbase material. All manholes and other structures which lie within the areas to be paved shall be brought to at least subgrade elevation. No subbase material may be placed until water, gas, and sanitary sewer lines have been tested and the owner of each has informed the Agency Engineer, in writing, that the underground work, at least to the subgrade level, is complete and that the test results were found satisfactory.

Electric, telephone, television and other conduit street crossings must be completed prior to the placement of subbase material. The owner of each of those lines must inform the Agency Engineer in writing that their installation is complete before subbase material is placed.

Section 51. Construction in Existing Streets

51.01 Description - This work encompasses the construction of underground utility mains, services and appurtenances, within public rights-of-way upon which surface improvements have been constructed.
51.02 Installation Requirements - Each utility shall be installed in conformance with the provisions of these specifications and the specifications and requirements of the agencies having jurisdiction over each particular utility.

Restoration of pavement removed in trenching shall conform to the Agency standards.

51.03 Minimum Cover - The requirements of Section 50.03 for minimum cover in new street areas and Section 50.04 for testing shall also apply to existing street areas.

Section 52. Excavation and Backfill

52.01 Definition - This work shall consist of excavating trenches for utility and storm drainage lines and structures in all public rights-of-way and easements, backfilling of same, and reconstructing disturbed surface improvements. This work shall be done as a part of the installation of the conduit or structure involved, and no separate payment will be made for the work covered in this section.

The Contractor's attention is directed to the requirements of Sections 12 and 13 of these specifications, "Legal Relations and Responsibilities to the Public," and "Underground Obstructions."

52.02 Extent of Trench to be Opened - In traveled streets no more than 500 feet of trench may be open at any time. An open trench shall be defined as any trench which has not been completely backfilled, satisfactorily compacted, and capped with at least 1 inch of temporary paving. Also, no more trench shall be opened in a given day than can be backfilled that same day. Should it be necessary for a Contractor to work past normal quitting time in order to comply with this requirement, he shall do so or else the Agency Engineer shall take whatever steps are appropriate under the provisions of Section 12.12 of these specifications.

The Contractor will be permitted to leave a short section of trench open at the end of each day's work to facilitate resumption of work the following day provided adequate facilities are provided to insure pedestrian and vehicular convenience and safety. This does not apply to excavations for structures to be installed later than the following day. The above requirements may be extended to work done outside of traveled streets wherever the Agency Engineer deems conditions warrant.

52.03 Standard Trench Detail - The requirements for trench widths, backfill and surface restoration stated on the standard drawings entitled "Standard Trench Detail" are hereby made a part of these specifications.

52.04 Jetting - Where the use of jetting has been approved by the Agency Engineer, it shall be done in strict conformance with the following requirements:

A. The material to be jetted shall contain no earth clods or stone larger than 3 inches.

B. No more than 3 feet of material (measured before compaction) shall be jetted in each lift.

C. The jetting pipe must be at least 4 feet long and have an inside diameter of at least 1 1/2 inches.

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D. The water supply shall be continuous and have a pressure of not less than 40 pounds per square inch.

E. Jetting shall be accomplished by rapidly lowering and slowly raising the outlet end of the jetting pipe through the entire depth of the layer at staggered points along the trench.

F. The jetting and subsequent ponding shall be sufficient to thoroughly and uniformly wet each 3 foot layer.

52.05 Restoration of Asphalt Concrete Surfacing - All asphalt concrete surfacing shall be replaced in conformance with the requirements of Section 36 of these specifications, except that:

A. The first lift may be compacted by compactive equipment subject to approval by the Agency Engineer.

B. Final lift rolling may be done with any steel wheel roller which will produce a smooth surface and complete consolidation of the asphalt concrete.

Existing asphalt concrete shall be saw cut to straight lines beyond the limits of the trench so that no loose asphalt concrete remains. The patch shall be made so that the new asphalt concrete forms a butt joint with the old. No overlaying of the old asphalt will be done unless directed by the Agency Engineer.

No asphalt concrete surfacing shall be placed until the Agency Engineer has approved the compaction of the trench backfill and the trimming and priming of the area to be patched.

No extra payment will be made for temporary pavement required by the Standard Drawings. Full compensation therefor shall be included in the prices paid for conduits and structures.

52.06 Underdrains - Wherever a granular trench backfill material is used, the Contractor shall install all facilities necessary to drain the water which will be collected in the backfill. Such subdrains and underdrains shall be connected to storm drainage facilities only; connection to sanitary sewers will not be permitted.

Trenches for underdrains shall be excavated, the pipe installed and the trench backfilled with permeable material according to the dimensions and details shown on the plans.

Pipe material shall be as specified in Section 68-1.02A through 68-1.02K of the State Specifications.

Filter fabric, if used, shall conform to Section 68-1.038 of the State Specifications.

All construction shall conform to the Special Provisions and Section 68-1.03 of the State Specifications.

Perforated pipes shall be laid with the perforations down.

Permeable material used for subdrains or underdrains shall conform to Section 68-1.025 of the State Specifications and as specified in the Special Provisions.
STORM CONDUITS

Section 54. General Requirements

54.01 Scope - All construction of storm conduits shall conform to the provisions of this section as well as to the requirements of the sections pertaining to the type of conduit installed. Payment for each type of conduit shall include full compensation for conforming to the provisions of this section.

54.02 Trenches - Before excavation of the trench in a fill area, the fill shall be completed to a height of not less than 1 pipe diameter over the top of pipe or to final grade, whichever is lower.

Where solid rock is encountered, it shall be removed to a depth of 6 inches below the normal trench bottom and the over-excavated area backfilled with suitable material compacted to at least 90 percent relative compaction as determined by AASHTO Test No. 180. No extra payment shall be made for this work and it shall be included in the prices paid for the conduit.

Trenches shall be dewatered when placing pipe. Where the trench bottom is found to be soft, wet, or spongy, the Agency Engineer shall specify a depth to which the trench is to be over-excavated and the over-excavated area filled with crushed or natural rock conforming to the following gradation requirements: at least 95% passing a 1 1/2 inch sieve, at least 25% passing a No. 8 sieve, and not more than 12% passing a 200 sieve. The rock shall be compacted to provide a firm subgrade upon which to lay the conduit. Payment for this over-excavating and filling shall be based on the contract price to be paid for trench stabilization. If there is no item for trench stabilization in the contract, it shall be paid for by force account as specified in Section 7.05 of these specifications. No payment will be made for trench stabilization placed outside of the limits specified by the Agency Engineer or necessitated by actions of the Contractor.

Trenches shall be cut to the width shown on the standard drawings unless otherwise specified in the Special Provisions. No pipe shall be laid in trenches which are narrower than the minimum width shown. Should the trench be cut to a width exceeding the maximum shown, the Agency Engineer may require that the Contractor use a pipe with greater strength or that he protect the pipe by means of a concrete cradle or encasement. This work will be done at no extra expense to the Agency.

Where two or more pipes are to be laid in the same trench, the distance between them shall be at least half the outside diameter of the largest pipe, and shall in no case be less than 12 inches.

54.03 Inspection - No pipe shall be backfilled until it has been inspected and approved by the Agency Engineer. Where the flowline grade of the conduit is less than 1 percent, special inspections may be required by the Agency Engineer.

54.04 Measurement - Quantities of storm conduits will be measured by the linear foot along the centerline of the conduit to the nearest whole foot. Lengths will be measured through structures only when the pipe is actually laid through them. No payment will be made for lengths in excess of those staked in the field unless directed by the Agency Engineer.

Quantities of trench stabilization will be based on the weight of filler material used. Measurement will be in tons to the nearest 0.1 ton.
54.05 Payment - The prices paid for the various types and sizes of conduits shall include full compensation for furnishing all plant, labor, tools, equipment, materials and incidentals required to excavate for, construct, and backfill conduits and to reconstruct disturbed surface improvements complete and in place as shown on the plans and required by these specifications.

The prices paid per ton of trench stabilization shall include full compensation for over-excavating the bottom of the trench, and furnishing, placing, and compacting the filler material.

Section 55. Precast Concrete Pipe

55.01 Description - This work shall consist of furnishing and installing circular or oval shaped reinforced concrete pipe or plain concrete pipe for culverts, siphons, storm drains, and conduits as shown on the plans and specified in these specifications and Special Provisions. Reinforced concrete pipe shall be of the class shown on the plans.

55.02 Materials - Reinforced concrete pipe shall conform to the provisions of Section 65-1.02 through 65-1.02C of the State Specifications. Nonreinforced pipe may not be substituted for any of the sizes of reinforced concrete pipe specified, and the appropriate provisions of Section 65-1.02A shall not apply. Nonreinforced concrete pipe, where specified on the plans, shall conform to the provisions of ASTM Specification C14, except as modified below.

The pipe shall be furnished in standard lengths of 3 feet or longer. The ends of the pipe sections shall be so constructed that one of the following types of joint may be made:

   A. Tongue and Groove
   B. Bell and Spigot
   C. Rubber Gasket

The joints shall be of such design as will permit effective placement and mortaring without appreciable irregularities in the flowline.

Pipe to be installed by jacking shall have 2 concentric cages of reinforcing steel in lieu of elliptical reinforcement so that the pipe will meet loading test requirements when rotated to any position for testing.

The class of reinforced pipe shall be clearly marked in waterproof paint on each joint of pipe. The following table relates pipe "Class" to the respective "D" loads:

<table>
<thead>
<tr>
<th>Class</th>
<th>&quot;D&quot; Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>1000D</td>
</tr>
<tr>
<td>III</td>
<td>1350D</td>
</tr>
<tr>
<td>IV</td>
<td>2000D</td>
</tr>
<tr>
<td>V</td>
<td>3000D</td>
</tr>
</tbody>
</table>

Mortar used for cementing joints shall be composed of 1 part portland cement to 2 parts sand.

No pipe shall be laid which is cracked, checked, spalled or damaged, and all such sections of pipe must be permanently removed from the work.
55.03 Laying Pipe - The pipe shall be carefully laid to line and grade. If the pipe is of the bell and spigot type, the bells must be laid in crosscuts previously cut in trench. Pipe shall be laid with the bell or groove end uphill.

Pipes with elliptical reinforcement shall be placed with the minor axis of the reinforcement in a vertical position.

Care shall be taken that no foreign material gets into the bell or groove end of the pipe when pipe is being joined.

The interior of the conduit shall be carefully freed from all cement, dirt and superfluous material of every description as the work proceeds.

55.04 Making Joints - Rubber gasket joints shall be made by placing the rubber gaskets in the grooves on the ends of the pipes and then drawing the sections of the pipes tightly together. In double rubber gasket joints, cement mortar shall be used to completely seal the inside and outside joint recesses between abutting pipe sections. The rubber gaskets shall be the sole elements depended upon to make the joints watertight. The Contractor shall be required to use such equipment as may be necessary to draw the sections of pipe tightly together.

The joints of bell and spigot pipe, and tongue and groove pipe shall be completely and compactly filled with cement mortar so as to make a strong and watertight joint. All joints shall be finished smooth on the inside of the pipe with cement mortar. In pipe sizes 24 inches and smaller, inside recesses shall be wetted and buttered with cement mortar prior to closure of the joint. After the closure is made, the joint shall be pointed inside the pipe and excess mortar removed by means of swab or squeegee. The outside of tongue and groove joints shall be banded all around the pipe with cement mortar.

Section 56. Cast in Place Concrete Pipe

56.01 Description - This work shall consist of constructing cast-in-place concrete pipe for culverts, storm drains and conduits as shown on the plans and in accordance with these specifications and the Special Provisions. Where cast-in-place pipe is shown on the plans, the Contractor may substitute reinforced concrete pipe of appropriate class approved by the Agency Engineer.

56.02 Trench - The trench shall be excavated to establish grade and alignment. The bottom of the trench shall be shaped to form the outside form for the pipe, and shall be graded and prepared to provide full, firm, and uniform support by undisturbed earth or compacted fill under the bottom 180 degrees of the pipe section.

No concrete shall be placed until the Agency Engineer has inspected and approved the trench. Where the flowline grade is less than 1 percent, the Contractor shall set a stringline centered in the trench 1 foot above design flowline grade to facilitate the Agency Engineer’s inspection.

56.03 Dimensions - The minimum wall thickness for the various sizes of pipe shall not be less than that shown below:
The minimum radius of curvature, measured at centerline of the pipe shall not be less than that shown below.

<table>
<thead>
<tr>
<th>Internal Diameter</th>
<th>Minimum Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>50'</td>
</tr>
<tr>
<td>30&quot;</td>
<td>50'</td>
</tr>
<tr>
<td>36&quot;</td>
<td>50'</td>
</tr>
<tr>
<td>42&quot;</td>
<td>65'</td>
</tr>
<tr>
<td>48&quot;</td>
<td>100'</td>
</tr>
<tr>
<td>54&quot;</td>
<td>130'</td>
</tr>
<tr>
<td>60&quot;</td>
<td>150'</td>
</tr>
<tr>
<td>66&quot;</td>
<td>200'</td>
</tr>
<tr>
<td>72&quot;</td>
<td>200'</td>
</tr>
<tr>
<td>78&quot;</td>
<td>200'</td>
</tr>
<tr>
<td>84&quot;</td>
<td>200'</td>
</tr>
</tbody>
</table>

Variations from the nominal internal diameter shall not exceed 2 percent. The actual internal cross-sectional area shall not be less than the theoretical circular area of the pipe.

The alignment of the finished pipe shall not deviate from the established centerline more than 0.2 feet in 10 linear feet, nor shall the maximum departure from line exceed 0.3 feet.

The flowline of the finished pipe shall not deviate more than 0.15 feet from the planned grade line, nor shall the finished flowline vary more than 0.10 feet in 10 linear feet.

Form strut indentations shall not exceed 1/8" depth.

Offset at form laps shall not exceed the limits specified below:

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Maximum Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot; - 30&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>36&quot; - 42&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>48&quot; - 54&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>7/8&quot;</td>
</tr>
</tbody>
</table>

56.04 Materials - Concrete shall be Class A portland cement concrete conforming to the requirements of Section 90 of the State Specifications as modified herein.
The aggregate grading shall conform to Section 90-3.04 "Combined Aggregate Gradings" of the State Specifications for the size of aggregate specified herein. The maximum size of aggregate shall be as follows:

- 48" (or less) diameter pipe
- over 48" diameter pipe

The maximum slump of the concrete shall not exceed 3 inches as determined by Test Method: Calif. No. 519 (slump cone) or Test Method: Calif. No. 520 (Kelly Ball).

The concrete mixture shall achieve a 28 day compressive strength of not less than 3000 psi. Cement shall be Type II modified portland cement.

The use of admixtures to reduce water requirements of the concrete, or to improve workability, will be permitted if, in the judgment of the Agency Engineer such admixture does not adversely affect the strength, setting time, rate of hardening, or volume change of the concrete.

56.05 Equipment - The pipe shall be constructed with equipment specially designed for constructing cast-in-place concrete pipe. All equipment shall be in good working condition, and faulty operation shall be cause for requiring the removal of such equipment and termination of the concreting operation until equipment is furnished that will construct acceptable pipe in a continuous operation without frequent breakdowns or joints.

When metal forms are used, they shall be of adequate strength to hold their position and withstand the pressure caused during the vibrating of the concrete, and to sustain the loading occurring during construction of the pipe without displacement of the form or deviation from the alignment, gradient, or wall thickness, or damage to the concrete previously placed.

The forms shall be lapped so that the lap ridges in the interior of the pipe shall face downstream without obstruction to flow of water. Vibrating shall be done by high frequency vibrators capable of consolidating the concrete expeditiously without segregation of materials.

56.06 Concrete Placement, Finish and Curing

A. Placement - Placement of concrete shall conform to the requirement of Section 63-1.05 of the State Specifications as modified herein. All earth surfaces against which concrete is to be placed shall be free of standing water, mud or debris, and shall be firm enough to prevent slippage of earth into concrete during placement and vibration. Forms shall be smooth, free of concrete and shall be oiled before use.

Absorptive surfaces shall be moistened thoroughly immediately prior to placing concrete against the surface.

An approved method or device shall be used when placing the invert concrete to insure that the required thickness is obtained.

The cast-in-place pipe shall be constructed in one placement around the complete periphery of the pipe.
B. Construction Joints - Sloping construction joints, intermediate between terminal structures, shall be constructed if the pour is interrupted more than 45 minutes. The joint shall be formed at an angle of approximately 45 degrees with a vertical line, with the sidewalls of equal length. No. 4 steel reinforcing bars, 24 inches long, shall be inserted in the center of the concrete section at 12 inch spacing around the periphery of the pipe. The dowels will be placed parallel with the center line of the pipe with 12 inches of embedment.

The surface of the concrete joint and the dowels shall be cleaned of laitzance and loose concrete immediately after initial set has occurred in the concrete. The concrete surface in the joint shall be left rough to develop bond with concrete to be added in future work.

Upon continuation of the pipe construction, the surface of the joint shall be coated with a 1/2 inch layer of bonding mortar and a concrete collar shall be constructed around the joint monolithic with the new work.

The bonding mortar, which shall be applied immediately before placing additional concrete over the joint, shall consist of not less than 2 parts of cement to 3 parts of sand (by volume).

The concrete collar, formed by excavating the earth along the periphery of the joint, shall lap the joint by at least 2 times the wall thickness and shall have a thickness of not less than 1 1/2 times the pipe wall thickness.

C. Finish - After removal of the interior forms, all cracks and rock pockets shall be repaired immediately. All porous and fractured concrete shall be removed and the holes patched. Holes cut in the pipe for inspection testing, or removal of forms shall be repaired by filling with concrete or dry patching mortar. Excess concrete at form bulges and oversize form laps shall be removed.

The finished surface inside the concrete pipe shall be substantially free of fractures, cracks, and surface roughness, and the surface texture shall be equivalent to that resulting from use of a steel trowel.

All dirt, debris, or extraneous concrete shall be immediately removed from the pipe.

The exterior surface of the concrete shall be finished with the equivalent of a wood float finish to a uniform shape and not less than the minimum thickness required for the specified size of pipe. All cracks, rock pockets, or other defects shall be repaired before curing.

Longitudinal cracking along the crown of the pipe shall be cause for rejection. The pipe shall be completely removed in such areas for a distance of five (5) feet beyond any visible cracking, and a new section of pipe installed.

D. Curing - upon completion of the finishing, the ends of the pipe shall be covered with a heavy cover which is kept wet or with a plastic sheet. Curing of the top surface of the pipe shall be accomplished in one of the following ways:

1. Cover with blanketeting or loose fiber and keep moist.
2. Cover with 6 inches of earth and keep moist.
3. Cover with plastic sheets lapped at joints.
Curing shall be carried out for a period of not less than 7 days.

E. Backfill - No backfill other than the 6 inch layer of earth (used for curing) shall be placed over the pipe for at least 7 days after the pipe is placed. The exact timing of the placement of the remaining backfill shall be determined by the Contractor and he alone shall bear full responsibility if the pipe fails or develop cracks or any other signs of structural deficiency due to premature backfilling or loading.

56.07 Structures - At locations where inlet or junction structures are to be constructed, the cast-in-place pipe shall be constructed through the structure location in a continuous operation. While the concrete in the pipe is still fresh, it shall be trimmed to the neat line of the inside faces of the structure walls as shown on the plans or standard drawings before construction of the structure itself. Alternate methods may be used subject to the approval of the Agency Engineer.

56.08 Cover Requirements in Public Roads, Parking Areas and Driveways

A. The depth from subgrade to top of cast-in-place concrete pipe shall not be less than 10 inches.

B. If the subgrade is less than 24 inches above the top of the cast-in-place pipe, a reinforced concrete slab shall be constructed over the pipe. The cover slab shall be Class A concrete, 6 inches thick, reinforced with a single mat of No. 4 bar reinforcing steel spaced 12" on center both ways. The slab shall extend beyond the center of the pipe a distance not less than the external diameter of the pipe.

C. If the top of pipe is 24 inches or more below the subgrade of pavement, a cover slab is not required.

56.09 Payment - The price paid per linear foot of cast-in-place concrete pipe shall include full compensation for performing all work necessary for constructing the pipe complete and in place.

Separate payment will be made for reinforced concrete slabs used for pipe protection. This payment will be based on the square footage of reinforced slab constructed and shall include full compensation for furnishing all materials and equipment for doing all work involved.

Section 57. Corrugated Metal Pipe, Structural Plate Pipe, Arches, Pipe Arches, Nestable Pipe and Slotted Pipe

57.01 Description - This work shall consist of furnishing and installing corrugated metal pipe, structural plate pipe, arches and pipe arches, with all necessary fittings, bases and foundations as shown on the plans and in accordance with these specifications and the Special Provisions.

57.02 Materials - Pipes, plates, arches, couplets, fittings and coatings shall conform to the provisions of Sections 66 and 67 of the State Specifications. All pipes on a grade greater than 10% shall have paved inverts. All construction measurement and payment shall conform to the provisions of Section 66 and 67 of the State Specifications.
57.03 Circular Pipe and Pipe Arch Metal Plate Thickness - Corrugated metal culverts may be either steel or aluminum. The thickness of the metal plate from which the pipe is fabricated shall be as shown below. This table is good for a maximum cover of 6 feet. For pipes with more than these heights of fill and for sizes greater than those shown the thickness for steel pipe shall be shown on the plan. Aluminum pipe, of suitable thickness approved by the Agency Engineer may be substituted.

**Circular Pipes**

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>6 thru 18</th>
<th>21 &amp; 24</th>
<th>27 thru 30</th>
<th>36</th>
<th>42 &amp; 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel or Alum.</td>
<td>16 ga</td>
<td>16 ga</td>
<td>14 ga</td>
<td>14 ga</td>
<td>12 ga</td>
</tr>
</tbody>
</table>

**Pipe Arches**

<table>
<thead>
<tr>
<th>Sizes (inches)</th>
<th>18x11</th>
<th>29x18</th>
</tr>
</thead>
<tbody>
<tr>
<td>22x13</td>
<td>25x16</td>
<td>36x22</td>
</tr>
<tr>
<td>43x27</td>
<td>50x31</td>
<td>58x36</td>
</tr>
</tbody>
</table>

| Steel or Alum. | 16 ga | 16 ga | 14 ga | 12 ga | 12 ga | 10 ga |

57.04 Placing of Pipe and Pipe Arches - Corrugated metal products shall be shipped and handled in such a manner as to prevent bruising, scaling, or breaking of the protective coating.

The pipes shall be laid in a trench excavated to the lines and grades established by the Agency Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of pipe.

Band couplers shall be installed so that the corrugations in the coupler fit the corrugations in the pipe. Couplers shall be tightened as firmly as possible.

57.05 Jacking Pipe and Pipe Arches - Jacking of corrugated metal pipes and pipe arches shall be done in conformance with the provisions of Section 66-3.10 of the State Specifications.

57.06 Placing Structural Plate Arches - Structural plate shall be assembled in accordance with the manufacturer's instructions. Shop drawings shall be provided by the manufacturer and shall be approved by the Agency Engineer prior to commencement of construction.

Each side of the arch shall rest on a galvanized metal or aluminum angle or channel bearing, securely anchored to the footing. The space between the arch and the sides of the angle or channel on which it bears shall be filled with a bituminous material conforming to the provisions of AASHTO Designation M190.

57.07 Structures - Where structures are placed along or at the ends of corrugated metal conduits, the ends of the conduits shall be cut flush with the inside surface of the structure.

57.08 Inspection - All corrugated metal pipe and structures shall be inspected by the Agency Engineer before backfilling.
Section 58. Subsurface Drains

58.01 Description - This work shall consist of installing subsurface drains in the ravine areas, in serpentine cut areas, or where seepage zones are encountered. These drains will consist of subdrains, perforated pipes, trenches, permeable material, and filter fabric as shown on the plans or designed by the Soils Engineer and approved by the Agency Engineer.

58.02 Materials - The pipe used for subsurface drains must conform to the pipe specifications in the Special Provisions. If the pipe is specified as alternate pipe underdrain on the plans the Contractor may select one from the allowable kinds specified in Section 68-1.02A through Section 68-1.02K of the State Specifications.

The permeable material used shall conform to Section 68-1.025 of the State Specifications per class and type as specified in the Special Provisions.

Filter fabric for use with subdrains shall conform to the requirements in Section 88-1.03 of the State Specifications and installed in accordance with the details shown on the plans and as specified in Section 68-1.03 of the State Specifications.

58.03 Installing Subdrains - Trenches for subdrains shall be excavated, filter fabric installed, the pipe installed, and the trench backfilled with permeable material according to the dimensions and the details shown on the approved plans and standard drawings.

The joints of butt-end clay or concrete drain tile shall be covered with filter fabric or other approved material to prevent infiltration of fine material. Bell and spigot, and tongue and groove clay or concrete pipe shall be laid without mortar in joints and the lengths shall be pressed firmly together to prevent infiltration of fine material. Lengths of asbestos cement pipe, perforated metal pipe, and perforated aluminum pipe shall be jointed by couplers.

Perforated pipe shall be laid with the perforations down.

All subdrains and underdrains shall be connected to storm drainage facilities only; connection to sanitary sewers will not be permitted.

58.04 Inspection - No permeable material shall be placed over the pipe until the Agency Engineer has inspected and approved the subdrain pipe. No backfill material shall be placed until the Agency Engineer has inspected and approved the permeable material.

58.05 Measurement and Payment - Subdrains will be measured and paid for by the linear foot. Payment will include full compensation for trenching, furnishing and installing the specified subdrain pipe, furnishing and installing permeable material and filter fabric and backfilling the trench.

Section 59. ABS Solid Wall Pipe

59.01 General - This subsection applies to ABS plastic solid wall pipe for use as storm drains. Pipe, fittings, and joints shall comply with ASTM D 2751 except as modified herein. Minimum wall thickness shall correspond with SDR 35.
Joint solvent cement shall be an ABS cement conforming to ASTM D2235. Gaskets shall conform to the requirements of Subsection 208.4.

Section 60. ABS or PVC Composite Pipe

60.01 General - This subsection applies to ABS or PVC composite pipe for use as storm drains. Pipe, fittings, and joints shall comply with ASTM D 2680, except as modified herein.

The pipe shall consist of two concentric extruded thermoplastic tubes integrally connected by webs to form a circular truss. The longitudinal void spaces shall be filled with inert material. The maximum average ID of the pipe, as determined by ASTM D 2122, shall be:

<table>
<thead>
<tr>
<th>Nominal Size (inches)</th>
<th>Max. Average ID (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5.81</td>
</tr>
<tr>
<td>8</td>
<td>7.90</td>
</tr>
<tr>
<td>10</td>
<td>9.88</td>
</tr>
<tr>
<td>12</td>
<td>11.83</td>
</tr>
<tr>
<td>15</td>
<td>14.80</td>
</tr>
</tbody>
</table>

Joint solvent cement shall be an ABS cement conforming to ASTM D 2235.

Section 61. PVC Plastic Pipe

61.01 General - This subsection applies to the requirements for unplasticized PVC plastic pipe for sanitary sewers, storm drains, and house connection sewers. Pipe, fittings, couplings, and joints shall conform to the requirements listed below except as otherwise modified by the plans or specifications.

<table>
<thead>
<tr>
<th>Pipe Size (Inches)</th>
<th>ASTM</th>
<th>Wall Thickness Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 - 15</td>
<td>D3033</td>
<td>SDR35</td>
</tr>
<tr>
<td>4 - 15</td>
<td>D3034</td>
<td>SDR35</td>
</tr>
<tr>
<td>18 - 30</td>
<td>F679</td>
<td>“T-1” only</td>
</tr>
</tbody>
</table>

61.02 Joining General - All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The socket and spigot configurations for the fittings and couplings shall be compatible with those used for the pipe.

61.021 Elastomeric Gasket Joints - Pipe with gasketed joints shall be manufactured with a socket configuration which will prevent improper installation of the gasket and will ensure that the gasket remains in place during the joining operation.

61.022 Solvent Cement Joints - Pipe with solvent cement joints shall be joined with a PVC cement conforming to ASTM D 2564.
61.023 Injection Sealed Joints - Pipe with injection sealed joints shall be sealed with a PVC adhesive compound. The compound shall conform to the requirements of ASTM D 2564 and shall have a minimum viscosity of 50,000 centipoise. The internal diameter of the socket shall be uniform with a locking taper at the base and an outer seal ring attached to the end. The socket shall have an injection port to inject the adhesive and an exhaust port on the opposite side to allow air to escape from the annular space.

Section 62. Polyethylene (PE) Solid Wall Pipe and Liner

62.01 General - Polyethylene (PE) plastic solid wall pipe and liner for use in gravity flow storm drains shall comply with ASTM D 3350 or ASTM F 714. Unless otherwise indicated; liner for pipe shall conform to SDR 32.5. Pipe for direct burial shall be as shown on the plans. Fittings shall comply with ASTM D 2683 or D 3261.
LANDSCAPING AND EROSION CONTROL

Section 71. Slope Planting

71.01 Description - This work shall consist of planting of banks and slopes for the purpose of erosion control in conformance with the plans and these specifications.

71.02 Shaping of Ground Surfaces - Areas to be seeded shall be shaped to a reasonable smooth surface so that runoff water will not be channelized for accelerated formation of gullies or that depressions will not be formed where water will stand. Large rocks or other debris not firmly embedded in the areas to be seeded shall be removed.

71.03 Materials

A. Mulch shall be wood cellulose fiber and shall be of such character that it will disperse uniformly into a slurry when mixed with water. The slurry, when hydraulically applied to the ground, shall form an absorptive mat of mulch uniformly impregnated with seed and other ingredients. No materials which inhibit growth or germination shall be present in the mixture.

B. Water shall be of adequate quality to properly promote plant growth.

C. Fertilizer - Inorganic fertilizer shall have a guaranteed analysis of 11% nitrogen, 8% phosphoric acid and 4% soluble potash and shall be in a form which will readily disperse into the slurry.

D. Seed shall be Annual Rye Grass or as set forth in the Special Provisions and shall be labeled in accordance with applicable federal and local requirements.

71.04 Equipment - Equipment for the application shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix a slurry of fiber, fertilizer, seed and water. The slurry distribution lines shall be large enough to prevent clogging. The discharge line shall provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum capacity of 1,000 gallons.

71.05 Preparation of Slurry - The slurry preparation should begin by adding water to the tank when the engine is at half throttle. When the water level has reached the height of the agitator shaft, the stabilizing agent, if specified, shall be added. Seed and fertilizer shall then be added, followed by the fiber mulch. The mulch shall only be added to the mixture after the seed and when the tank is at least one-third filled with water. The engine throttle shall be opened to full speed when the tank is half filled with water. All the mulch shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence within two hours after the tank is full.

71.06 Application - The operator shall spray the slopes with a uniform, visible coat by using the green color of the wood pulp as a guide. The slurry shall be applied in a sweeping motion, so as to allow the fibers to build on each other until a good coat is achieved, and the material is spread at the required rate per acre.
Rates of Application of Materials Per Acre

<table>
<thead>
<tr>
<th>Material</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>150 lbs.</td>
</tr>
<tr>
<td>Mulch Fiber</td>
<td>1500 lbs.</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>480 lbs.</td>
</tr>
</tbody>
</table>

71.07 Applying and Incorporating Straw - Straw shall be uniformly spread at the rate specified in the Special Provisions.

When weather conditions are suitable, straw may be pneumatically applied by means of equipment which will not render the straw unsuitable for incorporation into the soil.

Straw shall be incorporated into the soil with a roller equipped with straight studs, made of approximately 7/8 inch steel plate, placed approximately 8 inches apart and staggered. The studs shall not be less than 6 inches long nor more than 6 inches wide and shall be rounded to prevent withdrawing the straw from the soil. The roller shall be of such weight as to incorporate the straw sufficiently into the soil so that the straw will not support combustion, and will leave a uniform surface.

71.08 Erosive Slopes - On slopes judged by the Agency Engineer to be extremely erosive, 75 gallons of "Curasol" shall be added for each acre to be planted. When "Curasol" is added, the mulch fiber used can be reduced from 1500 lbs. per acre to 1000 lbs. per acre. On Agency work this will be called out in the Special Provisions.

71.09 Maintenance - The Contractor shall be responsible for the establishing of the grass cover. He shall protect, maintain, and repair plantings for a period of 45 days after seeding. After the showing of grass growth in seeded areas, the Contractor shall reseed any areas that show evidence of being skipped. Reseeding shall be with the seed specified for the initial sowing and shall be applied in a manner that will cause minimum disturbance to the adjacent growing areas.

71.10 Alternate Planting - On private projects, the owner may request alternate plantings on banks and slopes. The owner must supply the Agency Engineer with 5 copies of specifications for the alternate. The specifications must be prepared by a professional landscape architect.

If approved, the alternate planting shall be done in conformance with the landscape architect's specifications and shall be maintained for whatever period is specified by the Agency Engineer.

71.11 Measurement - The quantities of slope and bank planting will be measured in units of 100 square feet to the nearest 100 square feet. All measurements will be made parallel to the plane of planting rather than in a horizontal plane.

71.12 Payment - The price paid per 100 square feet of planting shall include full compensation for furnishing all plant, labor, materials, tools, equipment, and incidentals for doing all work included in preparing the ground to be planted, placing topsoil, planting, and mulching the planted area, and for repairing and maintaining same in conformance with the provisions of these specifications.
Section 72. Tree and Shrub Planting

72.01 Description - This work shall consist of planting trees and shrubs of the species indicated, at the locations designated, and in conformance with the plans, standard drawing, specifications, and Special Provisions.

72.02 Trees and Plants - Trees and shrubs shall be the variety and size shown on the plans or in the Special Provisions and shall conform to the requirements specified in this section.

When specified in the Special Provisions, certain varieties of trees and plants will be furnished by the Agency.

Each tree and shrub shall be handled and packed in the approved manner for that species or variety, and all necessary precautions shall be taken to insure that they will arrive at the site of the work in proper condition for successful growth. Trucks used for transporting trees and shrubs shall be equipped with covers to protect trees and shrubs from windburn.

All trees and shrubs furnished by the Contractor shall be true to type or name as shown on the plans and shall be tagged in accordance with the standard practice recommended by the American Association of Nurserymen; however, determination of plant species or variety will be made by the Agency Engineer and his decision shall be final.

All trees and shrubs shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Inspection certificates required by law shall accompany each shipment, and certificates shall be delivered to the Agency Engineer.

The Contractor shall obtain clearance from the County Agricultural Commissioner, as required by law, before planting trees and shrubs delivered from outside Marin County. Evidence that such clearance has been obtained shall be filed with the Agency Engineer.

Trees and shrubs furnished by the Contractor shall be healthy, shapely and well rooted, and roots shall show no evidence of having been restricted or deformed at any time. They shall be well grown, free from insects, pests and disease, and shall be grown in nurseries which have been inspected by the State Department of Agriculture and have complied with the regulations thereof.

Root condition of trees and shrubs furnished by the Contractor in containers will be determined by removal of earth from the roots of not less than 2 trees or shrubs nor more than 2 percent of the total number of each species or variety, except when container grown trees and shrubs are from several sources, the roots of not less than 2 of each species or variety from each source will be inspected. The Agency reserves the right to reject the entire lot or lots represented by defective samples. Any trees or shrubs rendered unsuitable for planting because of this inspection will be considered as samples and will not be paid for.

72.03 Planting - Trees and shrubs shall be planted in accordance with the following provisions and as directed by the Agency Engineer.

Before trees and shrubs are transported to the planting area they shall be properly pruned or cut back to reduce damage by wind and to force lateral growth.
No trees and shrubs shall be transported to the planting area that are not thoroughly wet throughout the ball of earth surrounding the roots.

Any trees or plants that, in the opinion of the Agency Engineer, are dry or in a wilted condition when delivered to the planting area will not be accepted, and shall be replaced by the Contractor at his expense.

Containers shall be cut and trees and plants shall be removed from the containers in such a manner that the ball of earth surrounding the roots is not broken, and they shall be planted and watered as hereinafter specified immediately after removal from the containers. Containers shall not be cut prior to delivery of the trees or plants to the planting area.

Roots not in containers shall be kept moist and covered at all times and shall not be exposed to the air except while actually being placed in the ground.

Trees and shrubs shall be set in the backfill material, in flat bottomed holes, to such depth that, after the soil has settled, the top of the plant ball will be even with the bottom of the basin or even with the surrounding soil where there is no basin. Trees and shrubs shall be planted in such a manner that the roots will not be restricted or distorted. Soil shall not be compacted around the roots or ball of the plant during or after planting operations.

Any trees or shrubs which have settled deeper than specified in the above paragraph shall be raised back to the required level, or replaced.

No planting shall be done in soil that is too wet or too dry or otherwise in a condition not generally accepted as satisfactory for planting from an agricultural standpoint.

Any planting done in soil that is too wet or too dry or not properly conditioned as provided in these specifications and the Special Provisions will not be accepted. No payment will be made for such planting and any further planting work will be suspended until the Contractor has complied in every way with the specifications.

Trees and shrubs in ground cover areas shall be planted and mulched before ground cover plants or cuttings are planted.

72.04 Maintenance - Trees and shrubs shall be protected, watered, and generally cared for, for the entire length of the maintenance period stated in the paragraph below. Watering basins, stakes and ties shall be kept free from weeds.

<table>
<thead>
<tr>
<th>Maintenance Period</th>
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<tbody>
<tr>
<td>Agency Projects</td>
<td>Period stated in Special Provisions</td>
</tr>
<tr>
<td>Subdivisions (Major &amp; Minor)</td>
<td>Until final acceptance by Agency</td>
</tr>
<tr>
<td>All other situations</td>
<td>90 days after planting</td>
</tr>
</tbody>
</table>

Any tree or shrub which dies, becomes diseased, is damaged, fails to establish itself, or in any other way fails to show evidence that it will become a strong, healthy plant shall be replaced by the Contractor as soon as such evidence becomes apparent or within 7 days of receipt of notice from the Agency Engineer that it needs to be replaced.
The maintenance of trees and shrubs in conformance with the above requirements and any additional requirements shown on the plans, standard drawings, or Special Provisions shall be the responsibility of the Contractor and/or developer doing or having the work done for the entire length of the maintenance period.

72.05 Measurement - The work performed under this section will be measured by the unit designated in the contract item.

72.06 Payment - The prices paid shall include full compensation for furnishing all tools, labor, materials, and incidentals for doing all the work involved in furnishing, planting, and maintaining trees and shrubs in conformance with these specifications. No additional payment will be made for replacing trees or shrubs, under the provisions of Section 72.04 of these specifications.

Section 73. Tree Trimming

73.01 Scope - This work shall consist of furnishing all the necessary plant, labor, materials, tools, and equipment to trim trees as follows:

A. Trees within or overhanging the public right-of-way shall be safety pruned, lifted and shaped.

B. Trees not within public right-of-way but which must be trimmed in order to provide clearance for construction equipment shall be shaped.

73.02 General Requirements

A. All cuts are to be made sufficiently close to the parent system so that healing can readily start under normal conditions.

B. All limbs over two inches in diameter shall be removed by precutting to prevent splitting. Any branches that would injure the tree by falling or might damage surrounding property shall be lowered from the tree by ropes.

C. All cuts made in accomplishing the work shall be painted with an approved tree wound dressing.

D. On any trees known to be diseased, tools shall be disinfected after each cut and between trees with alcohol, where there is known to be a danger of transmitting the disease on tools.

E. Any structural weaknesses, decayed trunks or branches, split crotches, or branches, should be reported immediately to the Agency Engineer.

F. Unless otherwise specified by the Agency Engineer, all old stubs where branches have previously broken off shall be cut back to the next lateral branch.

73.03 Safety Pruning shall consist of the removal of all dead, diseased, or weak branches larger than two inches in diameter, in accordance with the following:
A. Lifting shall consist of the removing of all branches lower than ten feet above finish grade. In lifting the bottom branches of trees for under clearance, care should be given to symmetrical appearance, and cuts should not be made too large that they will prevent normal sap flow.

B. Shaping shall consist of removing lower branches of lifted trees in order to retain the tree's symmetrical appearance.

73.04 Measurement and Payment - Unless otherwise stated in the Special Provisions, all of the work covered in this section shall be considered as a part of clearing and grubbing (Section 21 of these specifications) and no extra payment will be made therefor.
MISCELLANEOUS

Section 80. Structural Wood

80.01 General - Structural lumber shall be of the kinds and grades indicated on the plans or in the specifications. Proper allowance for shrinkage in the lumber shall be made by the Contractor where it is necessary to meet definite dimensions shown on the drawings. All sizes shown on the plans or in the specifications applying to lumber and timber refer to nominal sizes. Rough and dressed sizes shall conform to the sizes set forth in the American Lumber Standards. All lumber shall be grade marked by a lumber grading agency certified by the American Lumber Standards Committee.

80.02 Douglas Fir - Unless otherwise specified, all lumber shall be Douglas Fir and shall be selected as to grade and shall conform in all particulars to the Standard Grading Rules for Western Lumber, published by the Western Wood Products Association and approved by the American Lumber Standards Committee.

80.03 Redwood - Redwood lumber shall conform in all particulars to the standard specifications for Grades of California Redwood of the Redwood Inspection Service.

80.04 Plywood - Plywood shall be manufactured and graded in accordance with the rules of the American Plywood Association and the latest Product Standard for Softwood Plywood, Construction and Industrial, of the National Bureau of Standards. Each sheet of plywood shall bear the official stamp of a quality control agency stating the grade of the sheet.

80.05 Preservative Treatment of Lumber, Timber and Piling - All wood products to be treated shall conform to the requirements of Section 58-1.02, 58-1.03 and 58-1.04 of the State Specifications.

Notwithstanding other restrictions imposed state or federal regulations, preservatives used for wood in contact with ground or fresh water shall be limited to:

A. Creosote or creosote solutions;
B. Pentachlorophenol;
C. Ammoniacal Copper Arsenate;
D. Chromated Copper Arsenate.

Preservatives used for wood subject to marine (salt water) exposure shall be limited to:

A. Ammoniacal Copper Arsenate;
B. Chromated Copper Arsenate.

80.06 Field Treatment of Surface Cuts - When cutting or drilling becomes necessary after plant treatment, the cut or drilled surfaces shall be given protection by field treatment in accordance with the provisions of AWPA Standard M4.

80.07 Quality Control - Inspection of Preservatives - All materials treated shall be subject to inspection. The inspection and marking shall be in accordance with AWPA Standard M2.
Section 81. Painted Traffic Stripes and Pavement Markers

81.01 Painted Traffic Stripes - This work shall consist of applying painted and thermoplastic traffic stripes and pavement markings at the locations shown on the plans and as specified in Section 84 of the State Specifications and Special Provisions.

81.02 Pavement Markers - This work shall consist of furnishing and placing pavement markers at the locations shown on the plans and as specified in Section 85 of the State Specifications and the Special Provisions.