City of Albany

(A Charter City)

Standard Specifications

December 2010

GENERAL PROVISIONS

TABLE OF CONTENTS

Section 1 - Terms, Definitions, and Abbreviations 1
1.1 General. 1
1.2 Abbreviations. 1
1.3 Definitions. 2
Section 2 - Proposal Requirements 8
2.1 Proposal Forms. 8
2.2 Examination of Documents and Site. 8
2.3 Withdrawal of Proposals. 9
2.4 Public Opening of Proposals. 9
2.5 Disqualification of Bidders. 9
2.6 Relief of Bidders. 10
2.7 Rejection of Proposals. 10
2.8 Proposal Guaranty. 10
2.9 Addenda. 10
2.10 Approximate Estimate. 10
2.11 Substitution of Equals. 11
2.12 Interpretation of Documents. 11
2.13 Competency of Bidders. 11
2.14 Material Guaranty. 12
Section 3 - Award and Execution of Contract 13
3.1 Award of Contract. 13
3.2 Consideration of Bids. 13
3.3 Contract Bonds. 13
3.4 Execution of Contract. 13
3.5 Failure to Execute Contract. 13
3.6 Contract Documents. 14
3.7 Bond Substitutions, Renewal and Extension. 14
3.8 Return of Proposal Guarantees. 14
Section 4 - Scope of Work 15
4.1 Intent of Plans and Specifications. 15
4.2 Differing Site Conditions. 15
4.3 As Built Drawings. 15
4.4 Work to be Done. 16
4.5 Alterations and Increased or Decreased Quantities. 16
4.6 Extra Work. 17
4.7 Unauthorized Work. 17
4.8 Protection of Utilities. 17
4.9 Cleaning Up. 17
4.10 Noise Control. 18
4.11 Temporary Light, Power, and Water. 18
4.12 Coordination With Affected Residents. 18

4.13 Protection and Restoration of Existing Improvements. 19
4.14 Submittals. 20
4.15 Final Cleaning Up. 22
4.16 Changed Conditions. 22
4.17 As-Built Records. 23
Section 5 - Control of the Work and Materials 24
5.1 Authority of Engineer. 24
5.2 Assignment. 24
5.3 Subcontracting. 24
5.4 Precedence of Contract Documents. 24
5.5 Plans and Working Drawings. 25
5.6 Shop Drawings. 25
5.7 Lines and Grades. 26
5.8 Superintendence. 27
5.9 Defective and Unauthorized Work. 27
5.10 Character of Workman. 27
5.11 City Furnished Materials. 28
5.12 Storage of Materials. 28
5.13 Trade Names and Alternatives. 28
5.14 Samples and Tests. 29
5.15 Inspection. 29
5.16 Suggestions to the Contractor. 30
5.17 Foreign Materials. 30
5.18 Final Clean Up. 30
5.19 Conformity with Plans and Allowable Deviation. 30
5.20 Coordination with Contract Documents. 30
5.21 Interpretation of Plans and Specifications. 31
5.22 Authority of Duties and Resident Engineer. 31
5.23 Substitution. 32
5.24 Reinspection, Retesting, and Re-staking. 32
Section 6 - Legal Relations and Responsibility 33
6.1 Laws to be Observed. 33
6.2 Contractor's Equipment and Facilities. 33
6.3 Labor. 33
6.4 Contractor's Licensing Laws. 34
6.5 Vehicle Code. 34
6.6 Weight Limitation. 34
6.7 Payment of Taxes. 34
6.8 Permits and Licenses. 34
6.9 Patents. 34
6.10 Safety Provisions. 35
6.11 Public Convenience and Safety. 35
6.12 General Safety 36
6.13 Traffic Control. 37
6.14 Access for Adjacent Property. 39
6.15 Storage of Material Temporary Equipment. 39
6.16 Use of Explosives. 40

6.17 Protection and Restoration of Improvements. 40
6.18 Disposal Outside Project Limits. 42
6.19 Responsibility for the Work and Materials. 43
6.20 Subcontracting. 43
6.21 Mutual Responsibility of Contractors. 44
6.22 Separate Contracts. 44
6.23 Environmental Responsibilities. 44
6.24 Dust and Debris Control. 44
6.25 Contractor Not an Agent of the City. 45
6.26 Cooperation. 45
6.27 Rights in Land and Improvements. 46
6.28 Personal Liability. 46
6.29 Repair of Equipment. 46
6.30 Material Plants. 46
6.31 Non-Enforcement – No Waiver by City. 46
6.32 Guarantee and Warranty. 46
6.33 Relief from Maintenance and Responsibility. 47
6.34 Catastrophic Damage. 48
6.35 Responsibility for Claims and Damages. 48
6.36 Insurance. 49
6.37 Affirmative Action and Equal Opportunity. 52
6.38 Payment. 52
6.39 Claims and Protests by Contractor. 52
6.40 Apprentices. 54
6.41 Entry Rights. 54
6.42 Obstruction. 54
6.43 Sanitary Conveniences. 54
6.44 Preservation of Monuments. 54
6.45 Opening Sections of New Work. 54
6.46 Acceptance of Work on Contract. 55
6.47 Correction of Errors, Recovery for Errors, Dishonesty or Collusion. 55
6.48 Right-of Way. 55
Section 7 - Existing Utilities 56
7.1 General. 56
7.2 Utility Relocation and Rearrangement. 57
7.3 Notification and Location. 57
7.4 Coordination with Other City Projects. 58
7.5 Payment. 58
Section 8 - Progress of Work 59
8.1 Beginning of Work. 59
8.2 Progress Schedule. 59
8.3 Temporary Suspension of Work. 59
8.4 Termination of Contract. 60
8.5 Right of Way Delays. 61
8.6 Changes (Change Orders). 61
8.7 Emergency Work. 66
8.8 Working Hours. 66

8.9 Time of Completion. 67
8.10 Penalty for Late Completion. 67
8.11 Completion of Work/Acceptance. 68
Section 9 - Measurement and Payment 69
9.1 Measurement of Quantities. 69
9.2 Scope of Payment. 70
9.3 Extra Work 72
9.4 Progress Payments. 74
9.5 Delivered Material. 75
9.6 Payments Withheld. 75
9.7 Acceptance, Final Estimate and Payment. 76

GENERAL PROVISIONS

Section 1 - Terms, Definitions, and Abbreviations

1.1 General.

Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, applicable, appropriate, sufficient, proper, desirable, necessary, prescribed, approved, acceptable, satisfactory or words of like import, refer to actions, expressions and prerogatives of the Engineer.

Masculine gender words include the feminine. References to gender, such as "workman" and "flagman" and the pronoun "he" or "his" referring to such titles, are abstract in the specifications, used for the sake of brevity and are intended to refer to persons of either sex.

Singular words include the plural and "person" includes firms, companies and corporations.

1.2 Abbreviations.

Wherever in the specifications and other contract documents abbreviations, terms or pronouns in place of them are used, the intent shall be interpreted in the conventional common usage and general meaning within the related context and as outline in this Section.

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Construction
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood Preservers' Association

AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
EEI	Electrical Engineers Institute
EIA	Electronic Industries Association
IEEE	Institute of Electrical and Electronics Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers Association
PUC	Public Utilities Commission
REA	Rural Electrification Administration
UBC	Uniform Building Code
UL	Underwriters' Laboratories Inc.
UPC	Uniform Plumbing Code

1.3 Definitions.

Acceptance – The formal written acceptance by the City of an entire contract which has been completed in all respects in accordance with the Contract Documents and any modifications thereof previously approved.

Act of God – An earthquake, flood, cyclone or other cataclysmic phenomenon of nature. A rain, windstorm, high water or other natural phenomenon of which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as an Act of God.

Addenda – Written or graphic instruments issued prior to the Bid which modify or interpret the Contract Documents, Drawings, and Specifications by additions, deletions, clarifications or corrections.

Bidder – Any properly licensed and qualified individual, firm, partnership, corporation, joint venture, or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

City – The governing body of the City of Albany, County of Alameda, State of California, also called the Owner.

City Engineer – The engineer designated by the City to have administrative control over the work, sometimes referred to as Engineer, Director of Public Works.

Claim – Means a separate demand by the contractor for a time extension, payment of money or damages arising from work done by or on behalf of the contractor pursuant to the contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or an amount the payment of which is disputed by the City.

Contract – The written agreement covering the performance of the work as more fully described in, but not limited to, the Plans, Standard Specifications, Special and Technical Provisions, Contract Bonds, Proposal, Addenda, Change Orders.

Contract Change Order — A written order to the Contractor, covering changes in the plans or specifications, or quantities, within the scope of the contract, and establishing the basis of payment and time adjustments for the work affected by the changes.

Contract Documents — The written agreement covering the performance of the work and the furnishing of labor, materials, and Contractor's Plant and equipment in the construction of the work, also referred to herein as the Contract

The Contract Documents include, but are not limited to: The Accepted Proposal Packet; General Provisions; Technical Provisions; Special Provisions; Standard Plans; Project Plans, Approved Revisions to the Plans; Reference Specifications; Permits from other Agencies as may be required by law; Contract Change Orders; and other written supplemental Agreements. The Contract Documents do not however, include the logs of geologic test borings and other geologic records, reports and interpretations.

Contract Item — A specific unit of work for which a price is provided in the contract, also Bid Item or Pay Item.

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

Contract Time — The number of calendar days or working days stated in the Contract Documents for the completion of the Work.

Contract Unit Price — The contractor's original bid for a contract item of work in the Proposal.

Contractor – The person or persons, firm, partnership, corporation, or combination thereof, who have entered into a contract with the City, as party or parties of the second part or his or their legal representatives.

Contractor's Plant and Equipment – Everything, except labor, used by the Contractor in order to carry out the work, but not to be incorporated in the work.

Days – Days shall mean consecutive calendar days unless otherwise specified.

Designated Authority — The term Designated Authority, if used in the Contract Documents, shall be taken as a general reference to designate the party of parties authorized or employed by the City to observe and test materials or completed work and to observe their general compliance with the Contract Documents. The Designated Authority may include the following, among others, insofar as they perform designated functions within the scope of their authority.

City Engineer and his duly authorized representative.

Consulting Engineers.
Soils Engineers.
Public Utility Agencies.
Public Agency Authorities.

Engineer — The Engineer designated by the City to have administrative control over the work acting either directly or through duly authorized representatives such agents acting within the scope of the particular duties delegated to them; also referred to as the City Engineer or Director of Public Works.

Engineer's Estimate — The list of estimated quantities of work to be performed as contained in the "Bidders Proposal."

Extra Work — An item of work not provided for in the Contract or not included in bid items and not appurtenant or incidental to the items included, but found by the Engineer to be essential to the satisfactory completion of the Contract within its intended scope.

Fixed Costs — Any necessary labor, material and equipment costs directly expended on the item or items under consideration which remain constant regardless of the quantity of the work done.

Herein – "Herein", "hereinafter", "hereinabove", "hereof" and words of similar import shall refer to the contract documents as appropriate.

Inspector — An authorized representative of the Engineer assigned to make all necessary inspections of the work performed or being performed, or of the materials furnished or being famished by the Contractor.

Install ~ The installation complete in place of an item, material or piece of equipment with all its appurtenant and subordinate accessories, connections, supports and other work, labor and materials to perform same.

Invitation to Bid — The notice published and included in the proposal package also called the Notice to Contractors.

Laboratory – The designated materials testing laboratory authorized by the City Engineer to test materials and work involved in the contract.

Liquidated Damages — The amount prescribed in the specifications, pursuant to the authority of Government Code Section 14376, to be paid to the *City* or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

Notice of Award of Contract — The City standard written form notice of award of the contract for the work, issued by the Department of Public Works to the lowest responsible bidder awarded said contract shall be transmitted via certified mail.

Notice to Proceed — The formal notice to proceed, issued by the City Engineer

after all contract, insurance and bond forms have been approved and agreement has been executed by the City.

Owner — The City of Albany acting through its appointed and duly authorized officials.

Plans — The official project plans and standard plans, profiles, cross sections, working drawings and supplemental drawings, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. All such documents are to be considered as a part of the Contract Documents whether or not reproduced in the special provisions and are to be considered as a part of the contract supplementary to the specifications.

Processing — Any operation or operations of whatever nature and extent required to produce a specified material.

Proposal — The offer of the bidder for the work when made out and submitted in the prescribed proposal form, properly signed and guaranteed, also referred to as Proposal Form. Contractor may proceed with regular work on the current controlling operation as determined by the Engineer, toward the completion of the Contract, unless the controlling operation of work is delayed by inclement weather as may be specified in the Genera] Provisions.

Proposal Guaranty — The cashier's check, certified cheek, or bidder's bond accompanying the proposal submitted by the bidder, as a guaranty that the bidder will enter into a contract with: the City for the performance of the work if the contract is awarded to him.

Public Works Specifications — The Standard Specifications for Public Works Construction in effect at the time of advertising the work.

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 of advertising the project or issuing the permit, unless specified otherwise.

Shall be Approved — The term "shall be approved by the Engineer" or phrases of like import mean subject to the approval of the Engineer.

Shall, Will or May — "Shall" or "will," whenever used to stipulate anything is mandatory and means shall or will be done or be performed and means that the Contractor or the Owner has thereby entered into a covenant with the other party to do or perform the same. "May," wherever and in whatever manner used, is permissive.

Shop Drawings — All drawings, diagrams, illustrations, brochures, schedules and

other data which are prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

Specifications — The written directions, provisions and requirements herein contained pertaining to the method and manner of performing the work or to the quantities of the materials to be furnished under the contact, together with all other directions, provisions and requirements herein contained, plus such amendments, deletions from or additions thereto which may be provided for by supplemental agreement or agreements. Specifications include the General Provisions, the Technical and Special Provisions and the Plans, Drawings and Materials related to the work.

Standard Specifications — Whenever the words "Standard Specifications" are used without further identification or title, they shall be understood to mean the "Standard Specifications" of the City of Albany and its most recent revisions.

State Specifications — The State of California, Department of Transportation Agency's Standard Specifications in effect at the time of advertising the work, also called State Standard Specifications.

State — The State of California.

Subcontractor — The individual, partnership, corporation or other legal entity entering into a contract with the contractor to perform a portion of the work, sometimes referred to as employee of the contractor.

Submitted — Submitted to the Engineer for his consideration.

Substantial Completion — That date, as certified by the Engineer; when the construction of the work or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the work or specified part can be utilized for the purposes for which it is intended.

Surety — Any 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.

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

Work — The term "work" shall be taken to mean all the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments or extensions thereto made by contract change order or other written orders of the Engineer. The term includes all labor and materials and equipment necessary to produce the construction required by the Contract Documents, and all materials, equipment and incidentals incorporated or to be incorporated in such construction. Anything and everything to be done for the setting out, execution, completion

and fulfillment of the contract to be satisfaction of the City.

Working Day — Any day, other than a legal holiday, Saturday or Sunday, on which the Contractor may proceed with regular work on the current controlling operation as determined by the Engineer, toward the completion of the Contract, unless the controlling operation of work is delayed by inclement weather as may be specified in the Genera] Provisions.

Section 2 - Proposal Requirements

2.1 Proposal Forms.

The City will furnish to each Bidder a Proposal Form, which, when filled out and executed may be submitted as his bid. Bids not presented on forms so furnished will be disregarded. The Proposal Form bound together with the Contract Proposal Packet which must remain intact in its entirety.

If applicable, the proposal shall set forth for each Contract item of work, in clearly legible figures, an item price and a total for: the item in the respective spaces provided, and shall be signed by the bidder, who shall fill out all blanks in the proposal form as required.

All forms contained in the proposal packet shall be completed and the proposal submitted in accordance with the instructions contained therein and with the requirements of this section. Exceptions are those marked (Forms) included as illustrations.

The Financial Statement of the apparent low bidder shall be submitted to the City within three (3) calendar days following the bid opening, if required, pursuant to special provisions.

The Proposal Packet shall be submitted as directed in the Notice to Contractors under sealed cover plainly marked as a "Proposal," and identifying the project to which the proposal relates and the date of the bid opening therefore. Proposals which are not properly marked may be disregarded.

When proposals are signed by an agent, other than the officer or officers of a corporation authorized to sign contracts on its behalf or a member of a partnership, a "Power of Attorney" must be filed with the City prior to opening bids or shall be submitted with the proposal; otherwise, the proposal may be rejected as irregular and unauthorized.

2.2 Examination of Documents and Site.

The Bidder shall examine carefully both the site of the work contemplated, and the Contract Documents. The submission of a bid proposal shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, as the character, quality, and scope of work to be performed, and the quantities of materials to be furnished, and as to the requirements of the contract and the Contract Documents.

Where the City has made investigations of subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, such investigations are made only for the purpose of study and design. Where such investigations have been made, bidders or Contractors may, upon written request, inspect the records of the City as to such investigations subject to and upon the conditions hereinafter set forth.

The records of such investigations are not a part of the contract and are shown solely for the convenience of the bidder or Contractor. It is expressly understood and agreed that the City assumes no responsibility whatsoever in respect to the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Engineer in its use thereof and there is no warranty or guaranty, either expressed or implied, that the conditions indicated by such investigations thereof, or that unlooked-for developments may not occur, or that materials other than, or in proportions different from those indicated, may not be encountered.

When a log of test borings showing a record of the data obtained by the City's investigation of subsurface conditions is included with the contract plans, it is expressly understood and agreed that said log of test borings does not constitute a part of the contract, represents only the opinion of the City as to the character of the materials encountered by it in its test borings, is included in the plans only for the convenience of bidders and its use is subject to all of the conditions and limitations herein set forth.

No information derived from such inspection of records of investigations or compilation thereof made by the City or from the Engineer, or his assistants, will in any way relieve the bidder or Contractor from any risk or form properly fulfilling the terms of the contract.

2.3 Withdrawal of Proposals.

Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids only by written request for the withdrawal of the bid filed with the City Clerk. The request shall be executed by the Bidder or his duly authorized representative. The withdrawal of a bid does not prejudice the right of the Bidder to file a new bid. Whether or not bids are opened exactly at the time fixed in the public notice for opening bids, a bid will not be received after that time, nor may any bid be withdrawn after the time fixed in the public notice for the opening of bids or amendments thereto preceded by Addendum.

2.4 Public Opening of Proposals.

Proposals will be opened and read publicly at the time and place indicated in the "Notice to Contractors." Bidders or their authorized agents are invited to be present. After opening of Bids, the City Engineer will review all bids for accuracy and reserves the right to make corrections of obvious errors. Upon completion of the City Engineer's review, bids will be positioned and an apparent low bidder will be determined and notified.

2.5 Disqualification of Bidders.

More than one proposal from an individual, firm, partnership, corporation, or combination thereof under the same or different names will not be considered. Reasonable grounds for believing that any individual firm, partnership, corporation or combination thereof is interested in more than one proposal for the work contemplated may cause the rejection of all proposals in which such individual, firm, partnership, corporation or combination thereof is interested. If there is reason for believing that collusion exists among the bidders any or all proposals may be rejected. Proposals in which the prices obviously are unbalanced may be rejected.

2.6 Relief of Bidders.

Attention is directed to the provisions of Government Code §§14350 to 14355, inclusive, concerning relief of bidders and in particular to the requirement therein, that if the Bidder claims a mistake was made in his bid, the Bidder shall give the City written notice within five (5) days after the opening of the bids of the alleged mistake, specifying in the notice in detail how the mistake occurred.

The Contractor accepts all risks directly or indirectly connected with the performance of the contract. The Contractor further warrants that there has been no collusion and that he has not been influenced by any oral statement or promised of the Engineer, but only by the Contract Documents.

2.7 Rejection of Proposals.

Proposals may be rejected if they show any alteration of form, additions not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind.

The City reserves the right to reject all bids for: improper form, upon finding the Contractor to be irresponsible or incompetent, collusion, unbalanced bids, inability to perform the contract or any other reason found to be detrimental to the City's interest or welfare.

2.8 Proposal Guaranty.

All bids shall be presented under sealed cover and accompanied by one of the following forms of bidder's security.

A cashier's check, a certified check, or a bidder's bond consisting of City's Standard Bond Form and executed by an admitted surety insurer, made payable to the City.

The security shall be in an amount equal to at least 10 percent of the amount of the bid. A bid will not be considered unless one of the forms of bidder's security is enclosed with it.

A bidder's bond will not be accepted unless it conforms to the bond form included in the Contract Documents.

2.9 Addenda.

The Engineer may, when he deems necessary, and at a time prior to the bid opening, issue addenda to the Contract Documents to amend, clarify or correct matter contained therein. Such addenda shall constitute a part of said Contract Documents and shall be binding. Addenda will be forwarded to all prospective bidders, insofar as they are known to the Engineer.

2.10 Approximate Estimate.

The quantities given in the proposal and contract forms are approximate only, being given as a basis for the comparison of bids and the City does not expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of

the work, as may be deemed necessary or advisable by the Engineer.

2.11 Substitution of Equals.

Whenever in the Contract Documents any material, equipment or process is indicated or specified by patent or proprietary name or by name of manufacturer, and the Bidder desires to offer a substitute material, equipment or process as the case may be, on the basis that a substitute is the equal in every respect to that so indicated or specified, then the Bidder shall first submit to the Engineer a request in writing for his approval along with such detailed plans and specifications and other data as the Engineer may deem necessary to enable him to determine if the substitute is the equal of that called for. A request by a prospective bidder for such approval shall be submitted to the engineer at least ten (10) days in advance of the time and date set for opening of bids in order that all interested bidders may be notified of such approval or approved alternative, as the case may be.

The Engineer shall in all cases by the judge as to whether the substitute offered is the equal in all respects of the material, equipment or process specified.

If the material, equipment or process offered by the Bidder is of, in the opinion of the Engineer, not equal in every respect to that specified, then the Bidder must furnish the material, equipment or process specified, or one that, in the opinion of the Engineer, is the equal in every respect to that specified.

2.12 Interpretation of Documents.

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the Contract Documents, or finds discrepancies in, or omissions from the plans or specifications, he may submit to the Engineer a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery at least 7 days prior to the bid opening. Any interpretation or correction of the proposed documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. Any addenda issued during the period of bidding shall be duly executed by the bidder, and said addenda must be attached to and submitted with the proposal. Absence of such attachment of addenda may be cause for rejection of a proposal. The City will not be responsible for any other explanations or interpretations of the Contract Documents.

Neither the City nor the Engineer shall be deemed responsible for any oral clarification nor will same by binding.

2.13 Competency of Bidders.

Prior to the submission of bids, the Contractor shall be licensed in accordance with the provisions of Chapter 9 of Division III of the Business and Professional Code of the State of California and evidence of such license shall be presented to the Engineer on request.

The Engineer may require the Bidder to present satisfactory evidence that he has sufficient experience and that he is fully prepared with the necessary capital, materials, machinery, and skilled workmen to carry out the contract.

2.14 Material Guaranty.

Before any contract is awarded, Bidders may be required to furnish a complete statement of the origin, composition, and manufacture of any or all materials to be used in the construction of the work, together with samples, which samples may be subjected to the tests provided for in these specifications to determine their quality and fitness for the work.

Section 3 - Award and Execution of Contract

3.1 Award of Contract.

The right is reserved the City to reject any or all proposals and to waive irregularities in the bid procedure and proposal.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed. Such award, if made, will be made within 30 calendar days after the opening of the proposals, if the lowest responsible bidder refuses or fails to execute the contract, his bid security is forfeited and the City may award the contract to the second lowest responsible bidder. Such award, if made, will be made within 45 calendar days after the opening of proposals. If the second lowest responsible bidder refuses or fails to execute the contract, his bid security is forfeited, and the City may award the contract to the third lowest responsible bidder. Such award, if made, will be made within 60 calendar days after the opening of proposals. The periods of time specified above within which the award of contract may be made shall be subject to extension for such further period as may be agreed upon in writing between the City and bidder concerned.

All bids will be compared on the basis of the Engineer's Estimate of the quantities of work to be done, whenever applicable.

3.2 Consideration of Bids.

Bids will be opened publicly by the Purchasing Agent of the City on the date and at the time set forth in the "Notice to Bidders." The right is reserved by the City by action of the Council to reject any or all bids, to advertise for new proposals, to negotiate in the open market for a contract at a reasonable price, to purchase in the open market, or to have the work performed by City employees, or to abandon the work, if in the judgement of the Council, the best interests of the City will be promoted thereby.

3.3 Contract Bonds.

The Contractor, simultaneously with the execution of the Contract, shall furnish a surety bond to secure the faithful performance of the contract for the work in an amount of 100% of the contract price. He shall also furnish a bond to secure payment for all labor, material, equipment, and supplies furnished for the work in an amount equal to 100% of the contract price. The form of the Bonds shall be as contained in the Contract Documents and satisfactory to the City.

3.4 Execution of Contract.

The contract shall be signed by the successful bidder and returned, together with the contract bonds and insurance certificates, within 10 calendar days after the Notice of Award.

3.5 Failure to Execute Contract.

Failure of the lowest responsible bidder, the second lowest responsible bidder, or the third lowest responsible Bidder to execute the contract and file acceptable bonds as provided within ten days after such Bidder has received notice that the contract has been awarded to

him shall be just cause for the annulment of the award and the forfeiture of: the proposal guaranty. The successful bidder may file with the City a written notice, signed by the Bidder or his authorized representative, specifying that the Bidder will refuse to execute the contract if presented to him. The filing of such notice shall have the same force and effect as the failure of the Bidder to execute the contract and furnish acceptable bonds within the time prescribed.

3.6 Contract Documents.

The Contract Documents shall consist of, but not be limited to, the following:

1. Accepted Proposal
2. Notice to Bidders
3. Contract Agreement
4. Bond for Faithful Performance
5. Bond for Labor and Materials
6. Addenda
7. List of Subcontractors
8. These Standard Specifications and General Provisions
9. The Special and Technical Provisions
10. Drawings
11. Permits from Agencies as Required
12. Insurance Certificates

3.7 Bond Substitutions, Renewal and Extension.

Should any bond become insufficient, the contractor shall renew the bond within 20 calendar days after receiving notice from the City.

Should any Surety at any time be unsatisfactory (licensed in the State of California with a B+ rating) to the City, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the contract until a new qualified Surety shall be accepted by the City.

Changes in the work, or extensions of time, made pursuant to the contract, shall in no way release the Contractor or Surety from their obligations. Notice of such changes or extensions shall be waived by the Surety.

3.8 Return of Proposal Guarantees.

Retained proposal guarantees will be held until the contract has been finally executed and returned to the Contractor (but not to exceed 60 days) after which all proposal guarantees (except bidders bonds and any guarantees which have been forfeited) will be returned to the bidders whose proposal they accompany.

Section 4 - Scope of Work

4.1 Intent of Plans and Specifications.

The intent of the Plans and Specifications is to describe the details for the construction and completion of the work which the Contractor undertakes to perform in accordance with the terms of the contract. Where the Plans or Specifications describe portions of the work in general terms but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the contractor shall furnish all tools, equipment, and incidentals, and do all the work involved in executing the contract in a satisfactory and workmanlike manner.

In the event materials or equipment are to be furnished by the City, as designated in the Special Provisions or as agreed on, this shall not relieve the Contractor of the requirements to furnish all other labor, materials and equipment to complete the contract.

4.2 Differing Site Conditions.

Attention is directed to Section 7104 of the Public Contract Code. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of:

1. Material that the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required by law to be removed to a Class I, Class II, or Class III disposal site.

2. Subsurface or latent physical conditions at the site differing materially from those indicated in this contract.

3. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract.

The Engineer will promptly investigate the conditions. If he finds that such conditions do materially differ, or do involve hazardous waste, and do cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work under this contract, an equitable adjustment will be made, as determined by the Engineer.

In the event of disagreement between the -Contractor and the Engineer whether the conditions do materially differ or whether hazardous waste is involved or whether the conditions cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any completion date required by the contract, but shall proceed with all work to be performed under the contract

4.3 As Built Drawings.

The Contractor shall maintain a set of project plans at the job site for the sole purpose of noting changes, details, corrections, and any other information reflecting or

clarifying actual conditions. Both the Contractor and the Engineer shall have access to and entrance of information thereon, such information duly initialed an dated. All entries shall .be clear and sufficiently detailed to be used as entries on the original plans as Final "As Built Drawings." The said plans at the job site shall be City Property under custody of the Contractor, returned to the City upon completion of the Project.

4.4 Work to be Done.

The intent is to prescribe complete work or improvement which the Contractor undertakes to do in full compliance with the plans, specifications, and contract. The Contractor shall perform all items of work covered and stipulated in the specifications and contract, together with any extra work, all in accordance with lines, grades, cross-sections, and dimensions shown on the plans. It is further intended that all miscellaneous work required to make driveways, sidewalks, intersections, roof drains, and other privately owned improvements conform to the new work shall be performed by the Contractor. The Contractor shall furnish, unless otherwise provided in these specifications, all material, implements, machinery, equipment, tools, supplies, transportation, and labor necessary to the prosecution and completion of the work.

All work described in the plans and specifications will be let under one contract unless otherwise set forth in the Notice to Bidders or on the Bidder's Proposal.

4.5 Alterations and Increased or Decreased Quantities.

The City reserves the right in writing, to increase or decrease the quantity, to order additions to, omissions from, or corrections, alterations and modifications in the line, grade, form dimensions, plan or kind or amount of work, or materials herein contemplated, or any part thereof, either before or after the beginning of construction, as may be deemed necessary or advisable by the Engineer, provided such alterations do not change the total cost of the project, based on original estimated quantities and the unit prices bid, by more than twenty percent (20%), and provided further that such items do not change the total cost of any major item by more than fifty percent (50%). (A major item is one, the total cost of which is more than ten percent (10%) of the total contract price.) Any alterations in excess of these limits will be treated as extra work and will be covered by a contract change order, the same as though the alteration were an extra work item.

Should conditions during the progress of the work make it impossible for the Contractor to comply strictly with the terms of the contract, the Contractor shall apply in writing to the Engineer for an alteration, provided that it is not detrimental to the work or does not entail additional cost. If such alteration is acceptable to the Engineer, the Contractor shall be notified in writing, whereupon the alteration may be made. When such alteration is not acceptable to the Engineer, the Contractor shall determine some other method of doing the work which shall be acceptable.

Such alteration and increased or decreased quantities shall in no way affect or make void this contract or any part thereof, except what is necessarily affected by such alteration and is clearly the evident intention of the parties to this contract.

4.6 Extra Work.

New and unforeseen items of work will be classed as extra work when they cannot be covered by any of the various items for which there is a bid price or by combinations of such items, or if the character of an item is materially changed on which the Contractor based his bid price, and that change materially increases or decreases the cost of the item as outlined in Section 401.2 hereof.

Prices for extra work shall be itemized and covered by a contract change order submitted by the Contractor and approved by the Engineer prior to actual starting of such work.

Should the parties be unable to agree on unit prices for the extra work, or if it is impractical, the Engineer may instruct the Contractor to proceed with the work by force account and he shall be paid as provided in Section 901.2 of these specifications.

4.7 Unauthorized Work.

Work done without lines and grades being given, work done beyond the lines and grades shown on the plans, work done in the absence or without the knowledge of the Engineer, including any work performed by subcontractors without proper superintendence by the Contractor, as provided for in Section 501.6, or any extra work done without written authority, will be considered as unauthorized and at the expense of the Contractor and will not be measured or paid for by the City.

4.8 Protection of Utilities.

A preliminary study of the location of underground utilities within the limits of the work has been made. The location of the underground utilities indicated on the plans is not guaranteed to be accurate or complete, but is plotted for the general information of the Contractor. The Contractor shall contact Underground Service Alert (USA) at (800) 227-2600 at least four (4) working days before excavating, to allow utility companies to mark and identify their respective utilities within the limit of the work. Aboveground utilities are not shown on the plans. It shall be the responsibility of the Contractor to coordinate and determine the exact locations and/or depths of all of the aboveground utilities, underground utilities, and their service locations.

The Contractor shall be responsible for protecting and supporting the aboveground utilities and the identified underground utilities that occur in the limits of the work with a method acceptable to the respective utility owners. The cost of protecting and supporting the utilities shall be included in the bid prices for the various items of work. Any identified damage to the SBC Telephone, PG&E, EBMUD, or Cable TV lines shall be repaired by the respective utility owner at the Contractor's expense.

4.9 Cleaning Up.

The Contractor shall not allow the site of the work to become littered with trash, rubbish, and waste material but shall maintain the same in a neat and orderly condition throughout the construction period. The Engineer shall have the right to determine what is or is not trash, rubbish or waste material and the place and manner of disposal.

The Contractor shall maintain a neat appearance to the work. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from surfaces to prevent marring or other damage.

Broken concrete debris, and unsuitable excavated native soil during construction shall be disposed of concurrently with its removal. If stockpiling is necessary all debris shall be placed in trash bins daily and shall be removed or disposed of weekly. Any waste shall not be buried on the site or disposed of into storm drains, sanitary sewers, streams, or waterways.

Forms or falsework that are to be re-used shall be stacked neatly concurrently with their removal. Forms and falsework that are not to be re-used shall be disposed of concurrently with their removal.

Full compensation for conforming to the provisions in this section, not otherwise provided for, shall be considered as included in prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

Sidewalks, street area, parking strips, and driveway approaches must be kept reasonably clean at all times during construction and be completely and carefully cleaned after the work has progressed beyond the immediate vicinity to the satisfaction of the Engineer. Reasonable cleanup is defined as no dust, rock, or mud on any portion of the public right-of-way or the private properties as a result of the Contractor's work.

4.10 Noise Control.

All construction machinery and vehicles employed on the project shall be equipped with approved sound muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the work. Section 701.11 specifies time limitation in which engine driven equipment shall not be operated.

4.11 Temporary Light, Power, and Water.

The Contractor shall at its own expense, furnish, install, maintain, and remove all temporary light, power, and water, including piping, wiring, lamps, and other equipment, necessary for the work. The Contractor shall not draw water from any fire hydrant, except to extinguish a fire, without first obtaining permission from the water agency concerned.

4.12 Coordination With Affected Residents.

This contract may include a significant amount of work within construction easements in private property. The Contractor shall be required to provide adequate notification to, and coordination with, the affected residents. At least 1 week prior to working in easements, the Contractor shall notify the affected residents in writing of the intention to perform work within their properties, the starting dates of work, and duration of the work. The Contractor shall only initiate an amount of work that can be reasonably completed on the same day. If the initiated work is unfinished, the Contractor shall provide adequate covers and appropriate barricades and warning signs to ensure public safety to the satisfaction of the Engineer. After completion of work in the easement area, the Contractor shall obtain written release from the property owners and give a copy to the Engineer. Any damages to the properties shall be restored and handled in accordance with Section 401.11 of this specification.

In addition, service connections may be required to be temporarily stopped for rehabilitation of the sewer mains and/or laterals. At least 1 week prior to working in a particular area, the Contractor shall notify the affected residents in writing of the intended work, the starting date and duration, and any coordination requirements to facilitate work progress. The Contractor shall be required to adequately notify affected residents of schedule changes.

For service connection disruptions required to make system improvements, the Contractor shall provide a second notice to residents/businesses not less than 48 hours prior to service interruption. For interruptions in service longer than the limits specified below, the Contractor shall at his cost arrange for and provide in-kind services. Maximum interruption time without provision of in-kind services for private residences shall be as follows:

Water Services: 4 hours
Sewer Services: 7 hours

All interruptions shall be restored by the Contractor at the end of each day.

The Contractor shall plan for and provide the services of a septic tank pumper truck to periodically pump out any sewage which may accumulate in excavation pits at the two-way cleanout location. Alternatively, the Contractor may utilize submersible sewage pumps or trash pumps to convey the sewage from the pits to a functional portion of the existing sanitary sewer within the project area.

The Contractor shall at all times perform his lateral connection work so as to minimize the quantity of sewage which may accumulate, to minimize adverse impacts on public health and sanitation and to minimize the potential for odors. The Contractor shall at all times maintain an adequate supply of bottled chlorine bleach (sodium hypochlorite solution) to treat any accumulated sewage should this be determined necessary by the Engineer to minimize odors and to protect the public and workers' health.

All costs to the Contractor for coordination with the affected residents shall be included in bid prices for the replacement or rehabilitation of sewer mains and laterals.

4.13 Protection and Restoration of Existing Improvements.

The Contractor shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property.

The Contractor shall repair or replace all existing improvements and street pavements which are not designated for removal (e.g., street sections, curbs, gutters, driveways, fences, walls, structures, landscaping, etc.) which are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements, and shall match them in finish and dimensions.

Prior to initiating work in the public right of way and in the easements, the Contractor shall make an audio/video cassette tape recording of the affected areas showing all existing improvements, and their conditions. The tapes shall be turned over to the Engineer and shall

be used as a historical recording of the pre-construction conditions. The costs of the pre-construction audio-visual survey shall be the responsibility of the Contractor.

Any damages to the private properties will be restored to the satisfaction of the property owners/Engineer within seven (7) days of the damage(s).

Damages within the public right of way including street pavement will be restored to the satisfaction of the Engineer after work on that particular block is completed.

4.14 Submittals.

4.14.1 Where required by the specifications, the Contractor shall submit descriptive information which will enable the Engineer to advise the Agency whether the Contractor's proposed materials, equipment or methods of work are in general conformance to the design concept and in compliance with the drawings and specifications. The information to be submitted shall consist of proposed construction schedule, traffic control plan, shoring, sheeting and bracing as required drawings, specifications, descriptive data, certificates, samples, test results and such other information, all as specifically required in the specifications. In some instances, specified submittal information described some, but not all, features of the material, equipment, or method of work. Features not requiring submittals shall be as specified.

4.14.2 Contractor's Responsibilities. Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the drawings. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment, which are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated. The Contractor shall insure that there is no conflict with other submittals and notify the Engineer in each case where his submittal may affect the work of another contractor or the Agency. The Contractor shall insure coordination of submittals among the related crafts and subcontractors.

4.14.3 Transmittal Procedure

A. General. Submittals regarding material and equipment shall be accompanied by a transmittal form. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. Deviation from Contract. If the Contractor proposes to provide material, equipment, or method of work which deviates from the requirements of the plans and specifications, he shall indicate as "deviation" on the transmittal form accompanying the submittal copies.

C. Submittal Completeness. Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

4.14.4 Review Procedure. Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Contractor's judgment of their conformance to the requirements of the plans and specifications. Other features and characteristics are specified in a manner which enables the Contractor to determine acceptable options without submittals. The review procedure is based on the Contractor's guarantee that all features and characteristics not requiring submittals conform to the plans and specifications. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes except where specifically indicated or required by the contract documents or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.

When the contract documents require a submittal, the Contractor shall submit the specified information as follows:

1. One reproducible original of all the submitted information. When individual sheets in the submittal exceed 8-1/2 inches x 11 inches, a sepia shall be submitted.

2. Four copies of all the submitted information.

Unless otherwise specified, within 10 calendar days after receipt of the submittal, the Engineer shall review the submittal and return one copy of the marked-up reproducible original noted in 1 above. The reproducible original will be retained by the Engineer. The returned submittal shall indicate one of the following actions:

1. If the review indicates that the material, equipment or work method complies with the contract documents, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections.

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT." Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

4. If the review indicates that the material, equipment, or work method does not comply with the contract documents, copies of the submittal will be marked "REJECTED - SEE REMARKS." Submittals with deviations which have not been identified clearly may be

rejected. Except at his own risk, the Contractor shall not undertake the work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or " MAKE CORRECTIONS NOTED."

4.14.5 Effect of Review of Contractor's Submittals. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or the Agency, or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Agency has no objection to the Contractor, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

4.15 Final Cleaning Up.

Upon completion of the work, and before acceptance and final payment, the Contractor shall clean the project areas and remove all surplus and discarded materials, falsework, rubbish and temporary structures and restore in an acceptable manner all property, both public and private, which has been damaged during the prosecution of the work, and shall leave the improvement in a neat and presentable condition throughout the entire length of the improvement under contract to the satisfaction of the Engineer. If the Conditions as noted above are not corrected immediately, the Engineer may declare an emergency and take necessary action in accordance with Section 401.7-1 of this specification.

4.16 Changed Conditions.

The Contractor shall notify the Engineer in writing of the following Work site conditions, hereinafter called changed conditions, promptly upon their discovery and before they are disturbed.

1. Subsurface or latent physical conditions differing materially from those represented in the Contract; and

2. Unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character being performed.

The Engineer will promptly investigate conditions when notified or any conditions discovered by him which appear to be changed conditions. If the Engineer determines that the conditions are changed conditions and that they will materially increase or decrease the costs of any portion of the Work, a Change Order will be issued adjusting the compensation for such portion of the work in accordance with Subsection 401.3. If the Engineer determines that conditions of which has been notified by the Contractor do not justify an adjustment in compensation, the Contractor will be so advised in writing. Should the Contractor disagree with such determination, it may submit a notice of potential claim to the Engineer, as provided in Subsection 501.12.

If the Engineer determines that the conditions are changed conditions and that they will materially affect the performance time, the Contractor, upon submitting a written request, may be granted an extension of time subject to the provisions of Subsection 801.7.1.

The Contractor's failure to give notice of changed conditions promptly upon their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith.

4.17 As-Built Records.

The Contractor shall maintain at the jobsite one (1) set of Plans marked to show any deviations which have been made from the Plans, including buried or concealed construction and utility features revealed during the course of construction. Record the horizontal and vertical location of all buried utilities that differ from the Plans. These Plans shall be available for review by the Engineer at all times. Upon completion of the work, deliver the marked set of prints in good condition to the Engineer for incorporation into the original drawings.

Section 5 - Control of the Work and Materials

5.1 Authority of Engineer.

The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and. work performed and as to the manner of performance and rate of progress of the work; all questions which may arise as to the interpretation of the Plans and Specifications, all questions as to the acceptable fulfillment of the contract on the part of the Contractor; arid all questions as to compensation. His decision shall be final and he shall have authority to enforce and make effective such decisions and orders which the Contractor fails to carry out promptly.

5.2 Assignment.

The performance of the contract may not be; assigned, except upon the written consent of the Engineer. Consent will not be given to any proposed assignment which would relieve the original Contractor or is surety of their responsibilities under the contract nor will the Engineer consent to any assignment of a part of the work under the contract.

5.3 Subcontracting.

The Contractor shall give his personal attention to the fulfillment of the contract and shall keep the work under his control.

Subcontractors will be recognized only as employees of the contractor and he will be held responsible for their work, which shall be subject to the provisions of the contract and specifications.

5.4 Precedence of Contract Documents.

In the event of any conflict in the provisions thereof, the terms of said documents shall control, each over the other, in the following order:

1. Permits from other agencies as required.
2. Supplemental Agreements
3. Contract Change Orders
4. Approved Revisions to the Plans
5. Addenda
6. Proposal Packet
7. Project Special Provisions
8. Reference Specifications
9. Standard Plans
10. Standard Plans for the City of Albany
11. Special Provisions of the City of Albany
12. General Provisions of the City of Albany

The plans, specifications and other Contract Documents will govern the work. The Contract Documents are intended to be complementary and cooperative and to describe and provide for a complete project. Anything in the specifications arid not on the plans, or on

the plans and not in the specifications, shall be as though shown or mentioned in both. Reference specifications and standard plans are a part of the Contract Documents.

In the event of any discrepancy between any drawing and the figures written thereon, the figures shall be taken as correct.

5.5 Plans and Working Drawings.

The contract plans furnished consist of general drawings and show such details as are necessary to give a comprehensive idea of the construction contemplated. All authorized alterations affecting the requirements and information given on the contract plans shall be in writing.

Working drawings or plans for any structure not included in plans furnished by the Engineer shall be approved by the Engineer before any work involving these plans is performed, unless approval be waived in writing by the Engineer.

It is mutually agreed, however, that approval by the Engineer of the Contractor's working plans does not relieve the Contractor of any responsibility for accuracy of dimension and details, and that the Contractor shall be responsible for agreement and conformity of his working plans with approved plans and specifications.

Full compensation for furnishing all working drawings shall be considered as included in the price bid for the contract items of work to which such drawings relate and no additional compensation will be allowed therefore.

The Contractor shall keep at the work site a copy of the Plans and Specifications, including addenda and change orders, to which the Engineer shall have access at all times.

While it is believed that much of the information pertaining to conditions which may affect the cost of the proposed work will be shown on the plans or indicated in the specifications, the City does not warrant the completeness or accuracy of such information. It is the Contractor's responsibility to ascertain the existence of any conditions affecting the cost of work which would have been disclosed by careful examination of the site.

Existing improvements visible at the job site, for which no specific disposition is made on the plans, but which could reasonably be assumed to interfere with the satisfactory completion of the improvements contemplated by the plans, shall be removed and disposed of by the Contractor as part of the work at no additional cost to city or left in place and protected by the Contractor, at the direction of the. Engineer.

The Contractor shall, upon discovering any error, omission or conflict in the plans or specifications, immediately call it to the attention of the Engineer.

5.6 Shop Drawings.

When shop drawings or other details are necessary to adequately control the work or are required by the Contract Documents, or requested by the Engineer, they shall be prepared in accordance with current modern engineering/architectural practice and at the

Contractor's expense. Drawings shall be of a size and scale to show clearly all necessary details and shall be transmitted by letter, to the Engineer for review or correction at least ten (10) working days before such drawings will be required for commencing the work.

Materials shall not be furnished or fabricated nor any work done for which drawings are required, before review of the drawings.

When first submitted by the Contractor, each drawing shall be a good-quality transparency, accompanied by five prints. If reviewed without change or correction, three such copies will be returned to the Contractor. If extensive additions or corrections are required, the Engineer will return one marked-up copy to the Contractor, together with the transparency, for correction and resubmission. The Engineer will retain approved transparencies.

Review and approval of drawings by the Engineer shall not relieve the Contractor from the responsibility for errors or omissions in the drawings or from deviations from the Contract Documents unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal submitted with the drawings. The Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by use of such drawings.

The Engineer's review and approval is a general review only, for compliance with the Contract Documents, and does not constitute a detailed check of dimensions, quantities, materials, or fabrication processes. This review shall not relieve the contractor, subcontractor, or vendor from conforming with all aspects of the Contract Documents, and neither the Engineer nor the City shall be held responsible for any errors or omissions by reason of such review.

5.7 Lines and Grades.

Such stakes or marks will be set by the Contractor as the Engineer determines to be necessary to establish basic control lines and grades required for the completion of the work.

Basic initial horizontal arid vertical control points will be established-by the Engineer at no cost to the Contractor. These points shall be used as datum for the work. All additional survey, layout, and measurement work shall be the Contractors responsibility.

The Contractor shall deliver written notice at least two (2) working days prior to the time when he/she will require the services of the Engineer for setting initial control points.

The Contractor shall preserve all initial control points, permanent survey monuments, bench marks or boundary markers, in their proper places until authorized to remove and reset them by the Engineer. All expenses incurred in resetting such survey controls shall be paid by the Contractor.

All construction surveys and measurements, stakes and marks and all such related work necessary to prosecute the project except such initial basic control survey furnished by the Engineer, shall be the Contractor's responsibility and the costs thereof included in the

various Contract items of work. Such construction surveys shall be performed only under supervision of properly experienced and licensed persons and be sufficiently extensive, in the opinion of the Engineer, to assure compliance with the plans and specifications.

5.8 Superintendence.

At all times during the progress of the work, the Contractor shall have an authorized representative or agent present at the construction site who shall have complete authority to represent and to act for the Contractor. Before initial work is begun on the contract, the Contractor and his superintendent shall file with the Engineer, addresses and telephone numbers where they can be reached during all hours, including nights and weekends, when the work is not in progress.

Whenever the Contractor or his authorized representative is not present on any particular part of the work where it may be desired to give direction, orders may be given by the Engineer, which shall be received and obeyed by whoever may have charge of the particular work in reference to which the orders are given.

5.9 Defective and Unauthorized Work.

All materials, parts and equipment furnished by the Contractor in the work shall be new, high grade, and free from defects. Used or secondhand materials, parts and equipment may be used only if permitted by the Special Provisions. Workmanship shall be in accord with the generally accepted standards. Material and workmanship shall be subject to the Engineer's approval.

Materials and workmanship not conforming to the requirements of the Contract Documents shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the Contractor, at his expense, when so directed by the Engineer.

Any work done beyond the limits of Work, lines and grades shown on any approved plans or established by the Engineer, or any extra work done without written authority, will be considered as unauthorized and will not be paid for.

Upon failure on the part of the Contractor to comply within time specified in written notice, but in no case more than 5 days, with any order of the Engineer made under the provisions of this article, the Engineer shall have authority to cause defective or unauthorized work to be remedied, or removed and replaced, and to deduct the costs thereof from any monies due or to become due the Contractor, Costs to be deducted shall include twenty (20) percent markup for engineering and administration by the City.

5.10 Character of Workman.

If any subcontractor or person employed by the contractor who appears to the Engineer to be incompetent or to act in a disorderly or improper manner, he shall be discharged from the site immediately by the Contractor upon written direction of the Engineer, and such person or subcontractor shall not again be employed on the work.

5.11 City Furnished Materials.

Materials, if furnished by the City, will be made available as designated in the Special Provisions, The cost of loading, unloading, hauling and handling and placing City-furnished materials shall be considered as included in the price bid for the contract item involving such City-furnished material.

Contractor shall inspect and assure himself of the amount and soundness of such materials and acknowledge written receipt for same.

The Contractor will be held responsible for all materials furnished to him, and he shall pay all demurrage and storage charges. City-furnished materials lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the City for the cost of replacing City-furnished material and such costs may be deducted from any monies due or to become due the Contractor.

5.12 Storage of Materials.

Materials shall be stored in such a manner as to insure the preservation of their quality and fitness for the work. When considered necessary by the Engineer, materials shall be place on platforms or other hard, clean surfaces and covered: when directed. Materials shall be stored so as to facilitate inspection and if necessary to protect the public or the material shall be suitably fenced.

Unless otherwise designated in the Special Provisions, locations and arrangements for storage sites for materials and equipment outside the right-of-way or limits of work shall be selected and maintained by the Contractor at his expense. Full compensation for furnishing such storage sites as may be necessary or required by the Contractor shall be considered as included in the prices bid and no additional compensation will be allowed therefore.

5.13 Trade Names and Alternatives.

It is the intent of these specifications to permit the Contractor to supply any of the materials specified or offer an equivalent. The Engineer shall determine whether the material offered is equivalent to that specified. Adequate time shall be allowed for the Engineer to make this determination.

Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words "or approved equal." A listing of materials is not intended to be comprehensive, or in order to preference. The Contractor may offer any material, process, or equipment which he considers to be equivalent to that indicated. Requests for substitutions of equivalent materials and data substantiating said request shall be made in' ample time to permit approval without delaying the work.

The Contractor shall, at his expense, furnish data concerning items offered by him as equivalent to those specified. He shall have the material tested as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including

durability, finish, efficiency, dimensions, service, uniformity, and suitability are such that the item will fulfill its intended function.

Test methods shall be subject to the approval of the Engineer. Test results shall be reported promptly to the Engineer, who will evaluate the results and determine if the substitute item is equivalent. His findings shall be final. Installation and use of a substitute item shall not be made until approved by the Engineer.

If a substitute offered by the Contractor is found to be not equal to the specified material, the Contractor shall furnish and install the specified material.

In the event an item is specified for purposes of matching, aesthetics, maintenance, interfacing or other reason based on similarity or compatibility with existing or planned facilities, there may be no acceptable substitute.

The specified contract completion time shall not be affected by any circumstance developing from the provisions of this subsection.

Cost of any redesign necessitated by the substitution shall be borne by the Contractor.

5.14 Samples and Tests.

Before incorporating materials in the work, the Contractor shall submit samples, as the Engineer may require, at no cost to the City. The Contractor, at his own expense, shall deliver materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing shall be at no expense to the Contractor. Contractor shall however bear all costs initial and otherwise of materials or services proposed for substitution. Any retesting shall be at the Contractor's expense. When required by the Engineer, the Contractor shall furnish at no cost to the City the manufacturer's Certificate of Compliance and other documents which state that tests and quality have been passed.

The Contractor shall notify the City in writing at least fifteen (15) calendar days in advance, of his intention to use materials for which tests are specified, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of material.

5.15 Inspection.

All work and materials are subject to inspection and approval of the Engineer. The Contractor shall notify the Engineer before noon on the workday preceding the working day inspection is required. Unless otherwise authorized, work shall be done only in the presence of the Engineer or his authorized representatives. Any work done without proper inspection will be subject to rejection.

The Engineer and his authorized representatives shall at all times have access to the work during its construction at shops and yards as well as the project site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship

are in accordance with the Contract Documents. Inspection of the work shall not relieve the Contractor of the obligation to fulfill all conditions of the contract.

No portion of any work or installed materials shall be covered or concealed in any manner whatsoever without first obtaining an inspection. The cost of uncovering and replacing work and materials not inspected shall be borne by the Contractor.

Overtime construction work performed at the option of, or for the convenience of, the Contractor will be inspected by the City at expense of the Contractor and will be deducted from any monies due or to become due to him. For any such overtime beyond the regular 8-hour day and for any time worked on Saturday, Sunday, or holidays, the charges will be at cost plus direct cost percentage markup.

There will be no charge for the inspection of overtime work ordered by the Engineer.

Projects financed in whole or in part with County, State or Federal funds shall be subject to inspection at all times by the agency involved.

5.16 Suggestions to the Contractor.

Any plan or method of work suggested by the Engineer or Designated Authority to the Contractor but not specified whether followed, or ignored by the Contractor in whole or part, shall be at the risk and responsibility of the Contractor, and the City, Engineer, or Designated Authority shall not be responsible therefore.

5.17 Foreign Materials.

Section 6—1.08 of the State Standard Specifications shall apply to any item processed, manufactured or assembled outside the United States.

5.18 Final Clean Up.

Before final inspection of the work, the. Contractor shall clean the construction area, material sites, and all ground occupied by him in connection with the work of all rubbish, excess materials, form lumber, etc. All parts of the work shall be left in a neat and presentable condition.

5.19 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. Deviation from the approved plans, as may be required by the exigencies of construction, will, in all cases, be determined by the Engineer and authorized in writing.

5.20 Coordination with Contract Documents.

These specifications, the plans, and all supplementary documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative, to describe and provide for a complete work. If there is a conflict between Contract Documents, the document highest in precedence shall control. The precedence shall be:

1. Federal and State requirements.

2. Permits from other agencies as may be required by law.

3. Special Provisions

4. City of Albany Standard Specifications, General Provisions and Technical Provisions, Current Edition.

5. Contract Plans, including General Notes.

6. City of Albany Standard Details, Current Edition.

7. Standard Details for Public Works Construction, Current Edition.

8. Standard Specifications for Public Works Construction, Current Edition, Part 2 - Construction Materials and Part 3 - Construction Methods.

9. Reference Specifications.

Change orders, supplemental agreements, and approved revisions to Plans and Specifications will take precedence over documents listed above. Detailed plans shall have precedence over general plans.

5.21 Interpretation of Plans and Specifications.

Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Plans or Specifications, the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform to the same as part of the contract, so far as may be consistent with the original specifications; and in the event of any doubt or question arising regarding the true meaning of the Specifications, reference shall be made to the Engineer, whose decision thereon shall be final.

In the event of any discrepancy between any drawing and the figures written thereon, the figures shall be taken as correct.

Any part of the work which is not mentioned in the Specifications, but is shown in the Plans, or any part not shown on the Plans but described in the Specifications, shall be performed by the Contractor.

5.22 Authority of Duties and Resident Engineer.

Duly authorized Resident Engineers, who shall perform their duties under the direction of the Engineer, will be assigned to the project or each part thereof. The presence of the Resident Engineer shall in no way lessen the responsibility of the Contractor. In case of any dispute arising between the Contractor and the Resident Engineer as to materials furnished or the manner of performing work, the Resident Engineer shall have authority to reject materials or suspend the work until the questions at issue can be referred to and decided by the Engineer.

The Resident Engineer is not authorized to revoke, alter, enlarge, relax, or release any requirement to these specifications, nor to approve or accept any portion of the work, nor to issue instructions contrary to the Plans and Specifications.

5.23 Substitution.

Any materials, process, or article may be requested for a substitution by the Contractor, in lieu of that specified or shown, under the following conditions:

1. Requests must be submitted in writing sixty (60) days prior to starting the work, as established by the Engineer, so as not to cause any delay in completion of the project.

2. The Contractor shall, at no cost to the City, furnish all testing, data, engineering, and design services (including the review costs incurred by the Engineer) for items offered as equivalent to those specified. Test methods and findings shall, prior to installation, be subject to approval of the Engineer.

3. On sewer rehabilitation projects, the sewer rehabilitation methods shown on the Plans are the minimum levels acceptable for the respective reaches. The three sewer rehabilitation methods, in descending order of acceptability, are as follows:

Replacement
Inversion-Lining
Sliplining

Substitution with a lower level rehabilitation method will not be permitted unless field conditions dictate that a lesser method will provide comparable sewer integrity. A credit change order will be prepared accordingly. The foregoing shall require the approval of the City and the Engineer. Substitution with higher level rehabilitation method may be acceptable subject to approval of the Engineer.

1. No requests for substitution will be considered during the bidding period.

2. Any substitution of any material, process, or article shall be at no additional costs to the City. Substitution with a lesser level rehabilitation method shall be accomplished by credit change order. Substitution with a higher level method shall be accomplished by a no cost change order.

The Engineer reserves all rights and will have final approval as to the substitution of alternative rehabilitation methods.

5.24 Reinspection, Retesting, and Re-staking.

All costs incurred by the City for reinspection of poor workmanship, failing air tests, failing compaction tests, failing tests of any kind, and re-staking caused by the Contractor shall be deducted from the amounts due the Contractor by contract change order. The Engineer's decision as to determination of poor workmanship shall be final.

Section 6 - Legal Relations and Responsibility

6.1 Laws to be Observed.

The Contractor shall keep himself fully informed of all existing and pending County, State and National laws and regulations and all municipal ordinances and regulations of the City of Albany which in any manner affect those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders-arid decrees of bodies or tribunals having any jurisdiction or authority over the same; and shall protect and indemnify the City of Albany and all of its Officers, Employees, Agents and Servants against any claim or liability arising from or based on the violation of any such laws, ordinances, regulations, orders, or decrees whether by himself, his employees, or his subcontractors. If any discrepancy or inconsistency is discovered in the Contract Documents for the work in relation to any such law, ordinance, regulations, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

6.2 Contractor's Equipment and Facilities.

The Contractor shall furnish and maintain; in good condition all equipment, plant, and other facilities as required for the proper execution and inspection of the work. Such facilities shall meet all requirements of applicable ordinances and laws.

6.3 Labor.

6.3.1 General - Only competent workmen shall be employed on the work. Any person employed who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform his work properly and acceptably, shall be immediately removed from the work by the Contractor and not be reemployed on the work.

6.3.2 Laws - The Contractor, his agents and employees shall be bound by and comply with all applicable provisions of the California Labor Code and with Federal, State and local laws related to labor.

The Contractor shall strictly adhere to the' provisions of the Labor Code regarding minimum wages, the 8-hour day and 40-hour week, overtime, Saturday, Sunday, and holiday work, and non-discrimination because of race, color, national origin, ancestry, religion and other characteristics specified in the Labor Codes. The Contractor shall forfeit to the City the penalties prescribed in the Labor Code for violations.

In accordance with the California Labor Code, the City Engineer has on file a schedule of prevailing wage rates for the types of work to be done under these specifications. The Contractor shall pay -not less than the prevailing rates as required in the California Labor: Cede, unless the project is "locally funded" in which case prevailing wage rates do not apply. A copy of the applicable prevailing rate of per diem wages are on file in the office of the City Engineer.

Pursuant to Section 1773.8 of the California Labor Code, each workman shall be paid subsistence and travel as required by the collective bargaining agreements on file with the State of California, Department of Industrial Relations.

6.3.3 Apprentices - The Contractor shall comply with Section 1777.5 and 1777.60 of the California Labor Code relating to the employment of indentured apprentices on work to be performed hereunder.

6.4 Contractor's Licensing Laws.

Attention is directed to the provisions of the California Business and Professions Code concerning the licensing of contractors. All contractors shall be licensed in accordance with the laws of the State of California and any contractor not so licensed is subject to the penalties imposed by such laws.

6.5 Vehicle Code.

Vehicles and equipment traveling to and from the 'limits of work" or "job site" over or along a public way shall conform in every respect to the applicable provisions of the Vehicle Code.

6.6 Weight Limitation.

Unless expressly permitted in the Special provisions, construction equipment or vehicles of any kind shall not exceed the maximum weight and size limitations set forth in the California Vehicle Code and Albany Municipal Code unless approved by the Engineer in writing. The Contractor shall repair all facilities damaged by overloaded equipment or vehicles.

6.7 Payment of Taxes.

The contract prices bid for the work shall include full compensation for all taxes which the Contractor is required to pay, whether imposed by Federal, State or local government, including, without being limited to. Federal excise tax. No tax exemption certificate nor any document designed to exempt the Contractor from payment of any tax will be furnished to the Contractor by the City for Albany, as to any tax on labor, services, materials, transportation, or any other items furnished pursuant to this contract.

6.8 Permits and Licenses.

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. On contracts let by the City, fees, and charges for City issued permits will be waived. All contractors and subcontractors must have or obtain a City Business license and such business license fees will be required for all work undertaken within the limits of the City of Albany.

6.9 Patents.

The Contractor shall hold and save the City, its officers, agents, servants, and employees harmless from and against all and every demand or demands, of any nature or kind, for or on account of the use of any patented; invention, process, equipment, article, or appliance employed in the execution of the work or included in the material or supplies

agreed to be furnished under the contract, and should the Contractor, his agents, servants, or employees, or any of them be enjoined from furnishing or using any invention, process, equipment, article,, materials, supplies or appliance supplied or required to be supplied or used under this contract, the Contractor shall promptly substitute other inventions, processes, equipment, articles, materials, supplies, or appliances in lieu thereof, of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Engineer. Or, in the event that the Engineer elects, in lieu of such substitution, to have supplied, and to retain and use, any such invention, process, equipment, article, material, supplies, or appliances, as may be this contract be required to be supplied and used, in that event the Contractor shall at his expense pay such royalties and secure such valid licenses as may be requisite and necessary to enable the City its officers, agents, servants, and employees, or any of them, to use such invention, process, equipment, article, material, supplies, or appliances without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof. Should the Contractor neglect or refuse promptly to make the substitution hereinbefore required, or to pay such royalties and secure such licenses as may be necessary and requisite for the purpose aforesaid, then in that event the Engineer shall have the right to make such substitution, or the City may pay such royalties and secure such licenses and charge the cost thereof against any money due the Contractor from the City, or recover the amount thereof from him and his surety, notwithstanding final payment under this contract may have been made.

6.10 Safety Provisions.

The Contractor Shall conform to all requirements of title 88 chapter 4 of the California Administrative Code and the rules and regulations pertaining to safety established by the California Division of Industrial Safety, California Occupational Safety and Health Act, the California and Federal Office of Safety and Health Administration and other applicable regulations.

6.11 Public Convenience and Safety.

The Contractor shall so conduct his operations as to offer the least possible obstruction and inconvenience to the public. He shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the safety, rights, and convenience of the public.

Provisions shall be made to insure proper functioning of all gutters, sewers, drainage ditches, culverts, and natural water courses.

No road or street shall be closed to the public except with the permission of the Engineer.

Construction equipment shall interfere as little as possible with the free passage of traffic. The Contractor shall provide at his own expense the necessary signs, lights and flagmen to safely direct public traffic past such equipment.

No material or other obstruction shall be placed within 15 foot radius of active fire hydrants and they shall at all times be kept readily accessible to the Fire Department, unless approved by the Engineer.

The Contractor shall take due precaution against starting fires, and shall be responsible for any damage caused by fire started by his forces.

6.12 General Safety

6.12.1 General - In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

Any duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work.

The Contractor shall take all reasonable precautions for the safety and shall provide all reasonable protection to prevent damage, injury or loss to; all employees on the work and all other persons who may be affected thereby; all work, materials, and equipment to be incorporated therein, whether in storage on or off the project site, under the care, custody or control of the Contractor or any of his subcontractors; and other property on the project site or adjacent thereto, including trees, shrubs, lawns, fences, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall be held fully responsible for such safety and protection until acceptance of the work. The City shall have the right to require warehousing, watch service or other types of protection if the same is deemed necessary.

The Contractor shall comply with the rules and regulations pertaining to safety established by the Safety and Health Regulations for Construction under QSHA (Occupational Safety and Health Administration) and the California Division of Industrial Safety arid all other applicable laws, ordinances, rules, regulations and orders of any public authority having Jurisdiction, for the safety of persons or property or to protect them from damage, injury or loss.

The Contractor shall erect and maintain all reasonable safeguards for safety and protection of persons, including but not limited to; posting; danger signs, warning lights, reflectors, fences, barriers, warnings ^against hazards, promulgating safety regulations, and any other necessary, safety devices and measures in sufficient quantity to effectively warn of hazards to vehicles or persons at or adjacent to the project site. If contaminated soil is discovered during excavation or grading, see Chart No. 1 for process to follow.

In areas concerning the safety of the public and/or employees, whenever two or more laws, regulations, or standards apply, the more restrictive of those laws, regulations, or standards shall govern.

6.12.2 Excavation Safety.

A. Plans - Attention is directed to the provisions of Section 6705 of the Labor Code. Excavation for any trench 5 feet or more in depth shall not begin until the Contractor has received approval from the Engineer of the Contractor's detailed plan for worker protection from the hazards of caving ground during the excavation of such trench. Such plan, including Cal/OSHA excavation permit, shall be submitted at least 10 days before the Contractor intends to begin excavation for the trench and shall show the details of the design of shoring, bracing, sloping or other provisions to be made for worker protection during such excavation. No such plan shall allow the use of shoring, sloping or a protection system less effective than that required by the Construction Safety Orders for the division of Industrial Safety and if such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

B. Confined Spaces shall be per Cal OSHA Standards.

6.12.3 Material Safety Data Sheet (MSDS) -Attention is, directed to the provisions of General Industry Safety Orders §5194 Title 8, California Administrative Code. The Contractor shall submit to the Engineer a Material Safely Data Sheet or a letter from the manufacturer or supplier stating that an MSDS is not required for each hazardous substance proposed to be used, ten days prior to the delivery of such material to the jobsite or use of such material at a manufacturing plant where the Engineer is to perform an inspection. For materials which' are to be tested on District laboratories, the MSDS shall be submitted with the sample(s). Hazardous substance is defined as any substance included in the list (Director's List) of hazardous substances prepared by the Director, California Department of Industrial Relations, pursuant to Labor Code Section 6382. Failure to comply with the submitted of an MSDS for any hazardous material will result in suspension of construction work.

6.12.4 Payment - All costs incurred in providing and conforming to safety requirements shall be included in the prices bid and no separate payment will be made therefore.

6.13 Traffic Control.

Unless otherwise provided in the special provisions, one lane in each direction for public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

For the Contractor's convenience and coordination with the public, the Contractor shall submit a proposed "Parking Restriction Plan" to the City with the required "Work Schedule" for City approval.

On residential streets the Contractor's operation shall be conducted in such a manner as to allow parking on one side of the street at all times, unless permitted otherwise in writing by the City. Parking restriction necessitated by the Contractor's operations must be posted at least 24 hours prior to their being effective.

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 street lighting systems shall be kept in operation for the benefit of the traveling public during progress of the work.

The Contractor may be required to temporarily cover certain signs which regulate or direct public traffic. The Engineer will determine which signs shall be covered and period of covering.

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

Roadway excavation and the construction of embankments-shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory or 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; and if ordered by the Engineer, roadway cuts shall be excavated in lifts and embankments 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 only constructed on one-half the width of the traveled way at a time and 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. That portion of travel way left open to traffic shall not be less than required for fall width safety as directed by the Engineer.

While subgrade and paving operations are underway, 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.

Temporary road closures between the hours of 8:30 a.m. and 4:00 p.m., Monday through Friday (except Holidays), may be approved by the City provided such request is submitted in writing within the required "Work Schedule." If approved by the City, the Contractor shall post advisory signs notifying the public of such proposed temporary closure not less than 72 hours prior to such approved closure. Advisory signs shall be all approved by the City at the Contractor's expense.

At locations where traffic is being routed through construction under one-way controls and when ordered by the Engineer, the movement of the Contractor's equipment from one portion of the work to another shall be governed in accordance with such one-way controls.

In order to expedite the passage of public traffic through or around the work and where ordered by the Engineer, the Contractor shall install signs, lights, flares, barricades, and other warning safety devices for the sole convenience and direction of public traffic. Also where directed by the Engineer, the Contractor shall furnish competent flagmen whose sole duties shall consist of directing the movement of public traffic through or around the work.

Whenever a portion of the project has been completed, the Contractor shall open it to use by the public if the Engineer so orders or may open it to use by the public if the Engineer so consents. In either case the Contractor will not be allowed any compensation due to any delay, damage, or inconvenience to his operations caused by such public use. The Contractor will riot be relieved of any other responsibility under the contract or will he be relieved of cleanup and finishing operations.

The Contractor shall provide the necessary traffic control-such as, but not limited to, barricades, signs, flagmen, lights and other warning and safety devices as required by the latest manual approved by the California Department of Transportation for traffic control through construction areas.

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at no cost to the City. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

All costs to the Contractor for Traffic Control shall be considered as included in the various contract bid prices and no additional compensation shall be made therefore.

Temporary Traffic Striping and Pavement Marking shall be per CalTrans' standards.

Where applicable, temporary school markings (e.g., yellow crosswalks, etc.) shall be applied prior to reopening work areas to public traffic.

Temporary striping and marking materials and method(s) of application shall be approved by the Engineer.

6.14 Access for Adjacent Property.

Convenient access to driveways, houses, and buildings along the line of the work shall be provided and maintained and temporary approaches to crossings or intersecting highways shall be provided and maintained 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.

6.15 Storage of Material Temporary Equipment.

No material or equipment shall be stored where it will interfere with the free and safe passage of the public, 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 public use.

6.16 Use of Explosives.

All persons engaged in the activities of receiving, storing, using, handling or transporting any explosives must obtain a permit from the Fire Department; and. all work shall be governed by the Health & Safety Code and any amendments or existing articles of the State of California Construction Safety Orders. The Engineer must approve any use of explosives in writing. In general, the use of explosives will not be allowed unless it can be demonstrated to the Engineer's satisfaction that other methods cannot accomplish the work.

6.17 Protection and Restoration of Improvements.

6.17.1 General - Contractor shall protect, shore, brace, support, and maintain all existing surface and subsurface improvements uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod, plantings, and shrubs, shall be restored to match their original condition or better. All replacements shall be made with new materials.

Contractor will be held responsible for any damage to existing structures, work, materials, or equipment because of his operations and shall repair or replace any damaged structures, work materials, or equipment to the satisfaction of, and at no additional cost to, the City.

6.17.2 Document Preconstruction Condition - Contractor shall be responsible for preconstruction surveys to document the condition of existing-improvements. The Contractor shall be responsible to adequately document the condition for size, kind, quantity and the extent of existing improvements. For sanitary sewer laterals, the Contractor shall provide not less than one still photograph of each upper lateral location, with date and address noted on back. Photographs shall be for the purpose of documenting the pre-existing condition at the site of work. All surveys shall be delivered to the City prior to commencing work on any given lateral. In the absence of adequate pre-construction documentation, the Engineer's judgment shall be final.

6.17.3 Tree and Plant Protection - No trees or cultured plants shall be removed or damaged, unless the Contractor obtains the written permission of the property owner and Engineer. Whenever practicable. Contractor shall tunnel beneath trees when on or near the line of trench. Hand excavation shall be employed as necessary to prevent injury to trees and other plants.

All trees and other vegetation that are removed shall be disposed of by the Contractor as approved by the Engineer. All trees and plants not removed shall be protected against injury from construction operations.

Each tree injured beyond repair or removed shall be replaced with a similar tree the nearest size possible. All trimming, repair, and replacement of trees and plants shall be performed by qualified nurserymen or horticulturists.

6.17.4 Lawn Restoration - All lawn areas that have been disturbed by the contractor's construction activities or by parking of equipment, shall be restored using methods approved by the Engineer. The top surface elevation of the new sod shall match the preconstruction elevation.

The soil used in the repair work shall be commercially available processed topsoil. Sod shall be cut in strips or rectangular sections which may vary m length, but shall be of equal width and of a size that will permit the sections to be lifted and rolled without breaking. All sod shall be cut to a thickness of 1/2 to 3/4 inch. Fertilizer shall be pelleted or granulated and shall have an analysis of equal parts of available nitrogen, phosphorus, and potassium in percent by weight in order to supply the number of pounds of the pure chemicals per square foot recommended by the manufacturer. Water shall be free from any substances harmful to the growth of grass and shall be from a source approved by the Engineer prior to use.

Sod shall be placed after the soil has been adequately prepared and after the fertilizer has been applied as recommended by the manufacturer. Sod shall be laid smoothly, edge to edge, and with staggered joints.

All sodded areas shall be maintained in accordance with Section 20 of the "Technical Provisions." Maintenance shall include watering, re-sodding, repair of erosion damage, and all other operations necessary to obtain an acceptable grass cover. Watering shall be required if natural rainfall is not sufficient to maintain the sod bed in a thoroughly moist condition. Contractor shall provide water for watering. Sodded areas that have turned brown prior to final acceptance of the project shall be re-sodded. Original grades of the grass-covered areas shall be maintained after commencement of sodding operations and during the maintenance period.

6.17.5 Fences - All existing fences affected by the work shall be maintained by the Contractor until completion of the work.

Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained 'from the Engineer and owner of the fence and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

On completion of the work across any tract of land. Contractor shall restore all fences to their original or to a better condition and to their original location.

6.17.6 Restoration of Driveways. Sidewalks. Retaining Walls. Curbs, and Gutters - The Contractor shall observe the following requirements:

To the extent possible, construction shall be conducted without disturbing concrete driveways. All concrete curbs, gutters, aprons, patios, walls, driveways, and sidewalks which are broken, crushed, or damaged by the installation of the improvements shall be reconstructed by and at the expense of the Contractor. All restoration shall be of the same kind of material, quality, and of the same dimensions as the original work. The minimum

thickness for concrete slabs, etc. shall be no less than adjoining pavement in thickness, or as indicated on the Drawings, or as specified, whichever is the greater.

The repairs shall be made by removing the damaged portions between cold joints, or to nearest weakened plane joint cut by a concrete saw and by replacing the entire portions. Reinforcing dowels shall be placed in existing concrete as approved by the Engineer. Patching the damaged part is not allowed. All work shall match the appearance of the existing improvements as nearly as practicable.

A power-driven pavement saw shall be used to cut existing Portland cement concrete sidewalk, driveway, curb, and gutter where it is necessary to remove the concrete. Sidewalk shall be saw-cut at existing score marks. Driveway aprons shall be removed and replaced as a whole without saw cutting. The kerf shall be a minimum of 1-1/2 inches and straight; and, if two cuts are made they shall be parallel. The kerf shall be deep enough to permit complete breakage of the concrete without ragged edges.

All edges of concrete shall be edged with a cement edger of the size 2-3/4 inches in width with a 3/16-inch radius. All joints or grooves that are indicated on the Plans or are required by the Engineer shall be marked with cement groovers or jointers 4 inches in width and having a groove 3/8 inch wide at the top and a depth of 1/4 inch to 1/2 inches.

All new or previously existing concrete surfaces shall be left neat, clean, and free from concrete droppings. The Contractor shall be responsible for preventing vandals or others from disfiguring or defacing the finished surfaces. Any new concrete surfaces disfigured, shall be replaced at the Contractor's expense.

6.17.7 Payment - All costs to the Contractor for protecting, removing, and restoring existing improvements on public and private property shall be considered as included in the various contract bid items. Bid prices shall include restoration of surface as well as subsurface features to their before construction function and appearance to the satisfaction of the Engineer. Restoration shall include surface conditions such as street, curb, gutter, sidewalk, retaining walls, patios, fences, gravel, lawn, dirt, and driveways; underground service utilities such as water, phone, power, gas, cable TV, television; and underground property improvements such as sprinklers and drain pipes.

6.18 Disposal Outside Project Limits.

The Contractor shall make his: own arrangements for disposing of materials outside the right-of-way, and he shall pay all costs involved. Such costs shall be included in the bid prices.

When any material is to be disposed of outside the right-of-way, the Contractor shall first obtain a written agreement from the property owner on whose property the disposal is to be made and he shall file with the Engineer said written agreement together with a written release from the property owner absolving the City from any and all responsibility in connection with the disposal of material on said property. The Contractor is also responsible for obtaining any necessary permits of other Federal, State, County or local agencies.

When material is disposed of as above provided, the Contractor shall conform to all requirements of the City Municipal Code and other applicable regulations pertaining to grading, hauling and filling of earth. Any City-issued permits so required shall be no fee for City contract projects but may require bonds, if required by the Engineer.

Full compensation for all costs involved in disposing of materials as specified in this subsection, including all costs of obtaining a disposal site, required permits, loading, hauling and disposal, shall be considered as included in the price paid for the contract item of work involving such materials and no additional compensation will be allowed therefore. No additional payment will be granted the Contractor for inconvenience or delays encountered in complying to the requirements of this subsection.

6.19 Responsibility for the Work and Materials.

Until the acceptance of the work, 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 buy the City, 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, whether arising from the execution or from the non-execution of the work, except as provided under Section 6-33 "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 as otherwise expressly provided.

Where necessary to protect the work or materials from damage, the Contractor shall, at his expense, provide suitable drainage of the project and erect such temporary structures as are necessary to protect the work or materials from damage.

The suspension of the work from any cause whatsoever shall not relieve the Contractor of his responsibility for the work and materials as herein specified. If ordered by the Engineer, the Contractor shall, at his expense, properly store materials which have been partially paid for by the City or which -have been furnished by the City. Such storage by the Contractor shall be on behalf of the city and the City shall at all times be entitled to the possession of such materials, and the Contractor shall-promptly return the same to the site of the work when requested. The Contractor shall not dispose of any materials so stored except on written authorization form the Engineer.

6.20 Subcontracting.

The Contractor shall be as fully responsible to the City for the acts and omissions of his employees and subcontractors, and of persons either directly or indirectly employed by them.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any

subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in this contract shall create any contractual relation between any subcontractor and the City.

6.21 Mutual Responsibility of Contractors.

If, through acts of neglect on the part of the Contractor, any other contractors or any subcontractor shall suffer loss of damage on work, the contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other Contractor or subcontractor shall assert any claim against the City on account of any damage alleged to have been sustained, the City shall notify the Contractor, who shall indemnify and save harmless the City, its agents, employees, officials, and the Engineer against any such claim.

6.22 Separate Contracts.

The Contractor shall coordinate his operations with those of other contractors with the City acting as facilitator. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractors, shall keep informed of the progress and the detail work of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors.

Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

6.23 Environmental Responsibilities.

The Contractor shall comply with all air, water and other pollution and environmental control rules, regulations, ordinances and statutes which apply to any work performed pursuant to the contract.

6.24 Dust and Debris Control.

The Contractor shall be responsible for controlling dust in the air and rocks, debris, mud or dirt which are scattered as a result of his operations on the job. The Contractor shall be responsible for cleaning all mud, rock, dust, dirt, and debris-producing materials that originate in the project area and are deposited on other public or private property by truck tires, spillages, or by other means. The Contractor shall have suitable and adequate street cleaning equipment on the project site at all times.

The Contractor shall begin cleanup operation by 3 PM and before the end of each day's work, clean all paved portions of the project and paved streets leading from the project that have dust-producing materials or debris deposited upon them. The work areas shall be swept clean at the end of each day's work and at other times when directed by the Engineer.

The Contractor shall endeavor, whenever possible, to restrict the use of water to control dust for his convenience in order to conserve water during drought situations or mandated rationing required by the Water Utility Company. Whenever flushing of streets or any other work is necessary, the Contractor shall provide filter materials at the catch basin to retain any debris and dirt flowing into the City's drainage system.

The cost of the above work, including the providing of barricades, water and other materials, labor, and equipment shall be at the sole cost and expense of the Contractor.

The Engineer may determine that an emergency exists when dust, rocks, debris, mud, or dirt are scattered in the public right of way or in the private properties as a result of Contractor's activities and/or deterioration of such conditions due to rain. The emergency conditions may also be declared when traffic or the Contractor's equipment travelling through a job causes dust to fly or rocks, debris, mud, or dirt to be scattered. Similar emergency conditions may be determined by the Engineer if the storage of materials, tools, or any other equipment related to the project, in the public rights of way, is causing any obstruction or blocks access to the neighboring properties and/or dangerously placed without proper barricades and lights and/or backfill stockpiles or debris washing away into the street gutter and catch basins.

Emergency Cleanup Work. In any case in which the Contractor fails to satisfactorily complete the cleanup work described in this section, the Engineer or his representative may determine that an emergency exists. In the event an emergency is determined by the Engineer, the Contractor shall immediately make available manual labor or mechanical equipment capable of handling the cleaning process. During such an emergency, City forces may be called upon to complete the cleanup work, or the City may contract for the cleanup work. All construction work shall be shut down during this cleanup work by the City/contract forces. The Engineer may shut down further construction work until the violations are corrected to the satisfaction of the Engineer. The cost of the work performed by City/Contract forces plus an additional 70% surcharge shall be paid by the Contractor by deduction from payment due him on the contract. No compensation shall be given to the Contractor for stoppage of work.

Such action by the Engineer, however, shall not relieve the Contractor of his responsibility for any damages which may occur before, during or after such action has been taken by the Engineer, and shall place no liability upon the City or the Engineer.

6.25 Contractor Not an Agent of the City.

The right of general supervision by the City shall not make the Contractor an agent of the City, and the liability of the Contractor for all damages to persons or to public or private property, arising from the Contractor's execution of the work, shall not be lessened because of such general supervision.

6.26 Cooperation.

Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified or should work of any other nature be under way by other forces within or adjacent to said limits, the Contractor shall cooperate with all such

other contractors or- other forces to the end that any delay or hindrance to their work will be avoided. The right is reserved to perform other or additional work at, in or near the site (including material sources) at any time, by the use of other forces.

When two or more contractors are under contract with the City on related or adjacent work, each shall conduct their operations in such a manner as not to cause any unnecessary delay or hindrance to the other. Each Contractor shall be responsible to the other for all damage persons or property caused to the others by his operations and for loss caused the other due to his unnecessary, delays or failure to finish the work within the time specified for completion.

6.27 Rights in Land and Improvements.

Nothing in these general provisions shall be construed as allowing the Contractor to make arrangements with any person to permit occupancy or use of any land, structure, or building within the limits of the contract for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the City and any owner, former owner, or tenant of such land, structure, or building.

The Contractor shall not occupy City-owned property outside the work as shown on the plans unless he enters into a rental agreement with the City.

6.28 Personal Liability.

Neither the Engineer, nor any other officer or authorized employee or agent-of the City, nor any authorized officer or employee of the State, County, or any District shall be personally responsible for any liability arising under or by virtue of the contract

6.29 Repair of Equipment.

All costs of installing, assembling, repairing or reconditioning, or other work of any nature on machinery, equipment, or tools used in or upon the work shall be considered as included in the various contract items of work.

6.30 Material Plants.

The construction, erection, and operation of material production, proportioning, or mixing plants from which material is used wholly on the contract or on contracts under supervision of the City shall be considered, a part of the work to be performed under the contract and any laborers, workmen, or mechanics working on such plants shall be subject to all of the requirements relating to labor set forth in the contract.

6.31 Non-Enforcement – No Waiver by City.

The failure of the City or Engineer in any one or more instances to insist upon strict performance of any of the terms of this contract or to exercise any option therein conferred, shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion or at any future time.

6.32 Guarantee and Warranty.

In addition to guarantees required in other provisions of the contract, the Contractor shall, and hereby does, guarantee and warrant all work for a minimum period of one year

after date of acceptance of work by City and shall repair or replace any or all such work, together with any other work, which maybe displaced in so doing, that may prove defective in workmanship and/or materials within one year period from date of acceptance without expense whatsoever to City, Ordinary wear and tear, unusual abuse or neglect excepted. The Contractor shall request in writing, a warranty inspection by the City not more than thirty (30) calendar days nor less than fifteen (15) calendar days prior to the expiration of the warranty period. The Engineer shall perform a warranty inspection and notify the Contractor of any defects in writing.

In the event the Contractor fails to commence repair of any defective conditions within one week after being notified in writing, the City is hereby authorized to proceed to have defects repaired and made good at the expense of the Contractor-who/hereby agrees to pay all costs and charges therefore immediately, on demand including a twenty (20) percent markup for engineering and administration.

If in the opinion of the Engineer, defective work creates, a dangerous condition or requires immediate correction or attention to prevent further loss to the. City or to prevent interruption of operations of the City, the City will attempt to give this, notice required by this article. If the Contractor cannot be contacted or does not: comply, with the Engineer's request or correction within a reasonable time .as determined, by the Engineer, the City may, notwithstanding the provisions of this article, proceed to make such correction or provide such attention arid the costs including a 20 percent markup of such correction or attention shall be charged against the Contractor. Such action by the City will not relieve the Contractor of the guarantees provided in this article or elsewhere in this contract.

The Contractor shall post a warranty bond prior to the City's acceptance of the project. Such bond shall be in the amount of ten (10) percent of the final Contract amount and shall be held by the City until satisfactory performance by the Contractor of the correction of any defective work or materials.

This section does not in any way limit the guarantee on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period, nor does it limit other remedies of the City in respect to latent defect, fraud or implied warranties.

6.33 Relief from Maintenance and Responsibility.

Upon the request of the Contractor, the City may relieve him of the duty of maintaining and protecting certain portions of the work that have been opened for City use and which have been completed in all respects in accordance with the requirements of the contract and to the satisfaction of the Engineer, and thereafter the Contractor will not be required to do further work thereon. In addition, such action by the City will relieve the Contractor of responsibility for injury or damage to said completed portions of the work resulting from use by public traffic or from the action of the elements or from any other cause, but not from injury or damage resulting from the Contractor's own operations or from his negligence.

However, nothing in this Section shall be construed as relieving the Contractor of full responsibility for making good defective work or materials found at any time before the formal written acceptance of the entire contract by the City. Further, that the start of the guarantee period remains, as the date of acceptance by entire project.

6.34 Catastrophic Damage.

In the event damage to the work is caused by a storm, flood, tidal wave or earthquake, which constitute an "occurrence" as described in Section 7-1.165 of the State Specifications, said Section shall apply insofar as applicable to this work except only those earthquakes in excess of 6.0 on the Richter scale shall be considered as an "occurrence."

6.35 Responsibility for Claims and Damages.

The Contractor agrees to indemnify and save the City, its officers, agents and employees harmless from any loss or damage resulting from any claim or damage asserted under its care, custody or control. The City of Albany and all such officers and employees thereof connected-with the work shall not be -answerable or accountable in any manner, 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 of others from any cause which might have been prevented by the Contractor, or his workmen, subcontractors, 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 anytime before its completion and final acceptance.

The Contractor shall indemnify and save harmless the City of Albany 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 City may be retained by the City until disposition has been made of such suits or claims for damages as aforesaid.

Notwithstanding assertions that the City, its City Council, or its officers, agents, or employees may have been solely negligent, the Contractor shall assume the defense of the City, its City Council, and its officers, agents, and employees from all claims of any kind arising directly or indirectly out of the performance of the work.

6.36 Insurance.

6.36.1 General – The Contractor and his Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against Public Liability, Property Damage, and Vehicular Liability.

The Contractor shall either (a) require each of his subcontractors to procure and to maintain during 'the life of his subcontract, Subcontractor's Public Liability and Property Damage and Vehicular Liability of the type and in the same amounts specified for the Contractor, or (b) insure the activities of his subcontractors in his own policy.

All insurance policies shall bear an endorsement or shall have-attached a rider whereby it is provided that, in the event of expiration or proposed cancellation of such policies for any reason whatsoever, the City shall be notified by registered mail not less than thirty (30) days before expiration or cancellation is effective.

The Contractor shall not commence work under this contract until all the insurance required herein is obtained and approved. The following requirements apply to the Contractor and his subcontractors.

At the time of the execution of the agreement, the Contractor shall, at his own expense, procure and at all times during the prosecution of the work hereunder and until final completion thereof maintain in full force and effect Workmen's Compensation Insurance and Public Liability Insurance, including motor vehicles and equipment, and include perils of explosion, collapse, underground and personal injury as follows:

A policy of public liability insurance naming the City of Albany, its officers, agents and employees as insured against all loss from liability, contingent or otherwise, for injury to, or death of, any person or persons, or damage to real or personal property, arising in or by reason of or in connection with the performance of the work herein contemplated, and agreeing to defend against all claims, demands, actions or legal proceedings made or brought by any person by reason of any such injury, death or damage and to pay all judgments, interests, costs, legal and other expenses arising out of or in connection therewith.

The insurance required shall provide adequate protection for the Contractor and his subcontractors against damage claims which may arise from operations under this contract, whether such operations be by the insured or by any one directly or indirectly employed by him and also against any of the special hazards which may be encountered in the performance of this contract. The policies shall be issued by an insurance carrier satisfactory to said City and shall be delivered to the City at the time of delivery of such contract. In lieu of actual delivery of such policies, a certificate issued by the insurance carrier showing such policies to be in force for the period covered by the contract, covering without exclusions the requirements as specified and covering the City, its officers, its agents and employees as additional insured, may be delivered to the City. Such policies and such certificates shall be of a form approved by the City Attorney of the City. Should any policy be cancelled before final completion of the work herein contemplated and the Contractor fail to immediately procure other insurance as herein required, then the City may procure such insurance and the cost of such insurance shall be from any monies due to the Contractor.

City may require a copy of the actual policy represented by any certificate in which case Contractor shall comply.

The Contractor shall save, keep and hold harmless the City, its officers, agents and employees from all damages, costs or expenses in law or equity that may at any time arise or be set up because of damages to property, or of personal injury received by reason of or in the course of performing work, which may be occasioned by any act or omission of the Contractor, any of the Contractor's employees, or any subcontractor. The City will not be liable for any accident, loss or damage to the work prior to its completion and acceptance.

In case an extension of time is granted to the Contractor, the Contractor shall submit evidence of required insurance coverage for the additional length of tune such insurance policies shall be in effect. The cost of providing all required insurance coverages shall be considered as included in the various contract bid prices and no additional compensation shall be made therefore.

6.36.2 Workers Compensation Insurance – The Contractor shall procure and shall maintain during the life of this contract Workers Compensation Insurance as required by applicable State law for all of his employees to be engaged in the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workers Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's workers Compensation Insurance. In case any class of employees engaged in work on the project under this contract is not protected under the Workers Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

The Contractor shall also comply with Section 3800 of the Labor Code by securing, paying for, and maintaining in full force and effect for the duration of the contract, complete Workers Compensation Insurance, and shall furnish a Certificate of Insurance to the Engineer before execution of the Contract. The City, its officers, or employees will not be responsible for any claims in law or equity occasioned by failure of the Contractor to comply with this paragraph.

All workers compensation insurance policies shall bear an endorsement or shall have attached a rider whereby it is provided that, in the event of expiration or proposed cancellation of such policies for any reason whatsoever, the City shall be notified by registered mail not less than thirty (3'0) calendar days before expiration or cancellation is effective.

6.36.3 Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance – The Contractor shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance specified. The Contractor shall either require each of his subcontractors to procure and to maintain during the life of his subcontract. Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance specified or insure the activities of his subcontractors in his policy.

The Contractor shall famish to the City and maintain during the life of the contract such public liability and property damage insurance policies including "All Risk" Builder's risk coverage, as are necessaty to insure the contractor, his subcontractor, the City, and its officers, agents and employees, while acting within the scope of their duties, against all claims arising out of or in connection with the work to be performed.

The policies shall each provide in at least the following limits:

Public Liability	$1,000,000.00	each person
	$3,000,000.00	each occurrence
Property Damage	$ 500,000.00	each occurrence

Such policies shall provide coverage at least as broad as that provided in the Standard Form approved by the National Bureau of Casualty Underwriters together with such endorsements as are required to cover the risks involved. The City reserves the right to approve the form, sufficiency and manner or execution of the insurance contract.

The Contractor shall arrange for the policies to be so conditioned as to cover the performance of .any necessary extra work during the contract.

The Contractor shall take out and pay for all property insurance on the work to be constructed under this contract and upon all materials, in or adjacent thereto and intended for use thereon. Said policy shall insure the work against all risks of fire, lightning, vandalism, water and other risks of loss ^provided in the "all risk" type policy. The City reserves the right to approve the form, sufficiency and manner of execution of the contract of insurance. This insurance shall be written on a Builder's Risk Form for 100% of the value of the work completed at all times and materials delivered at the site at all times. Thp.C6ntractor shall deliver to the City a duly certified copy of the insurance policy at the tune (he contract is signed; said policy shall be written in the name of both the City and the Contractor. All losses shall be paid to the insured as their interests appear.

If and whenever the Contractor or any subcontractor, in carding on the contract operation, shall use and operate automobiles, trucks or other vehicles on public streets and highways, each shall use and operate, automobiles, trucks or other vehicles on public streets and highways, each shall carry, at his own expense, automobile public liability and property damage insurance, with limits of hot less than $1,000,000.00 for any one person, and $3,000,000.00 for any one accident, and $500,000.00 property damage.

The term "public streets and highways" shall be deemed to include without limiting the generality thereof, all roads, roadways and thoroughfares used for access to the site of the work.

No payment will be made to the Contractor unless the provisions of this Section have been complied with.

6.37 Affirmative Action and Equal Opportunity.

The Contractor shall not discriminate against any employee or applicant for employment because of race, color, national origin, sex, ancestry, sexual orientation, or religion. Contractor shall take affirmative action to assure that applicants are employed and employees are treated during employment without regard to race, color, sex, national origin, sexual orientation, ancestry, or religion, with the goal being that the ethnic composition of the Contractor's work force component for the project or service will approximate the ethnic composition of the population of Alameda County. Such action shall include, but not be limited to, employment, upgrading, demolition, or transfer, recruitment or recruitment advertising; lay-off or termination; rate of payor forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship training, and on-the-job training. Contractor agrees to post in conspicuous places available to employees and applicants for employment, notices to be provided by the awarding authority setting forth the provisions of this non-discrimination clause.

6.38 Payment.

Full compensation for conforming to all the provisions of Section 6 "Legal Relations and Responsibility" shall be considered as included in the prices bid for the various contract bid items of work and no additional compensation will be allowed therefore.

6.39 Claims and Protests by Contractor.

A. Written Protest:

If work demanded of the Contractor is considered by him to be outside the requirements of the contract, or if he considers any decision of the Engineer to be unfair, he shall, upon such work being demanded or such decision being made, proceed without delay to perform the work or conform to the decision, arid shall give written notice of protest to the Engineer within 48 hours. The written notice shall include the date and circumstances of the order or decision and his objections thereto,

The Engineer will consider and investigate the protest and his decision thereon shall be final and conclusive, except in the case of gross error. In the event of a gross error, the Engineer may reconsider his findings and thereafter his findings shall be final and conclusive.

Except for such protests as are made of record in the manner specified, the Contractor waives all grounds for protest to such orders or decisions of the Engineer.

B. Written Claim:

No more than 30 days after submitting a protest in accordance with A- above or 30 days after completing the protested work, if that is later, the Contractor shall submit to the Engineer his/her claim concerning the matter so noticed. The claim shall set forth clearly and in detail, for each item of additional compensation or time adjustment claimed, the reasons for the claim, references to applicable provisions of the specifications, the nature and amount of cost or time involved, or both, the computations used in determining such cost or time, or both, and all other pertinent factual data. The Contractor shall furnish such

clarification and further available information and data as may be requested in writing by the Engineer within the time specified in such request. In addition, he shall maintain complete and accurate daily records of the costs of any portion of the work for which additional compensation is claimed, and shall give the Engineer access thereto or certified copies thereof as requested.

No claim may be filed after the date of council acceptance or the Director of Public Works' written acceptance of the work.

If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference, within 30 days for-settlement of the dispute.

If following the meet and confer conference the claim or any portion remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 920) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled form the time the claimant submits his or her written claim pursuant to the above until- the time the claim is denied, including -any period of time utilized by the meet and confer conference.

Any orders or decisions of the Engineer as to which the Contractor has submitted a protest shall be final and conclusive on the Contractor if he fails to submit or document a claim with respect thereto in the manner and within the times above stated, and such failure shall constitute a waiver of all claims in connection therewith, whether direct, indirect, or consequential in nature.

C. Resolution of Disputed Claim:

Should the contractor not be satisfied with the Engineer's decisions rendered pursuant to C. above, he/she must notify the Director of Public Works within 15 calendar days of the receipt of the Engineer's written decision pursuant to Section 20104 of the Government Code.

The City shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the City may have against he claimant.

If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the City and the claimant.

The City's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period

of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

6.40 Apprentices.

The Contractor and any subcontractor working under him must comply with and be governed by the laws of the State of California having to do with the employment of apprentices on public works as set forth in Sections 1777.5 and 1777.6 of the Labor Code of the State of California.

Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

6.41 Entry Rights.

The right is reserved to the City, and also to railway, water, gas, telephone, telegraph, cable television and electric power transmission companies to enter upon the work for the purpose of making repairs and changes that have become necessary by reason of work. Projects financed in whole or in part with State funds shall be subject to inspection at all times by the State of California agency having jurisdiction or his agent.

6.42 Obstruction.

No material or other obstruction shall be placed within fifteen (15) feet of fire hydrants, which must be at all times readily accessible to the Fire Department.

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.

6.43 Sanitary Conveniences.

Necessary sanitary facilities for the use of workers properly secluded from public observation and in compliance with health ordinances and laws, shall be constructed and maintained in an approved manner by the Contractor, and their use shall be strictly enforced.

6.44 Preservation of Monuments.

The Contractor shall carefully preserve bench marks, reference points and stakes, and in case of willfully or careless destruction, he will be charged with the entire cost of replacing them and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance. Monuments which have to be removed shall not be disturbed until authorized by the Engineer.

The Contractor shall provide the City with a minimum of 48 hours notice of any activities which may result in the displacement damage or destruction of monuments.

6.45 Opening Sections of New Work.

Whenever, in the opinion of the Engineer, any section of the work is in a condition for beneficial use by the City it may be opened for use. Such openings, when authorized in writing

by the Engineer shall not represent acceptance of that portion of the work unless all specified testing has been satisfactorily completed.

The Contractor will be responsible for all necessary repairs on any section of work, so opened, due to defective material or work, damage by Contractor's operation, or to natural causes other than ordinary wear and tear until final completion and acceptance of the work. Such repairs shall be at the expense of the Contractor.

6.46 Acceptance of Work on Contract.

When the final inspection is completed and it has been determined that the work is in accord with the plans and specifications, the Engineer will formally accept the contract. After such acceptance, the Contractor will be relieved of protecting the work, except for such correction or repair as shall be required to correct any defect in the work. The Contractor will not be required to perform any further work thereon except such items as may be reserved specifically in the specifications or formal written acceptance, and he shall be relieved of responsibility for injury to persons or property or damage which occurs after the formal written acceptance.

6.47 Correction of Errors, Recovery for Errors, Dishonesty or Collusion.

The City reserves the right to correct any error that may have been made in any estimate that has been paid. The City also reserves the right to claim and recover by process of law any sums sufficient to correct any error or make good any deficiency in the work, regardless of when such error, dishonesty or collusion shall be discovered.

6.48 Right-of Way.

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

Section 7 - Existing Utilities

7.1 General.

Unless otherwise required, at least 2 working days prior to starting work on the project, the Contractor shall notify in writing all affected public "utility agencies of the approximate time that the work set forth in these specifications will start. The Contractor shall also notify Underground Service Alert (USA) and make all arrangements for marking of existing underground utilities.

Attention is directed to the possible existence of underground main or trunk line facilities not indicated on the plans or in the special provisions and to the possibility that underground main or trunk lines may be in a location different form that which is indicated on the plans or in the special provisions. The Contractor shall ascertain the exact location of underground main or trunk lines whose presence is indicated on the plans or in the special provisions, the location of their service laterals or other appurtenances of any other underground facilities which can be inferred from the presence of visible facilities such as buildings, meters and junction boxes prior to doing work that may damage any of such facilities or interfere with their service.

If the Contractor discovers underground main or trunk lines not indicated on the plans or in the special provisions, he shall immediately give the Engineer and the Utility Company written notification of the existence of such facilities. Such main or trunk lines shall be located and protected form damage as directed by the Engineer.

Further attention is directed to Section 1540 (a) (1) of the Construction Safety Orders (Title 8 California Administration Code Section 1540), issued by the Occupational Safety and Health Standards Board pursuant to the California Occupational Safety and Health Act of 1973, which states in part:

> (1) "Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, water, fuel, electric lines, etc., will be encountered and, if so, where such underground installations are located. When the excavation approaches the approximate location of such an installation, the exact location shall be determined by careful probing or hand digging; and, when it is uncovered, adequate" protection shall be provided for the existing installation. Underground Service Alert (USA) shall be advised of proposed work at least 48 hours prior to the start of actual excavation."

Utility notification and verification of the location of existing underground utilities is the Contractors responsibility. All costs to the Contractor related to this Section shall be considered as included in the various contract bid prices and no additional compensation shall be made therefore.

7.2 Utility Relocation and Rearrangement.

The right is reserved to the City and the owners of utilities or their authorized agents to enter upon the work area for the purpose of making such changes as are necessary for the rearrangement repair and/or connections of their facilities. The Contractor shall cooperate with forces engaged in such work and shall conduct Jus operations in such a manner as to avoid any unnecessary delay or hindrance to the work being, performed by such forces and shall allow the respective utilities time to relocate and/or repair their facilities.

The Contractor assumes responsibility for the removal, relocation, or protection of existing facilities wherein said facilities are identified by the plans or special provisions. It is the duty of the Contractor at all times to coordinate with the owner of utility facilities for the rearrangement of said facilities.

In the event that certain underground utilities not known to the City or in a different location than shown on the plans or special provisions are found to exist, the Contractor shall:

(1) notify the City Engineer of the existence of said facilities immediately,
(2) 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, and
(3) notify the owner(s) of the utility.

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

When the special provisions or plans indicate that a utility is to be relocated, altered or constructed by others, the City will conduct all negotiations with the owners and the work will be done at no additional cost to the Contractor.

The Contractor shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the public agency or the owner of the utility to provide for removal or relocation of the existing facilities as it affects a controlling item of work.

Temporary or permanent relocation or alteration of utilities, desired by the Contractor for his own convenience shall be his responsibility, and he shall make arrangements and bear all costs.

7.3 Notification and Location.

Prior to doing any underground work or excavation, the Contractor shall give the Underground Service Alert (USA) (phone number 800-642-2444) forty-eight (48) hour notice, in addition to direct notification of all agencies providing utilities shall be made.

It shall be the Contractors responsibility to determine the exact location and depth of all utilities, including service connections, which have been marked by the respective

owners and which he believes may affect or be affected by his operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

7.4 Coordination with Other City Projects.

The Contractor shall coordinate his work with all other City projects within or adjacent to the contractors work as necessary to avoid conflicts.

All expenses incurred for coordination with other City projects shall be borne by the Contractor, as included in bid prices.

7.5 Payment.

Full compensation for conforming to all the provisions of this Section on Existing Utilities shall be considered as included in the prices bid for the various contract bid items of work and no additional compensation will be allowed therefore.

Section 8 - Progress of Work

8.1 Beginning of Work.

The Contractor shall begin work within ten (10) calendar days after the notice to proceed and shall diligently prosecute the same to completion within the time limit provided in the Contract Agreement, or Special Provisions.

Should the Contractor begin work in advance of the notice to proceed, any work performed by him in advance of the said date of approval shall be, considered as haying been done by him at his own risk and as a volunteer unless said contract is so approved.

8.2 Progress Schedule.

Unless otherwise specified, the Contractor shall, within five (5) calendar days after receiving the notice to proceed, submit to the Engineer a practicable schedule showing the order in which the Con tractor proposes to carry out the work, the dates on which he will start the several salient features of the work (including procurement of materials, plant and equipment), and the contemplated dates for completing the said salient features. Contractor shall update schedule as required by the Engineer. The schedule shall be a bar chart or C.P.M. In addition to the schedule, the Contractor shall make other submittals as required by Section 8.2.

8.3 Temporary Suspension of Work.

In the event the Engineer shall determine that the work or any portion of the work is not proceeding in accordance with the Contract Documents or any applicable rules and regulations, the Engineer may order the cessation of further work, either in part or total, until the work proceeds in compliance with such requirements. All delays in the work occasioned by such stoppage shall not relieve the Contractor of any duty to perform the work or serve to extend the time for its completion. Any and all necessary corrective work done in order to comply with the plans and specifications shall be done at no cost to the City.

The Engineer shall also have 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. Such temporary suspension of work will be considered as justification for time extensions to the contract in an amount equal to the delay, as determined by the Engineer to the current controlling operation of work.

The Engineer may also, temporarily suspend the work upon the written request of the Contractor and upon just showing in writing by the Contractor that such request is reasonable and necessary due to delays beyond the Contractor's control and further provided that there is no resulting increased in costs to the City.

In the event that a suspension of work is ordered as provided in this section, the Contractor, at his expense, shall do all work necessary to provide a safe, smooth and

unobstructed passageway through construction for use by public, pedestrian and vehicular traffic, during the period of such suspension. Should the Contractor fail to perform the work as specified, the City may perform such work and the cost thereof will be charged against the Contractor and will be deducted from moneys due or to become due the Contractor under the contract.

The Contractor shall not be entitled to any claim for additional time or compensation for any delays due to any suspension lawfully ordered by a duly authorized State, Federal or other officer having jurisdiction of safety, health, labor or environmental statute violation.

8.4 Termination of Contract.

If at any time, in the opinion of the Engineer, the Contractor has failed to supply suitable equipment, an adequate working force, or material of proper quality, or has failed in any other respect to prosecute any work with the diligence and force specified and intended in and by the terms of the Contract, notice thereof in writing may be served upon him and his surety, and should he neglect or refuse to provide means for a satisfactory compliance with the Contract, as directed by the Engineer, within the time specified in such notice, the City in any such case shall have the power to terminate all or a portion of the Contract.

Upon receiving notice of such termination, the Contractor shall discontinue said work, or such parts of it as the City may designate. Upon such termination, the Contractor's control shall terminate and thereupon the City Council or its duly authorized representative may take possession of all or any part of the Contractor's materials, tools, equipment, and appliances, and plant, and buy such additional materials and supplies at the completion thereof; or may 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 City may deem proper; or the City Council, or authorized representative, may annul and cancel the contract and complete 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 therefore.

In the event of such termination, all money due the Contractor or retained under the terms of his contract shall be forfeited to the City; but such forfeiture will not release the Contractor or his sureties from liability or failure to fulfill the Contract. The Contractor and his sureties will be credited with the amount of money so forfeited toward any excess of cost over and above the contract price, arising from the suspension of the operations of the contract and the completion of the work by the City as above provided, and the Contractor will be so credited with any surplus remaining after all just claims for such completion have been paid.

In the determination of the question whether there has been .any such noncompliance with the contract as to warrant the termination of annulment thereof, the decision of the City Council, or authorized representative, shall be binding-on all parties to the contract

8.5 Right of Way Delays.

If through the failure of the City; to-acquire or clear rights of way, except for utility delays, the Contractor sustains loss, which could not have been avoided by the judicious handling of forces, equipment, supplies and plant, the Contractor shall upon written request be entitled to an amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor' actual loss as, in the opinion of the Engineer, was unavoidable. Any such compensation will be made as provided in Section 8-1.09 "Right of Way Delays" of the State Standard Specifications and Section 9-3 "Extra Work" of these General Provisions, and as modified herein.

Actual loss shall be understood to include no items of expense other than idle time of rental equipment and the cost of extra moving of equipment, with no markup in any case for overhead or profit. Labor costs shall not exceed one day with no markup in any case for overhead or profit.

If performance of the Contractor's work on the current controlling operation is delayed as the result of the failure of the City to acquire or clear such right of way, an extension of time determined pursuant to the provisions of these specifications will be granted upon written request. The Engineer shall make the determination on the number of additional working days to be granted.

The current controlling operation or operations as used in the above paragraph is to be construed to include any feature of the work considered at the time by the Engineer, which if delayed will delay the time of completion of the contract.

8.6 Changes (Change Orders).

8.6.1 General – The City reserves the right to make such alterations, deviations, additions to or deletions from the drawings and specifications, including the right to increase or decrease the quantity of any item or portion of work or to omit any item or portion of the work, and to require such changes in the work as are determined by the Engineer to be necessary or advisable for proper completion or construction of the whole work contemplated.

8.6.2 Change Orders – Changes will be set forth in a contract change order. If the work to be done or change to be made causes an increase or decrease in the Contractor's cost of performance of the contract, an equitable adjustment may be made as determined by the Engineer. The contract change order will specify the payment to be made or credit to be taken and adjustment of the contract time, if any. Payment in accordance with the terms and conditions set forth in a contract change order shall constitute fall compensation for .all work included therein or required thereby.

Contractor shall proceed with the ordered work, unless another starting date is specified. If the Contractor agrees with the terms and conditions of the contract change order, he shall indicate his acceptance by signing the original copy and returning it the Engineer within 10 calendar days. If the Contractor disagrees with the terms and conditions of such contract change order, he shall proceed with the ordered work and shall submit a written protest in accordance with "8- 63 Protest Procedure."

Prior to issuing an approved contract change order, the Engineer may request that the Contractor submit a proposal covering the changes. The request of the Engineer may include a description of the work or revised drawings or specifications reflecting the changes proposed to be ordered. The Engineer may request the contractor to submit revised drawings and proposed specifications for the change order item. Within 10 calendar days after receiving the request, the Contractor shall submit his proposal to the Engineer, including any claim for extension of time and any and all compensation which may be necessary as a result of performing the changes. If the Engineer decides not to issue a contract change order after requesting a proposal from the Contractor, the Contractor will be notified of such decision in writing.

The Engineer may, in writing, order the Contractor to proceed with the work prior to receipt of an approved contract change order therefore. In such case, the Engineer will as soon as practicable issue an approved contract change order for the work and the provisions in "8-6.3 Protest Procedure" shall be fully applicable to such subsequently issued contract change order. The Contractor shall keep fall and complete records of the cost of the ordered work until the method of compensation is determined and the approved change order is received, and shall permit the Engineer to have access to such records. An approved change order shall supersede any previously issued written order covering the same work.

8.6.3 Protest Procedure – Should the Contractor disagree with any terms or conditions set forth in an approved change order which he has not executed, he shall submit a written protest to the Engineer within 10 calendar days after the receipt of such approved contract change order. The protest shall state the points of disagreement, contract references, quantities, and costs involved. The Engineer shall consider and investigate such protest within a reasonable time and his decision thereon shall be conclusive and binding against both parties to the contract, except in the case of gross error. If a written protest is not submitted, adjustment of the contract time and payment will be made- as set forth in the approved contract change order and shall constitute full compensation for all work included therein or required thereby. An unprotested1 approved change order will be considered as an executed contract change order at execution.

When the protest concerning an approved contract change order relates to compensation, the Contractor shall keep full and complete records of the cost of such work arid shall permit the Engineer to have such access 'thereto as may be necessary to assist in the determination of the compensation payable for such work.

When the protest concerning an approved contract change order relates to the adjustment of contract time for the completion of the work, the time to be allowed therefore will be determined as provided in the change order.

8.6.4 Changes Requested by the Contractor – Changes requested in the plans and specifications shall be made in writing. Approved changes shall be made by change orders at a reduction in cost or at no additional cost to the City. Nothing herein shall be construed as granting a right to the Contractor to demand acceptance of such changes.

8.6.5 Value Engineering Change Proposals

A. General

1. This Section applies to Contractor developed value engineering change proposals (VECPs) that:

a. Require a change to the existing contract to implement.
b. Reduce the contract price without impairing essential functions or characteristics.
c. Will not have an adverse financial impact on the City when the costs of operating and maintenance through the life cycle of the item are considered.
d. Are hot based solely on changes in deliverable quantities.

2. Contractor will share in the net contract savings realized from accepted VECPs.

B. Definitions

1. Gross Savings: The difference between Contractor's estimated cost of performing the work in accordance with the existing requirements and Contractor's estimated cost of performing-work in accordance with the proposed change, cost of performing work may include overhead but not profit;

2. Contractor Development and Implementation Costs: Reasonable costs incurred by the Contractor in developing, testing, preparing, and submitting the VECP and costs incurred by the Contractor to make contractual changes required by City acceptance of the VECP.

3. Net Savings: Gross savings less Contractor Development and Implementation Costs.

4. City Costs: Reasonable costs incurred by the City for evaluating and implementing the VECP, such as analyzing, testing, and redesign, where required. Does not include normal administrative costs of processing the VECP.

C. Documentation

1. As a minimum, the following information shall be submitted by the Contractor with each VECP:

a. Description of existing contract requirements.
b. Description of proposed change.
c. Discussion of differences between existing requirements and proposed change. Give advantages and disadvantages of each, justify any changes to function or characteristics, and give effect of the change on performance of the item.
d. Analysis. Identify and describe each part of the existing requirements that must be changed to implement this VECP, and recommend how to make such change.

e. Life-Cycle Cost Effects. State the estimated effect of the proposed change on cost of operating and maintenance throughout the life cycle of the item.

f. Time for Implementation of this VECP. State the latest time for acceptance of this VECP by the City to obtain maximum cost reduction during remainder of contract.

g. Time of Completion. State the effect on contract completion if this VECP is accepted.

h. Cost Analysis:

1. Detailed estimate of the cost of performing the work in accordance with existing contract requirements.
2. Detailed estimate of the cost of performing the work in accordance with proposed contract change.
3. Gross Savings to the Contractor.
4. Implementation Costs:
   i. Detailed breakdown of Contractor Development and Implementation Costs.
   ii. Estimated City Costs.

i. Estimated Net Savings.

D. Contractor

1. Submit VECP in accordance with the applicable provisions of Section 8.6.

2. After Notice to Proceed, Contractor may request a preliminary determination from the City that the proposed VE change does not impair an essential function or characteristic, and that a formal VECP may be accepted. Prior to Notice to Proceed, the City will not comment on any VECP.

a. Requests should be in writing and sufficiently detailed to enable a city determination.

b. Requests should be submitted prior to any significant expenditure of time or effort to develop a VECP.

3. Until a VECP is accepted by the City and an implementing change order is issued- by the Engineer and executed by the Contractor, the Contractor shall perform in accordance with the existing contract.

4. The Contractor shall have the right to withdraw, in whole or in part, any VECP at any time prior to acceptance by the City.

E. City Review

1. The Engineer will evaluate the VOECP. Final determination of the effect of the proposed change on essential functions and characteristics of the effect of the proposed change on performance of the item, and of the life-cycle costs and City implementation costs will be made by the Engineer.

2. The City will not be liable for any delay in acting upon any proposal submitted.

3. The Engineer will notify the Contractor of the status of the VECP within 15 working days after receipt. If additional time is required, the Engineer will notify the Contractor within the 15-day period and provide the reason for the delay and the expected date of decision.

4. The Engineer may request additional data for clarification or for modification of the proposal.

5. If the forma] VECP is not accepted, the Engineer will notify the Contractor in writing, explaining the reasons for rejection.

F. Acceptance by City

1. The City may accept or reject, in whole or in part, any VECP submitted. Acceptance will be by contract change order.

2. The decision of the Engineer to accept or reject, in whole or in part, any VECP under this contract, shall be final and shall not be subject to protest.

3. If a VECP submitted by the Contractor is accepted, the contract price will be reduced by an amount equal to 50% of Net Savings plus 50% of actual City Costs, expressed by the formula: Reduction = 0.5 (Net Savings) + 0.5 (City Costs)

4. If a VECP submitted by the Contractor is not accepted, the Contractor will not be entitled to an extension of time or to any other compensation for the effort expended in developing and submitting the VECP.

G. Subcontracts

1. Contractor shall include VE provisions in any subcontract of $25,000 or greater, and may include such provisions in subcontracts of lesser value. Subcontracts shall contain a provision that any benefits accruing to contractor as a result of an accepted, VEC^, initiated by a subcontractor shall be shared by Contractor and subcontractor.

2. To compute adjustment of the contract price, the Contractor's cost of development and implementation of a VECP which-is accepted under this contract shall include any development and implementation costs of a subcontractor.

H. Data Restriction

1. The City reserves the right to duplicate, use, and disclose any part of a VECP or any part of the supporting data submitted by the Contractor, in any manner and for any purpose whatsoever, except that the Contractor's estimated cost of performing work or of development and implementing the VECP will not be disclosed outside the City.

8.7 Emergency Work.

8.7.1 During Working Hours – In case of an emergency which threatens loss or injury of property, and/or safety of life during working hours, the Contractor shall act, without previous instructions from the City, as the situation may warrant. He shall notify the Engineer of the emergency and the action taken immediately thereafter. Any compensation claimed by the Contractor, together with substantial documents in regard to expense, shall be submitted to the Engineer within 5 calendar days after the emergency. Compensation, if allowed, will be paid for as extra work.

8.7.2 Outside of Working Hours – Whenever in the opinion of the City there shall arise outside of the regular working hours on the contract work an emergency involving a danger to public safety, the City's forces may handle such emergency work if the Contractor fails to immediately respond-to an emergency call out from the City. If such emergency arises out of or is the result of operations by the Contractor, the cost of the corrective measures will be billed to the Contractor and deducted from his payment as provided in the contract documents. The performance of emergency work by City forces will not relieve the Contractor of any of his responsibilities, obligations, of liabilities under the contract. This provision shall hot relieve the Contractor from monitoring and maintaining public safety at all times.

8.8 Working Hours.

A. Except for emergency work and traffic safety work, work or activity of any kind shall be limited to the hours from 7:30 a.m. to 6:00 p.m. Monday through Friday without prior approval; of the Engineer, Attention is directed to the Albany City Code limiting work hours in residential and other areas of the City.

B. Work in excess of eight hours per day, on Saturdays, on Sundays, or on City holidays, requires prior consent of the Engineer and is subject to Cost of Overtime Construction Inspection.

C. City Holidays are:

New Year's Day
Martin Luther King Day (3rd Monday in January)
Lincoln's birthday
Washington's Birthday (3rd Monday in February)
Memorial Day (last Monday in May)
Independence Day
Labor Day (first Monday in September)
Admission Day
Columbus Day (2nd Monday in October)
Veteran's Day
Thanksgiving Day arid following Friday
Christmas Day

No work shall be performed on these days without prior approval of the City.

8.9 Time of Completion.

The Contractor shall complete the work called for under the contract in all parts and requirements within the number of days set forth in the Contact Documents.

8.10 Penalty for Late Completion.

It is agreed by the parties to the Contract that time is of the essence in the completion of this work and that in case all the work called for under the Contract is not completed with before or upon the expiration of the time limit as set forth in the Contract, damage will be sustained by the City of Albany and that it is impracticable to determine the actual damage which the City will sustain in the event of and by reason of such delay; and it is, therefore, agreed that the Contractor will pay to the City of Albany the sum set forth herein or in the special provisions per day for each and every day's delay beyond the-time prescribed to complete the work; and the Contractor agrees to pay such penalty as herein provided and in case the same are not paid, agrees that the City may deduct the amount .thereof from any money due or that may become due the Contractor under the Contract

It is further agreed that in case the work called for under the Contract-is not finished and completed in all parts and requirements within the number of Contract days specified, the Engineer shall have the right to increase the number of Contract days or not, as he may deem best to serve the interests of the City, and if he decides to extend the said number of working days, he shall further have the right to charge to the work all or any part, as he may deem proper, of the actual cost of engineering, inspection, superintendence and other overhead expenses which are directly chargeable to the contract, and which accrue during the period of such extension.

Unless such liquidated damages are specified in the Special Provisions differently, the amount per Contract day shall be as follows:

Amount of Contract	Amount of Liquidated' Damages (Per Day)
Less than $100,000	$200.00
$500,000 and less than $500,000	$500.00
$500,000 and less than $1,000.000	$1,000.00
$1,000,000 and over	$1,500.00

The Contractor will be granted an extension of time and will not be assessed a penalty or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time named in the Contract for the completion of the work caused by acts of God or of the public enemy, fire or flood not caused or preventable by the Contractor, epidemics, quarantine restrictions, strikes, labor disputes, shortage of materials and freight embargoes, provided that the Contractor shall notify the Engineer in writing of the causes of the delay within 15 calendar days from the beginning of any such delay. The Engineer shall ascertain the facts and the extent of the delay, and his findings and action thereon shall be final and conclusive.

No extension of time will be granted for a delay caused by a shortage of materials unless the Contractor furnishes to the Engineer documentary proof that he has diligently made every effort to obtain such materials from all known sources within reason and further proof in the form of supplementary progress schedules, that the inability to obtain such materials when originally planned, did in fact cause a delay in final completion of the entire work which could not be compensated for by revising the sequence of the Contractor's operations. Only the physical shortage of material will be 'considered under these provisions as a cause for extension of time and ho consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Engineer that such material could have been obtained only at exorbitant prices entirely out of line with current rates taking into account the quantities involved and the usual practices .in obtaining such quantities.

If the Contractor is delayed in completion of the work by reason of changes made by any act of the Engineer not contemplated by the contract, an extension of time commensurate with the delay in completion of the work thus caused will be granted and the Contractor shall be relieved form any claim for liquidated damages, or engineering and inspection charges or other penalties for the period covered by such extension of time; provided that the Contractor shall notify the Engineer in writing of the causes of delay within 15 calendar days form the beginning of any such delay. The Engineer shall ascertain the facts and the extent of the delay, and his findings and actions thereon shall be final and conclusive.

8.11 Completion of Work/Acceptance.

When the Engineer or his authorized representative has made the final inspection and determines that the Contract has been completed in all respects in accordance with the plans and specifications, and other Contract Documents, s/he will recommend that the City Council formally accept the work, and immediately upon and after such acceptance by the Council, the Contractor will be relieved of the duty of maintaining and protecting the work as a whole, and he will not be required to perform any further work thereon; and the Contractor shall be relieved of his responsibility for injury to persons or property or damage to the work which occurs after the formal acceptance by the Council; except as provided pertaining to such guaranties of the work as may be required or resulting from Contractor's defects; or faulty work not discovered prior to such acceptance; or maintenance required beyond the completion of the work such as landscape maintenance.

Section 9 - Measurement and Payment

9.1 Measurement of Quantities.

Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to. United States Standard Measures or Metric System of Measurement, and the units of measurement for payment, and the limits thereof, shall be as shown on the plans or the special provisions or in the absence thereof, as set forth in these specifications.

In determining quantities, all measurements shall be made in horizontal or vertical planes unless otherwise specified.

9.1.1 Methods of Measurement – Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the particular sections involved.

9.1.2 Certified Weights – When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall furnish the Engineer with duplicate licensed weighmaster's certificates showing the actual net weights. The City may accept the certificates as evidence of the weights delivered.

9.1.3 Units of Measurement – Measurements, conversions, multiples and fractions thereof shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds. The unit of liquid measure is the U.S. gallon. The units of area are square feet and square yards and the unit of volume is cubic yards. Unit of length is linear feet

Material not used from a transporting vehicle shall be determined by the Engineer and deducted from the certified tag.

When materials are to be measured and paid for on a volume basis, and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Engineer in writing, 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 Engineer before such method of measurement of pay quantities will be adopted. Unless otherwise specified, units of measurement are as determined in place based on neat lines as indicated on Contract Plans or Drawings without regard to expansion or compaction.

Where contract plans, drawings, reference drawings or other contract specifications indicate a minimum dimension (e.g., 2 inch minimum depth of asphalt concrete overlays), no payment for exceeding the minimum dimension shall be allowed, except when payment is based on weight or volume the Engineer may approve up to a five (5) percent increase based

either on the contract bid amount, or theoretical weight or volume based on the contract drawings and specifications, which ever is less.

Full compensation for all expense involved in conforming to the requirements for measuring and weighing materials shall be considered as included in the unit prices bid for the materials being measured or weighed and no additional allowance will be made therefore.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or 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; or material not unloaded form the transporting vehicle; or material placed outside the lines indicated on the plans or given by the Engineer; or material remaining on hand after completion of the contract, will not be paid for and such quantities will not be included in the final total quantities. No compensation will be allowed for hauling and disposing of rejected materials.

9.2 Scope of Payment.

The Contractor shall accept the compensation, as herein provided, as full payment for furnishing all 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 form the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as herein specified; and for estimate or of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

This Section shall apply to all bid items as if repeated and contained separately therein.

Compensation for all work performed under the Contract shall be included in the bid prices listed in the Bid Proposal and include the full compensation for all of the costs, overhead, profit and expenses in connection therewith, including furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved -in completing each item as shown and specified. Principal features of the work to be included under the various payment items are noted. Work not specifically listed in the "Bid Proposal" shall be included in the prices bid under the items to which such work is applicable. Quantities of work to be paid shall be based on the number or amount of the item acceptably installed complete in place, as measured by the Engineer. In the case of item limits of payment designated on the plans, such limits shall control and no separate measurement or payment will be made beyond such limits for the items.

The work of this project is designated in the Bid Proposal by size, type, quantity or whatever information is necessary for identification. The Contractor shall accept the compensation provided in the contract as full payment for furnishing all bonds, licenses, permits, fees and insurances, supervision, labor materials, tools, equipment; testing, corrections, repair, field construction survey, and incidentals necessary to the completed

work and for performing all work contemplated and embraced under the Contract. Also for loss or damage arising form the nature of the work or form the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the City and for all risks of every description connected with the prosecution of the work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Contract; and for completing the work in accordance with the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective or damaged work or material.

No compensation will be made in case of loss of anticipated profits. Increased or decreased work involving Contract Change Orders or supplemental agreements will be paid for as provided in such Contract Change Orders or agreements.

Payments for materials and supplies stored or not installed in their final positions will not be allowed.

Unless specifically provided differently, references to contractor's cost, borne by Contractor, paid by Contractor and phrases of like import shall be deemed to be accompanied with the phrase "at no additional cost to the City."

It is mutually agreed between the parties hereto that no certificate given or payments made under this Contract, except the final certificate of payment, shall be conclusive evidence of the performance of this Contract, either wholly or in part, against any claim of the City, and no payments shall be construed as an acceptance of any defective work or improper materials. The Contractor hereby further agrees that the payment of the final amount due under the Contract, and the adjustment and payment for any work done in accordance with any alterations of the same, shall release the City, Engineer, and their authorized representatives form any and all claims or liability on account of work performed under this contract or any alterations thereof.

The Contractor shall submit an estimated, progress payment-request to the City for the work constructed during the preceding calendar month. The City will review the progress payment request to determine that it represents the total amount of work done, and if required, will adjust the request to represent the total amount of the work done. The City will deliver copies of such adjustments to the Contractor. Such progress payment requests shall be on a form provided or approved by the City.

No payment or partial payment will be made for any work or portions thereof which work or portions are not incorporated and installed as a completed part of the work. The unit and lump sum prices bid shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, supplies, and appurtenances; providing all construction plant, equipment, and tools; performing all necessary labor and supervision to fully complete the work; and restoration of existing improvements and utilities, shall be included in the prices bid. All concomitant work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

All estimated quantities stipulated in the Bidders Proposal or other Contract Documents are approximate and are to be used only as a basis for estimating the probable cost of the work and for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference, between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.

9.3 Extra Work

9.3.1 General – New or unforeseen work will be classed as "extra work" when the Engineer determines that it is not covered by contract unit prices or stipulated unit prices.

9.3.2 Payment – When the price for the extra work cannot be agreed upon, the city will pay for the extra work based on the accumulation of costs as provided herein.

9.3.3 Daily Reports by Contractor – At the beginning of the following day, the Contractor shall submit a daily report to the Engineer, on forms approved by the City, together with applicable delivery tickets, listing all labor, materials and equipment involved for that day, and for other authorized services and expenditures. An attempt shall be made to reconcile the daily report, and it shall be signed by the Engineer and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through the prime contractor. The Daily Reports shall show .the following:

a. Labor — The report shall show names of workers, classification and hours worked.
b. Material — The report shall describe and list quantities of materials used.
c. Equipment — The report shall show type of equipment, size, identification number and hours of operation, including loading and transportation, if applicable.
d. Other Services and Expenditures — Other services and expenditures shall be described in such detail as the City may require.

9.3.4 Basis for Establishing Costs

9.3.4.1 Labor – The costs of labor will be the actual cost for wages, not to exceed that prevailing locally for each craft or type of workman at the time the extra work is done, plus costs. The use of labor classification which would increase the extra work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

9.3.4.2 Labor Surcharge – The labor surcharge compensates the Contractor for statutory payroll items stipulated by various governmental agencies. The four items

included are Workers* Compensation, Social Security, State Unemployment and Federal Unemployment taxes. The general rate is an average of the job classifications common to public projects. Exceptions to this average are listed below. The exceptions were determined from ratings of very high Workers' Compensation costs. The exceptions should be utilized only for the employee group actually performing the "excepted" task. Questions or disputes should be directed to the City.

The Labor Surcharge percentage will make all necessary compensation for the fact that 1) the unemployment portion of the percentage should be applied only to the first $7,000.00 earned and 2) the entire percentage should be applied only to base wage and vacation pay. The surcharge percentage to be applied to the actual wages paid will be 19 percent for all work, except that for the following types of work said surcharge will be as shown below:

Type of Work Performed	Labor Surcharge Percent
Concrete Construction - Bridge	20
Drilling	23
Erection of structural metal for metal bridges, excluding sign bridge	24
Puedriving, not including drilled, cast-in-place concrete piles	23
Wrecking & Demolition	21

9.3.4.3 Materials – The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the job site in the quantities involved, plus sales tax, freight and delivery. The City reserves the right to approve materials and sources of supply, or to supply materials to the Contractor if necessary for the progress of the work. No charge of markup shall be applied to any material provided by the City.

9.3.4.4 Tool and Equipment Rental – No payment will be made for the use of tools which are not listed on the current State equipment Rental Rate List.

The rates to be used in determining equipment rental costs shall not exceed those determined using the latest State Department of Transportation Manual of Equipment Rental Rates.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance and all incidentals. Necessary loading and transportation costs for equipment used on the extra work shall be included.

If equipment is used intermittently and, when not in use, could be returned to its rental source and less expense to the City than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the City.

All equipment shall be acceptable to the Engineer, in; good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at last: the minimum rating recommended by the manufacturer.

The reported rental time for equipment already at the job site shall be the duration of its use on the extra work, commencing at .the time it is first put into actual operation on the extra work, plus the time required to move it from is previous site and back or to a closer site.

9.3.4.5 Other Items – The City may authorize other items which may be required on the extra work. Such items include labor, services, material and equipment which are different in their nature from those required for the work specified in the contract and which are of a type not ordinarily available from the Contractor or any of his subcontractors. Invoices covering all such items in detail shall be submitted with the request for payment.

9.3.4.6 Invoices – Vendor's invoices for material, equipment rental, and other expenditures shall be submitted with the request for payment. If the request for payment is not substantiated by, invoices or other documentation, the City may establish the cost of the item involved at the lowest price which was current at the time of the work involved.

9.3.4.7 Markup – The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits.

On Labor	25%
On Materials	15%
On Equipment Rental	15%
On Other Items and Expenditures	15%

No additional markup shall be made by reason of the performance of extra work by a subcontractor or other forces.

9.4 Progress Payments.

The Contractor shall, once each-month, prepare an estimate of the total amount of work done. The Engineer will review and correct the monthly estimate as appropriate. Upon the Engineers approval of the monthly estimate, the City shall retain 10% of such estimated value of the done and shall pay to the Contractor, the estimated amount of work after deducting therefrom all previous payments and all sums to be kept or retained under the provisions of the Contract No such estimate or payment shall be required to be made, when, the judgment of the 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 don® since the last estimate amounts to less than One Thousand Dollars ($10DO).

Progress payments will be made no sooner than 15 calendar days following the Engineer's approval of the monthly pay request and no later than 25 calendar days following the Engineer's approval.

In lieu of the above described retention, at the request and expense of the Contractor, the City will make payment of funds withheld" from progress or partial payments pursuant to the requirements of Government Code Section 14402 if the Contractor deposits in escrow with a bank acceptable to the City, securities eligible for the investment of State funds under Government Code Section 16430 or bank certificates of deposit, upon the following conditions.

a. The Contractor shall bear the expense of the City and the escrow agent, either the City Treasurer or the bank, in connection with the escrow deposit made.

b. Securities or certificates of deposit to be placed in escrow shall be subject to approval of the Department and unless otherwise permitted by the escrow agreement, shall be of a value of at least 100 percent of the amounts of retention to be paid to the Contractor pursuant to this section.

c. The Contractor shall enter into an escrow agreement satisfactory to the City, which agreement shall include provisions governing (inter alia):

1. the amount of securities to be deposited,

2. the providing of powers of attorney or documents necessary for the transfer of the securities to be deposited,

3. conversion to cash to provide grounds to meet defaults by the Contractor including, but not limited to termination of the Contractor's control over the work, stop notices filed pursuant to law, assessment of liquidated damages or other amounts to be kept or retained under the provisions or the contract,

4. decrease in value of securities on deposit

5. the termination of the escrow upon completion of the contract.

6. The Contractor shall provide written notice to the surety to such agreement.

9.5 Delivered Material.

When provided for in the Special Provisions, subject to limitations and conditions therein, the cost of materials and equipment delivered but not incorporated in the work may be included in the progress estimate, upon approval by the Engineer.

9.6 Payments Withheld.

The City may withhold, or on account of later discovered evidence, nullify all or part of any certification made to the Contractor by the City as to the amount determined to be

due the Contractor, to such extent and period of time only as may be necessary to protect the City from loss on account of:

(a) Defective work not remedied;
(b) Claims filed or written evidence indicating probable filing;
(c) Failure to properly pay Subcontractors or for material or labor;
(d) Damage to City property.

9.7 Acceptance, Final Estimate and Payment.

Whenever the Contractor shall, in the opinion of the Engineer, have completed his Contract, the Engineer shall so certify in writing to the City Council, and shall make a final estimate of the amount of the work done by the Contractor and also the value of his work according to the terms of the Contract.

Upon acceptance of the work by the City Council, the final payment of the work will be made to the Contractor. The payment due the. Contractor for work performed and materials furnished shall be determined form the final measurements made by the Engineer and the unit prices bid by the Contractor, including such extra work as may have been properly authorized. All prior partial quantities and payments shall be subject to correction in the final payment and no payment shall be construed to be an acceptance of any effective work or improper materials.

From the total amount of .the work, a deduction of ten (10) percent will be made and from the remainder will be deducted all amounts due to the City from Contractor in accordance with the terms of the contract. This amount will be paid no sooner than 35 calendar days, nor later than 45 calendar days, -following council acceptance.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Table of Sections

Section	Title	Page
1	Mobililzation	T-1
2	Clearing and Grubbing	T-2
3	Earthwork	T-5
4	Dust Control and Watering	T-19
5	Street Failed Area Repair	T-23
6	Subgrade Preparation	T-27
7	Aggregate Subbase	T-29
8	Aggregate Base	T-31
9	Asphalt Concrete	T-34
10	Asphaltic Seal Coats	T-40
11	Hot Surface Recycling	T-63
12	Asphalt Concrete Leveling Course & Crack Fill Repairs	T-67
13	Cold Planing	T-71
14	Pavement Reinforcing Fabric	T-74
15	Pavement Delineation	T-77
16	Traffic Signs	T-82
17	Concrete Construction	T-86

Table of Sections
(continued)

Section	Title	Page
18	Sanitary Sewers & Storm Drains	T-124
	18-1 Trenching	T-124
	18-2 Bedding	T-126
	18-3 Pipe Materials & Installation (New or Replacement)	T-127
	18-4 Pipe Liners (or Pipe Rehabilitation Lines)	T-138
	18-5 Backfill	T-143
	18-6 Testing Pipelines	T-149
	18-7 Manholes, Cleanouts and Appurtenances	T-154
	18-8 Sewer Lateral Rehabilitation	T-159
	18-9 Control of Existing Flows	T-165
	18-10 Trench Resurfacing	T-166
	18-11 Measurement & Payment	T-166
19	Landscape Irrigation	T-168
20	Landscaping	T-190
21	Tennis & Basketball Court Resurfacing	T-209
22	Tree Trimming & Stump Removal	T-214
23	Standard Specifications for Public Works Construction "Technical Provisions"	T-218

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 1

Mobilization

1-1 General — Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project site.

1-2 Payment — Payments for mobilization will be made with each progress payment on a prorata percentage basis. The prorata basis shall be the total for the progress billing divided by the total contract amount, adjusted in accordance with approved change orders.

The contract lump sum price paid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in mobilization as specified herein, and no additional compensation shall be made therefor. Mobilization shall be considered as a non-adjustable contract item. Any contract change orders shall be considered as including full compensation for mobilization.

When the contract does not include a contract pay item for mobilization as above specified, full compensation for any necessary mobilization required shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 2

Clearing & Grubbing

2-1 General — This work shall consist of removing all objectionable material from within the limits of the project as specified. The limits of clearing and grubbing shall be of sufficient area and depth to complete the work shown on the plans or described herein.

The area above and below the natural ground surface shall be cleared of all vegetable growth and deleterious material such as trees, logs, upturned stumps, roots of down trees, brush, grass, weeds, rocks, concrete, pavement, and all other objectional material which would interfere with the work to a minimum depth of 6″ below subgrade or 6″ below natural ground, whichever is lower. All materials removed shall be disposed of outside of the City unless provided or otherwise in the Special Provisions. No accumulation of flammable material shall remain on or adjacent to the right-of-way. The roadway and adjacent areas shall be left with a neat and finished appearance.

All trees, existing stumps and large roots within embankment areas where the grading plane is two feet or more above the natural ground or where scheduled for removal shall be cut off flush with the natural ground at any point and need not be completely removed except where a structure is to be built or piles are to be placed or driven.

2-2 Pavement Removal

2-2.1 Bituminous Pavement — bituminous pavement shall be removed to clean, straight lines. Saw cutting of edges to be joined is optional. Where only the surface of existing bituminous pavement is to be removed, the method of removal shall be approved by the Engineer, and a minimum laying depth of 1 inch (25mm) of new pavement material shall be provided at the join line. Where bituminous pavement adjoins a trench, the edges adjacent to the trench shall be trimmed to neat straight lines before resurfacing to ensure that all areas to be resurfaced are accessible to the rollers used to compact the subgrade or paving materials. This requirement shall not apply when the street involved is to be overlaid or seal coated.

2-2.2 Concrete Pavement — Concrete pavement shall be removed to neatly sawed edges. Saw cuts shall be made to a minimum depth of 1½ inches (38mm). If a saw cut in concrete pavement falls within 3 feet (0.9m) of a construction joint, cold joint, expansion joint, or edge, the concrete shall be removed to the joint or edge. The edges of existing concrete pavement adjacent to trenches, where damaged subsequent to saw cutting of the pavement, shall again be saw cut to neat straight lines for the purpose of removing the damaged pavement areas. Such saw cuts shall be either parallel to the original saw cuts or shall be cut on an angle which departs from the original saw cut not more than 1 inch (25mm) in each 6 inches (150mm).

2-2.3 Concrete Curb, Walk, Gutters, Cross Gutters, Driveways, and Alley Intersections — Unless otherwise marked in the field by the Engineer prior to bids, concrete shall be removed to neatly sawed edges with saw cuts made to a minimum depth of 1½ inches (38mm). Concrete sidewalk or driveway to be removed shall be neatly sawed in straight lines either parallel to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than 30 inches (750mm) in either length or width. If the saw cut in sidewalk or driveway would fall within 30 inches (750mm) of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge, except that where the saw cut would fall within 12 inches (300mm) of a score mark, the saw cut shall be made in and along the score mark. Curb and gutter shall be sawed to a depth of 1½ inches (38mm) on a neat line at right angles to the curb face.

2-3 Disposal of Materials — All materials removed shall be disposed of in accordance with Section 7-1.13, "Disposal of Material Outside the Highway Right-of-Way," of the State Specifications and Section 6-18, "Disposal Outside Project limits," of General Provisions, City of Albany Standard Specifications, at no extra cost to the City. The contract work area shall be left with a neat and finished appearance. All trucks hauling demolition debris or other such materials shall be covered.

2-4 Salvaging of Materials — All existing materials that are designated to be salvaged shall be removed, cleaned and hauled to the City Corporation Yard, unloaded and stockpiled, by the Contractor unless otherwise directed by the Engineer.

2-5 Abandoning Pipes and Structures — Existing pipes when indicated on the plans to be abandoned, shall be so abandoned by one of the following methods as designated:

METHOD A: The existing pipe shall remain in place; all open ends of the pipe shall be plugged with Class 560-C-3250 concrete. The thickness of the concrete shall be a minimum thickness equal to the pipe diameter of 12 (twelve) inches, whichever is greater.

METHOD B: The existing pipe shall be completely filled with a sand/cement slurry Class 100-E-100.

If no method is specified on the plans or in the Special Provisions, Method B shall apply.

Existing structures, pavement slabs and structural sections to be abandoned shall be demolished to an elevation three feet below finished grade. Their bottoms (if any remain) shall be broken thoroughly to prevent entrapment of water and all voids backfilled with suitable backfill.

2-6 Measurement — Quantities of clearing and grubbing will be measured on a lump sum basis.

2-7 Payment — Clearing and grubbing shall be paid for at the contract lump sum price, which price and payment shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in clearing and grubbing as shown on the plans, as specified and as directed by the Engineer, including the removal and disposal of all the resulting material.

When the Contract does not include a pay item for clearing and removal work, as above specified, and unless noted otherwise in the Special Provisions, full compensation for any necessary clearing and removal work shall be considered as being included in the unit price paid for the type of earthwork involved, and no additional compensation will be allowed therefore.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 3

Earthwork

3-1 Earthwork

3-1.1 General — Earthwork shall consist of all excavation grading and construction, except structure excavation of pipelines, any excavation separately designated and paid for as a separate item. Work under this section shall consist of performing all operations necessary to excavate earth and rock, regardless of character and subsurface conditions, from the roadway prism or adjacent thereto; to excavate all materials, of whatever nature, necessary for the construction of foundations for structures and other facilities; to excavate drainage and irrigation ditches; to excavate drainage channels; to excavate selected material and borrow material for use as specified; to construct embankments including the placing of selected material in connection therewith a specified; to place backfill for structures, and other facilities; to backfill trenches and depressions; to remove and replace unsuitable material; to excavate and grade road approaches, driveways, and connections; to construct protection dikes; to remove unstable material, slide material which has come into the graded area, and material which has slipped from embankments; all as shown on the plans and as specified in these Specifications and the Special Provisions and as directed by the Director of Public Works; and furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work that may be required for earthwork, except excavation, trenching and backfilling for pipe, culverts, underground utilities system, and other subsurface pipes. Excavation trenching and backfilling for sewer and storm drain pipes, underground utilities, and other subsurface pipes is as specified in other sections of these Technical Provisions.

Whenever reference to finished grade is made, it shall be considered to be the finished surface of the completed facility. When the work covered by the Contract is stage construction, the relation between finished grade and the work covered by the Contract will be as shown on the plans.

Unless otherwise specified, quantities of all type of existing subbase, base, surfacing, or pavement removed will be included in the quantities of the type of

excavation in which they are located, and no separated payment will be made therefor.

When hauling is done over highways or City streets, and when directed by the Director of Public Works, the loads shall be trimmed and all material removed from shelf areas of vehicles in order to eliminate spilling of material. If directed by the Director of Public Works, the loads shall be watered after trimming to eliminate dust and/or covered.

3-1.2 Protection of Construction/Erosion Control — The Contractor shall provide and maintain slopes, crowns, and ditches on all excavations, fills and embankments to ensure satisfactory drainage at all times during the construction period. He shall be responsible for the construction of temporary dams, silting basins, and other facilities as required to prevent damage to the work, and eroded earth and silt from being deposited in streams or on adjacent properties. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base or pavement is placed. No separate payment will be made for this work, but it shall be considered as being included in the unit bid price for the earthwork involved. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base or pavement shall be laid until the subgrade has been checked and approved. Attention is directed to Chapter 15 of the City Code, the provisions of this section shall apply to all work.

3-1.3 Control of Ground & Surface Waters — The Contractor shall take such measures as may be required, and shall furnish, install and operate such pumps or other devices as may be necessary to remove any seepage, storm water or sewage that may be found or may accumulate in the excavations during the progress of the work. The Contractor shall keep all excavations entirely free from water at all times during the construction of the work and until the Director of Public Works gives permission to cease pumping.

3-2 Selected Materials — Shall be defined as materials which are excavated from the project site and which are satisfactory for use in fills, embankments, as backfill or other uses as specified or directed, insofar as such material is suitable for compaction, contains no cemented lumps or rocks larger than 3 inches in greatest dimension, is free of topsoil, organic and other deleterious materials, and is approved by the Director of Public Works.

3-3 Local Borrow Materials — Shall be defined as materials excavated and used in the construction of fills and embankments, or for use as selected material, or for other construction purposes obtained from sources within the project site as directed by the Director of Public Works or as specified in the Special Provisions. The Contractor will have no choice or selection of the source.

Imported Borrow Materials — Shall be defined as materials which are obtained from sources outside the project site. Such materials shall be subject to the approval of the Director of Public Works. Unless otherwise stipulated in the Specific Provisions, the Contractor shall make his own arrangements for obtaining imported material and shall pay all costs involved.

3-5 Topsoil — When so specified in the Special Provisions or directed by the Director of Public Works, topsoil shall be stripped to a depth of 4 to 6 inches and shall be either spread on areas indicated or shall be transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later. Topsoil shall be kept separate from other excavated materials and stockpiled free of roots, stones, and other undesirable materials.

3-6 Classification of Excavation — Unless otherwise specified in the Special Provisions, all excavation shall be unclassified. When excavation is classified in the Special Provisions as rock or common excavation and separate payment items have been established for same, then all excavation shall be done on a classified basis.

No consideration will be given to the nature of the materials under the designation of unclassified excavation. Earth and rock, regardless of character and subsurface conditions, shall be excavated to the lines and grades as established by the plans.

3-7 Selection of Borrow Materials — Borrow materials shall be selected to meeting the requirements and conditions of the particular fill or embankment for which it is to be used. Local borrow material shall be obtained from the borrow areas shown on the plans or specified in the Special Provisions. Imported borrow material shall be obtained from sources selected by the Contractor and approved by the Director of Public Works. Unless otherwise specified, the Contractor shall obtain from the owners the right to procure material, pay all royalties and other charges involved, and bear all expense of developing the sources, including rights of way for hauling.

No imported borrow material shall be delivered to the site until approved by the Designated Authority. Approval of borrow material shall be based on the Designated Authority's inspection of the borrow source and the testing of representative samples submitted by the Contractor. Such representative samples shall be submitted to the Director of Public Works not less than 15 days prior to commencing the work.

Imported borrow, delivered to the site, that significantly differs from the submitted samples shall be subject to rejection. Rejected materials shall be removed from the site at the Contractor's expense. Approval of a particular borrow material shall constitute approval of only that portion of the proposed borrow source represented by the submitted sample.

Unless specifically provided, no local borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of local borrow pits and the disposal of debris thereon shall be considered incidental operations to the borrow excavation and shall be performed by the Contractor at no additional cost to the City.

3-8 Unsuitable Material — Material below the natural ground surface in embankment areas and basement material in excavation areas below the limits specified in Article "Compaction" herein, that is unsuitable for the planned use, shall be excavated and disposed of al directed by the Director of Public Works.

The removal and disposal for such unsuitable material will be paid for as roadway excavation for the quantities involved if the removal for such material is shown on the plans or specified in the Special Provisions.

If removal of such unsuitable material is not shown on the plans or specified in the Special Provisions, the removal and disposal of such unsuitable material will be paid for at the contract prices for roadway excavation for the quantities involved unless either the Director of Pubic Works, prior to removal of any such material, orders the unsuitable material to be removed and disposed of an paid for as extra work as provided in Part I - General Provisions, or the Contractor, prior to performing any such work, requests in writing that the removal and disposal of such unsuitable material be paid for as extra work as provided in Part I - General Provisions of the Standard Specifications.

When unsuitable material is removed and disposed of, the resulting space shall be filled with material suitable for the planned use. Such suitable material shall be placed and compacted in layers as hereinafter specified for constructing embankments.

3-9 Slides and Slipouts — Material outside the planned roadway or ditch slope which is unstable and constitutes a potential slide in the opinion of the Designated Authority, material which has come into the roadway or ditch, and material which has slipped out of new or old embankments shall be excavated and removed. The material shall be excavated to designated lines or slopes either by benching or in such manner as directed by the Soils Engineer and approved by the Director of Public Works. Such material may be used in the construction of the embankments when approved by the Soils Engineer.

The removal and disposal of slide and slipout material as above specified, and not resulting from any act or failure to act on the part of the Contractor, will be paid for at the contract prices of roadway excavation for the quantities involved.

However, if in the opinion of the Director of Public Works the character of the work, the removal and disposal of such material is not properly compensable at the contract prices for roadway excavation, the work may be paid for saw "Extra Work" as

provided in Part I - General Provisions provided the Contractor requests in writing such payment prior to performing any such work.

Only those quantities of slide or slipout material will be paid for which are actually removed as ordered by the Director of Public Works.

3-10 Slopes — Excavation slopes shall be finished in conformance with the lines and grades shown on the plans. All debris and loose material shall be removed. When completed, the average plane of the slopes shall conform to the slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope. Where excavation is in rock no point shall vary more than 2 feet from the designated plane of the slope. In no case shall any portion of the slope encroach on the roadbed.

Embankment slopes shall be finished in conformance with the lines and grades shown on the plans. When completed, the average plane of the slopes shall conform to the slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope.

3-11 Surplus Materials — Unless otherwise shown on the plans or specified in the Special Provisions, no surplus excavated material may be disposed of within the right-of-way or on adjacent property within the project area. Unless otherwise specified in the Special Provisions, surplus excavated material to be disposed of shall become the property in responsibility of the Contractor and shall be disposed outside the City at the Contractor's expense, unless otherwise provided for in the Specific Provisions.

Quantities of surplus material, if any shown on the plans or in the Special Provisions, are approximate only. The Contractor shall satisfy himself that there is sufficient material available for the completion of the embankments before disposing of any indicated surplus material. Any shortage of material, caused by premature disposal of the indicated surplus material by the Contractor, shall be replaced by him and no compensation will be allowed for such replacement.

3-12 Deficiency in Materials — If the quantity of acceptable material from excavation is not sufficient to construct the fills or embankments required by the work, the quantity of material needed to complete the fills or embankments shall consist of imported borrow, as determined by the Director of Public Works.

The Contractor shall obtain imported borrow in accordance with the provisions of Section 3-3 and 3-4 herein. If the contract does not include an item for imported borrow, payment of the required imported borrow will be made by "Extra Work" as provided in Part I - General Provisions.

3-13 Selected Material — Selected material encountered in the excavation

within the right-of-way shall be used for finishing the top portion of the roadbed, constructing shoulders, structure backfill; as shown on the plans; as specified in the Special Provisions, or as directed by the Director of Public Works. Topsoil excavated within the limits of the project may be considered as a selected material only for the purpose of backfilling areas to be planted.

When practicable, selected material shall be hauled directly from excavation to its final position in the roadway prism and compacted in place and such work will be paid for at the contract prices for roadway excavation.

Selected material shall remain in place until it can be placed in final position as provided above. No additional compensation will be allowed for any delay in excavation operations, except that if ordered in writing by the Director of Public Works, selected material may be excavated and stockpiled at locations designated by him and later placed in final position in the roadway prism.

Excavating selected material and stockpiling, if required, will be paid for at the contract prices for roadway excavation. Removing the selected material from stockpiles and placing it in final position in the roadway prism will again be paid for at the contract prices for roadway excavation, except that the quantities to be paid for will be determined from measurements of the material in the stockpiles prior to removal.

No payment for stockpiling of selected material will be made, unless such stockpiling is ordered by the Director of Public Works.

When determining quantities of earthwork to be paid for, topsoil placed along the tops of slopes in connection with erosion control work will not be considered as stockpiled material.

3-14 Measurement

3-14.1 Roadway Excavation to be paid for the will be the number of cubic yards of material excavated as classified or unclassified excavation, as defined in thee Technical Provisions, measured in the original position and computed by the average end area method. The following earthwork operations will be measured as roadway excavation for the quantities of material involved; excavating the roadway prism including public and private road approaches; connections and driveways; excavating unsuitable slides and slipouts not resulting from overshooting; excavating surplus material; excavating selected material and topsoil form within the limits of project and removing such materials from stockpiles when stockpiling is ordered; excavating channels; and excavating local borrow.

Excavating 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 elevation or authorized section at no expense to the City.

The measurement will not include the yardage of subgrade material or other material that is scarified or plowed and reused in place by road mixing or other similar in place method of operation.

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 common excavation by means of average areas, the Director of Public Works 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.

The final estimate of roadway excavation quantities shall be the quantities included within the planned or authorized cross section, excluding the rounding of the tops of excavation slopes and ends of excavations, and the quantities involved in the removal of slides and slipouts.

3-14.2 Imported Borrow — The quantity of imported borrow material will be measured either by the ton (2,000 lbs.), or by the cubic yard of truck measure, as indicated in the bid schedule. When measured by the ton, the Contractor shall furnish certified weight slips to the Director of Public Works for each load delivered. A weight deduction will be made for any moisture content in excess of 6 percent of the dry weight of the material. When truck measure is used, each type of truck shall be accurately marked for its cubic yard, "water level," capacity, and said yardage figures shall be mutually agreed upon before hauling commences. All such vehicles shall be loaded to at least their "water level" capacity, and the Contractor shall furnish certified yardage slips to the Director of Public Works for each load delivered.

3-15 Payment

3-15.1 Roadway Excavation — Quantities of classified or unclassified roadway excavation will be paid for at the contract unit price per cubic yard for the respective classification. Such price shall include excavating, sloping, rounding tops and ends of excavations, loading, depositing, conditioning, spreading, watering, and compacting the material complete in place and disposal of surplus material and no additional compensation shall be made therefor. If there is no bid item for Roadway Excavation, full payment shall be considered as included in the other contract items of work.

3-15.2 Imported Borrow — Imported borrow and classified or unclassified local borrow, measured as stated above and accepted, will be paid for at the contract unit prices per cubic yard or ton for borrow, which prices and payment shall constitute full compensation for furnishing all labor, materials, equipment, tools, supplies, and incidentals necessary to clear and strip the borrow sites, excavating, loading, hauling, depositing, spreading, watering and compacting the material complete in place, and disposing of cleared and stripped material, and no additional compensation shall be made therefor.

If there is no bid item for Import Borrow, full compensation shall be considered as included in the other contract items of work.

3-16 Structure Excavation and Backfill

3-16.1 General — Shall consist of the removal of material for the construction of foundations for bridges, box culverts, retaining walls, headwalls and endwalls for culverts, reservoirs, buildings, and other structures, and other excavation designated on the plans or in these Specifications, or in the Special Provisions as structure excavation.

Structure backfill shall consist of furnishing, placing and compacting backfill material around structures to the lines designated on the plans or specified or directed by the Director of Public Works.

Structure excavation and structure backfill shall include the furnishing of all materials and equipment and the construction or installation of all shoring, cofferdam and sheeting and/or other facilities which may be necessary to perform the excavations and place and compact the backfill, and the subsequent removal of such facilities, except where they are required or permitted by the plans or Specifications to remain in place.

When shown on the plans or directed by the Director of Public Works, recesses of culvert inlets shall be excavated in excavation slopes to the dimensions designated and the resulting material disposed of in embankments as directed, and such work will be paid for as structure excavation for the quantities involved.

Surplus material from structure excavation shall be deposited in embankments as provided in Article "Embankment Construction," or disposed of as provided for in "Surplus Material," all as directed by the Director of Public Works, and no additional compensation will be allowed for such work.

3-16.2 Foundation Subgrade Treatment — When footing concrete or masonry is to rest upon rock, the rock shall be fully uncovered and the surface thereof shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly

leveled off or cut to approximate horizontal and vertical steps, and shall be roughened. Seams in the rock shall be grouted under pressure or treated as the Director of Public Works may direct and the cost thereof will be paid for as extra work.

When no piles are used and footing concrete or masonry is to rest on an excavated surface other than rock, care shall be taken not to disturb the bottom of the excavation and final removal of the foundation material to grade shall not be made until just before the concrete or masonry is placed. Except when over-excavation is directed by the Director of Public Works, excavation below grade shall be replaced at the Contractor's expense with the same class of concrete specified for the structure and at the time the concrete for the structure is being placed.

The excavation for piers and abutments shall be completed to the bottom of the footings before any piles are driven therein, and excess material remaining in the excavation after pile driving shall be removed to the elevation of the bottom of the footings.

When piles are used and ground displacement results from pile driving operations, the Contractor shall at his expense excavate or backfill the footing areas to the grade of the bottom of the footing as shown on the plans with structure backfill material.

3-16.3 Construction Review — Whenever any structure excavation is completed, the Contractor shall notify the Director of Public Works who will conduct a construction review of the foundation. No concrete or masonry shall be placed until the foundation has been approved by the Director of Public Works.

3-16.4 Structure Backfill — Shall not be placed until the structure footings or other portions of the structure or facility have been reviewed by the Director of Public Works and approved for backfilling. No backfill material shall be deposited against the back of concrete abutments, concrete retaining walls, foundation walls, or the outside walls of cast-in-place concrete culverts until the concrete has developed a strength of not less than 2,500 psi in compression as determined by test cylinders cured under conditions similar to those prevailing at the site.

Unless otherwise specified in the Special Provisions, structure backfill shall consist of approved selected material from excavation, free from stones or lumps exceeding 3 inches in greatest dimension, vegetable matter, or other unsatisfactory material. When the material from excavation is unsuitable for use as backfill, it shall be disposed of as directed by the Director of Public Works and suitable material approved by the Director of Public Works shall be furnished by the Contractor for the backfill.

Consolidation of structure backfill by pounding and jetting will be permitted when, as determined by the Director of Public Works, the backfill material is of such character that it will be self-draining when compacted and that foundation materials will not soften or be otherwise damaged by the applied water, and no damage to the structure from hydrostatic pressure will result. Pounding and jetting of the upper 2 feet below finish subgrade will not be permitted in roadway areas. When pounding and jetting is permitted, material for use as structure backfill shall be placed and compacted in layers not exceeding 4 feet in thickness. The work shall be performed without damage to the structure or softening of the embankment, and in such a manner that excess water will not be impounded. Pounding and jetting methods shall be supplemented by the use of vibratory or other consolidation equipment when necessary to obtain the required consolidation.

3-16.5 Measurement — There shall be no separate measurement for Structure Excavation and Backfill.

3-16.6 Payment — Unless otherwise provided in the Special Provisions, no payment will be made for structure excavation or backfill as such; the cost thereof shall be considered as included in the price bid for the construction or installation of the items to which such excavation or backfill is incidental or appurtenant. Separate payment for such excavation or backfill will be made only when the Special Provisions provide, and then, only for the volume included within vertical faces one foot beyond and parallel with the outermost horizontal dimensions of that portion of the structure to be constructed within the limits of the excavated space.

3-17 Embankment Construction

3-17.1 General — Shall consist of constructing embankments and fills, including the preparation of the areas upon which they are to be placed; buttress fills; dikes; the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of material in holes, pits and hole depressions.

Areas over which fills are to be placed shall be cleared and scarified to provide a bond between the existing ground and the material to be deposited thereon. When fills are to be placed over existing surface improvements which are to remain in place, such clearing and scarifying will not be required. Whenever a fill is constructed upon an existing structure or pavement, 4 inch drainage holes shall be drilled through the structure on 5 foot centers each way or the pavement shall be broken by stomping in a grid pattern of 5 feet each way.

Rocks, broken concrete, or other solid materials which are larger than 4 inches

in greatest dimension, shall not be placed in fill areas where piles are to place or driven, or that would interfere with the construction for other structures.

When fill is to be made and compacted on hillsides or where new fill is to be compacted against existing fill or where embankment is built one-half width at a time, the slopes of original hillsides and old or new fills shall be benched a minimum of 4 feet horizontally as the fill is placed. A new bench shall be started where the vertical cut for the next lower bench intersects the existing ground.

Materials thus cut out shall be recompacted along with the new embankment material at the Contractor's expense unless the width of the bench required by the Director of Public Works exceeds 4 feet, in which case the excavated material in excess of 4 feet will be measured and paid for as excavation.

Clods or hard lumps of earth of 6 inches in greatest dimensions shall be broken up before compacting the materials in embankment, with the following exception:

When the fill materials contain large rocks, boulders, or hard lumps such as hardpan or cemented gravel which cannot be broken readily over 12 inches in greatest dimension, such materials may be incorporated in the fill only when authorized by the Director of Public Works with respect to the acceptability of the material, the location and depth of its placement in the fill, and the method to be used. When the embankment material consists of large rocky materials, or hard lumps such as hardpan or cemented gravel, 12 inches and less in greatest dimension, which cannot be broken readily, such material shall be well distributed throughout the embankment. Sufficient earth or other fine material shall be placed around the large material as it is deposited so as to fill the interstices and produce a dense, compact embankment.

When bridge footings are to be constructed in embankment, the embankment shall be constructed to the elevation of the grading plane before excavating for the footing, or when foundation piling is shown on the plans, before driving the piles or excavating for the footing.

3-17.2 Compacting — Embankment shall be constructed in compacted layers of uniforms thickness and each layer shall be compacted in accordance with the requirements herein specified with the following exception: where embankments are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping excessive loads in a uniformly distributed layer of a thickness not greater than that necessary to support the equipment while placing subsequent layers. The remainder of the embankment shall be constructed in layers and compacted as specified.

The construction of dikes, the placing and compacting of approved material where

unsuitable material has been removed, and the filling of holes, pits and other depressions shall conform to all of the requirements specified herein for compacting embankments. Trenches, holes, depressions and pits outside of areas where embankments are to be constructed shall be graded to provide a presentable and well-drained area.

Embankments shall be constructed so that each layer shall have a cross fall of at least 2% but not more than 5%.

The loose thickness of each lift of embankment material shall not exceed that which will provide the specified relative compaction through the full depth of the lift by the specific compaction equipment being utilized. Each lift shall be compacted in accordance with the requirements of Article "Compaction" herein.

When embankment material contains by volume over 25% of rock larger than 6 inches in greatest dimension, the embankment below a place 3 feet form finished grade may be constructed in layers of a loose thickness before compaction not exceeding the maximum size of rock in the material but not exceeding 3 feet in thickness.

The interstices around the rock in each layer shall be filled with earth or the fine material and compacted. Broken Portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the embankment with the following limitations:

1. The maximum dimension of any piece used shall be six inches.

2. Pieces larger than 4 inches shall not be placed within 12 inches of any structure.

3. Pieces larger than 3 inches shall not be placed within 12 inches of the subgrade for paving.

4. "Nesting" of pieces will not be permitted.

At locations where it would be impracticable to use mobile power compacting equipment, embankment layers shall be compacted to the specified requirements by any approved method that will obtain the specified relative compaction.

At the time of compaction, the moisture content of embankment material shall be such that the specified relative compaction will be obtained and the embankment will be firm, hard and unyielding. Embankment material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required relative compaction. Full compensation for any additional work involved in drying embankment material to the required moisture

content shall be considered as included in the contract unit prices and no additional compensation will be allowed therefor.

3-17.3 Measurement — There shall be no separate measurement for embankment.

3-17.4 Payment — Full compensation for constructing embankments, preparing subgrade at the grading plane, doing necessary plowing or benching, constructing all dikes, placing and compacting approved material where unsuitable and unstable embankment foundation material has been removed, filling and compacting holes, pits, and other depressions, backfilling excavations resulting from the removal of structures and other facilities, placing selected material where required, placing topsoil excavated from within the project limits on slopes, placing selected material and topsoil in stockpiles, all as shown on the plan and as specified in these Specification and the Special Provisions, shall be considered as included in the contract price paid per cubic yard for excavating the material or the contract price paid for furnishing and placing the material, as the case may be, and no additional compensation will be allowed for such work.

Where embankment is specified in the bid schedule or in the Special Provisions full compensation for constructing such embankments shall include the cost of all the necessary excavation in connection therewith, both within the limits of the project or otherwise, together with the cost of all grading, shaping, and other work that is required under this Article "Embankment Construction." The quantities used in determining payment for embankment bid items shall be those of the completed embankments in place within the limit of dimensions shown on the plans.

3-18 Compaction

3-18.1 General — Earthwork compaction consists of obtaining the required compaction in all earthwork described in these Specifications or the Special Provisions, except structure backfill.

Embankments shall be constructed in layers. The loose thickness of each layer of embankment material before compaction shall not exceed 0.67 foot, except as provided for rocky material.

3-18.2 Relative Compaction (95 Percent) — Unless otherwise specified in the Special Provisions, whether in excavation or embankment, when subbase, base, pavement, or curb and gutter is to be placed directly on subgrade material, the top 6 inches of subgrade material shall be compacted to a relative compaction of 95 percent. After compaction and trimming, the subgrade shall be firm, hard, and unyielding. When expansive soils are encountered, the Director of Public Works may require that 6 inches of expansive soils be removed and replaced with either

aggregate base or subbase, this will be in lieu of the 95 percent compaction requirement. This provision does not waive the requirement in regard to "Unsuitable Material."

In addition, relative compaction for not less than 95 percent shall be obtained under subbase, base, pavement, and curbs and gutters for a minimum depth of 2.5 feet below finished grade in embankment areas.

Relative compaction for not less than 95 percent shall be obtained for embankment under wall footings without pile foundations within the limits established by inclined planes sloping 1½:1 out and down from lines one foot outside the bottom edges of the footing.

3-18.3 Relative Compaction (90 Percent) — Relative compaction of not less than 90 percent shall be obtained in all layers of material in embankment, except as specified herein to be 95 percent; and under driveways and sidewalks for a minimum depth of 2.5 feet below finished grade.

3-18.4 Measurement — There shall be no separate payment for compacting earthwork.

3-18.5 Payment — For earthwork compaction will be considered as included in the various contract items of work requiring compaction of earthwork and no separate payment will be made therefor. If the Contractor elects to excavate and replace basement material to facilitate compaction, the cost of such work will be considered as included in the contract items of work requiring compaction of earthwork and no separate payment will be made therefor.

3-19 Finish and Tolerance — The surface of all excavations, fills, embankments, and subgrade shall be finished to a reasonably smooth and compact surface, substantially within 0.10 foot above or below the planned elevation, the lines, grades, and cross sections or elevations, except for roadways, parking areas, sidewalks, and other paved areas, the finished subgrades of such areas shall not vary more than 0.03 foot above nor 0.05 foot below the planned elevation.

When the subbase, base or pavement for roadways, parking areas, sidewalks, and other paved areas are not being constructed under this Contract, the subgrades of such areas shall be finished within a tolerance of plus or minus 0.2 foot.

All other site areas that have been excavated, or that have received fill or embankments (excluding roadways and other paved areas), shall be finished within a tolerance of plus or minus 0.2 foot.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 4

Dust Control and Watering

4-1 Dust Control

4-2 General — This work shall consist of applying either water or dust palliative, or both, for the alleviation or prevention of dust nuisance.

Dust resulting from the Contractor's performance of the work, either inside or outside the project area, shall be controlled by the Contractor in accordance with the provisions in Section 6 "Legal Relations and Responsibility" of the General Provision.

It is understood that these provisions will not prevent the Contractor from applying water or dust palliative for his convenience if he so desires.

The Contractor's attention is also directed to section 6-24 "Dust Control" of the General Provisions.

4-3 Dust Palliative

4-3.1 Description — This work shall consist of applying a dust palliative for the prevention of dust nuisance. The dust palliative shall be applied in the amount and at the locations as directed by the Director of Public Works.

4-3.2 Materials — The binder shall be either miscible in water or be some form of material that is directly applied to the surface without mixing with water.

Binders that are miscible in water shall be either a resin emulsion, an SSI type asphaltic emulsion, materials composed essentially of lignin sulfonate, or any other binder that is miscible in water in the proportions provided in Section 18-1.03, "Application," is non-corrosive, and is effective as a dust palliative.

Binders that are directly applied to the surface without mixing with water shall be a product prepared from crude petroleum that is effective as a dust palliative.

Resin emulsion shall be composed of from 57 percent to 63 percent of liquid petroleum resin and the remainder water to which a suitable emulsifying agent has been added. The resin emulsion shall be readily miscible with water and when diluted with any hard water in the proportions of one part of emulsion to 10 parts water shall show no signs of breakdown or separation of the petroleum resin base. Resin emulsion which has been stored in closed containers at temperatures above freezing for a period up to 3 months shall show no signs of separation. Any resin emulsion which has been stored for more than 3 months shall not be used until tested and approved.

SS1 type asphaltic emulsion shall conform to the provisions in Section 94 "Asphaltic Emulsions" of the State Standard Specifications.

4-3.3 Application — Binders that are miscible in water shall be mixed with additional water at the rate of from 4 to 19 parts of water to one part of binder, the exact rate to be determined by the Director of Public Works. Mixing shall be accomplished by placing the binder and water in the spreading equipment simultaneously or by some other mixing method that will produce equivalent results.

The resulting mixture shall be applied with pressure type water distributor trucks equipped with a spray system to pressure type asphalt distributors conforming to the provisions in Section 93-1.03 of the State Standard Specifications "Mixing and Applying" at an approximate rate of from 0.2 gallon to 0.8 gallon per square yard.

Binders that are directly applied to the surface without mixing with water shall be applied with equipment approved by the Director of Public Works. The binder shall be applied at a rate of form 0.10 gallon to 0.25 gallon per square yard.

The exact rate and number of applications of binders will be determined by the Director of Public Works.

4-4 Watering

4-4.1 Description — This work shall consist of developing a 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.

4-4.2 Application — Water shall be applied in the amounts, at the locations, and for the purposes designated in the General Provisions and in the various Technical Provisions and as ordered by the Director of Public Works.

Water for compacting embankment material, subbase, base and surfacing material, and for laying dust shall be applied by means of pressure-type

distributors or pipelines equipped with a spray system or hoses with nozzles that will insure a uniform application of water.

All equipment used for the application of water shall be equipped with a positive means of shut-off.

Unless otherwise permitted by the Director of Public Works, or all the water is applied by means of approved pipelines, at least one mobile unit with a minimum capacity of 1,000 gallons shall be available for applying water on the project at all times.

4-4.3 Chemical Additives — If the Contractor elects to do so, he may use chemical additives in water used for compaction. If such additives are used, furnishing and applying the additives shall be at the Contractor's expense.

The right is reserved by the Director of Public Works to prohibit the use of a particular type of additive, to designate the locations where a particular type of additive may not be used, or to limit the amount of a particular type of additive to be used at certain locations, all if the Director of Public Works has reasonable grounds for believing that such use will be in any way detrimental to the work.

4-5 Penalty for Non Compliance — If in the opinion of the Engineer dust from the Contractor's work or work area, including but not limited to storage and staging areas, is not being properly controlled, the Engineer may assess a monetary penalty against the Contractor. The amount of the assessment shall not exceed $250.00 for each violation. For the purpose of enforcement, a violation shall be constituted by any one of the following:

1. A complaint (verbal or written) from the public.
2. A written warning from the Engineer.
3. A site visit out by Air Quality Control Board representative.

Upon written warning from the Engineer, each hour that transpires without dust being controlled to the satisfaction of the Engineer shall constitute a separate violation. Assessments will be deducted from any payments due to the Contractor.

4-6 Failure to Comply with Engineer's Order to Provide Adequate Dust Control — Should the Contractor, in the opinion of the Engineer, not comply with written warnings to provide adequate dust control, the Engineer may order a partial or complete stop of the Contractor's work until compliance is achieved. Such partial or complete stoppage shall not be just cause for the Contractor to request any additional compensation or extension of time to complete the project. Any costs incurred by the City due to enforcement of these provisions shall be at the Contractor's expense, and deducted from any payments due the Contractor. Any partial or complete stoppage of

work shall not apply to the Contractor's responsibility to maintain the project and adjacent area in a safe, clean and convenient condition.

4-7 Measurement — There shall be no separate measurement for dust control, or dust palliative or watering.

4-8 Payment — No separate payment will be made for any work performed or material used to control dust resulting from the Contractor's performance of the work, either inside or outside the right-of-way. Full compensation for dust control, including dust palliative and watering, will be considered as included in the prices paid for the various contract items of work involved, and no additional compensation shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 5

Street Failed Area Repair

Street Failed Area Repair

5-1.1 General — The Contractor shall remove failed pavement areas where marked to a minimum depth of three (3) inches. The exact limits, including depth, shall be subject to adjustment by the Director of Public Works in the field based on actual conditions at the time of removal of the failed area.

Failed areas shall be carefully removed to neat lines by methods necessary to insure that the existing underground utilities areas are not damaged, the subgrade at the depth of planned removal is not damaged, and removal does not occur beyond the planned or approved limits. Any removal beyond planned or approved limits shall be restored as failed area repair at no expense to the City.

Prior to placing asphalt concrete in the failed areas, the subgrade shall be compacted to a minimum relative compaction of 95% to a depth of not less than six (6) inches. The subgrade shall be smooth and uniform in depth.

Attention is directed to the possibility that certain streets may have concrete pavement underlying the existing asphalt surfacing, or the asphalt concrete thickness may exceed the three (3) inch minimum depth of repair. It shall be the Contractor's responsibility to fully investigate the existing condition to satisfy himself as to the nature and thickness of the existing surfacing. No additional payment will be made for removal and repair to a depth greater than the three (3) inch minimum, or to reach depth as specified in the Special Provisions.

5-1.2 Disposal of Excavated Material — Asphalt concrete and base rock materials removed from failed area repairs may be either:

a) Removed from the project limits and disposed of as provided for in Section 6-18 of the General Provisions, or

b) Prepared by means approved by the Director of Public Works to meet the

gradation requirements of class subbase material in accordance with Section 7-2.3 of these specifications, and delivered to the City's designated storage site.

5-1.3 Tack Coat — Excavate failed areas shall have the edges thoroughly coated, by spraying or hand application, with a RS-1 emulsified asphalt tack coat prior to placing asphalt, as specified by Section 9-6 of these specifications.

5-1.4 Placing Asphalt Concrete — Asphalt concrete, conforming to the Section 9 — "Asphalt concrete" of these specifications shall be placed in accordance with Section 9, in the failed areas as soon as possible, but in no event in less than twenty-four (24) hours after the removal of the failed areas.

Asphalt concrete may be placed in failed areas in lifts not to exceed three (3) inches and shall be compacted to a minimum relative compaction of not less than 95%.

5-1.5 Measurement — Failed area repairs shall be measured by the cubic yard based on the neat planned lines or lines approved by the Engineer in the field. Repairs outside planned or approved limits will not be included in final measurements.

5-1.6 Payment — The contract unit price for failed area repair shall be considered as including all labor, equipment, materials and incidentals, including but not limited to excavation, disposal, compacting subgrade, tack coating asphalt concrete, for completing the item, and no additional compensation shall be made therefor.

5-2 Specifications for Application of Crack Seal

5-2.1 Scope — This work shall consist of placing asphalt-rubber crack sealant in random cracks in accordance with these specifications and as directed by the Engineer.

5-2.2 Materials

General: Only materials conforming to these specifications shall be incorporated in the work.

Asphalt-Rubber Sealant: The crack sealant shall consist of a mixture of paving grade asphalt and vulcanized granulated crumb rubber. The mixture shall contain not less than 25 percent granulated reclaimed rubber, by weight. Rubber gradation shall conform to the following requirements:

Sieve Size	Percent Passing
No. 8	100
No. 10	98-100
No. 30	—
No. 40	0-10

The sealant shall conform to the following requirements:

Cone Penetration, 77 degrees F	40 Max
Softening Point, degrees F	175 Min
Resilience, 77 degrees F, %	30 Min

The sealant shall be capable of being melted and applied to cracks at temperatures below 400 degrees F. When heated, the material shall readily penetrate cracks ¼ inch in width or wider.

Modifiers may be used to facilitate blending.

Control of Materials: Each lot of sealant shipped to the job site shall be accompanied by a certificate of Compliance as provided in Section 6-1.07, "Certificate of Compliance," of the latest edition of the California State Department of Transportation's *Standard Specifications*, and shall be accompanied by storage and heating instructions and cautions.

5-2.3 Application — Cracks shall be cleaned prior to application to provide intact bonding surfaces which are free from all dust, moisture or other contaminants.

Cracks with an average clear opening of ⅛ inch or more in width and less than ⅜ inch in width shall be routed to provide a minimum sealant reservoir of ⅜ inch wide by ¾ inch deep. Cracks having an average clear opening wide of ⅜ inch or greater need not be routed, but shall be cleaned to a minimum depth of ¾ inch. Cracks less than ⅛ inch clear opening width need not be sealed.

Vegetation in cracks shall be treated with an approved weed killer, after removal.

Immediately prior to placing sealant, the crack shall be cleaned by blastcleaning or by hand methods and then cleaned with high pressure air jets to remove all residue and foreign materials. Exposed surfaces shall be dry at the time the sealant is applied.

Sealant materials shall be heated and placed in conformance with the manufacturer's written instructions. Joint sealant materials shall not be placed when the pavement surface temperature is below 50 degrees F.

Sufficient sealing material shall be placed in the cracks so that upon completion of the work, the surface of the sealant in the crack shall be flush with the adjacent pavement surface, or at the elevation directed by the Engineer. The Contractor shall "spot up" or refill to the proper elevation, at the Contractor's expense, all unsatisfactory cracks.

All cracks shall be leveled and excess crack sealant removed immediately after placing. Sand shall be applied to sealed cracks, as necessary and at the direction of the Engineer, to absorb excess material.

The finished crack sealant shall be bonded to the faces of the crack. There shall be no separation or opening between the sealant and the faces, and there shall be no crack, separation, or other opening in the sealant.

Crack sealing will not be required when the existing surfacing is to be covered by an asphaltic membrane or by a rubberized seal coat.

5-2.4 Measurement and Payment — Payment will be per linear foot of cracks sealed. The price shall include full compensation for all labor and materials necessary to seal cracks in accordance with these specifications.

If no bid item is provided in the "Bid Proposal," crack filling shall be considered as included in the contract unit price paid for asphalt concrete.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 6

Subgrade Preparation

6-1 General — The work specified in this section includes the preparation of the ground on which the subbase, base, pavement or other surfacing materials is to be placed, as specified. The finished subgrade plane lies between the subgrade and the lowest element of any other surfacing material placed on it. All relative compaction shall be not less than 95 percent, for a depth of 0.5 feet, regardless of location. All subsequent material placed thereon shall have a relative compaction of 95 percent throughout unless otherwise specified herein. All work and materials to be in conformance with applicable portions of Sections 25 and 26 of the State Specifications, except as modified herein.

After compaction and trimming, the subgrade shall be firm, hard, and unyielding.

Unsuitable subgrade material, as determined by the Director of Public Works, shall be removed to a depth as specified and disposed of as directed. Soft material as determined by the Director of Public Works may be allowed to dry and be reprocessed at no cost to the City. Any removed material shall be replaced with suitable material approved by the Director of Public Works and shall be compacted to a relative compaction of not less than 95 percent. Any such work, including the removal, disposal, and replacement of said material, shall be paid for as extra work less the cost of processing the top six inches, unless otherwise specified.

The Contractor shall repair at his expense any damage to prepared subgrade caused by his operation or by use of public traffic. No material shall be placed upon the prepared subgrade until the subgrade is in the condition meeting the requirements specified.

In order to facilitate the preparation of subgrade, the Contractor may, if he elects, remove rocks, lumps, break up hardened material or temporarily construct a rough grading plane below the subgrade elevation, provided he subsequently brings such rough grading plane up to subgrade elevation with suitable material approved by the Director of Public Works, and that said material is compacted to a relative compaction of not less than 95 percent. Any such work shall be at the expense of the Contractor and no

separate payment will be made therefor.

6-2 Subgrade Tolerance — Subgrade for asphalt concrete, concrete, or other roadway structures, shall not vary more than 0.03 feet from the specified grade and cross section. Variations within the specified tolerances shall be compensated so that the average grade and cross section specified are met.

6-3 Measurement — There shall be no separate measurement for subgrade preparation, unless provided for in the "Bid Proposal."

6-4 Payment — Unless provided for otherwise in the "Bid Proposal," no separate payment shall be made for preparing subgrade. Full compensation for furnishing all labor, materials, tools, equipment, water and incidentals, and for doing all the work involved in preparing subgrade as specified, shall be included in the contract price paid for the various contract items of work, and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 7

Aggregate Subbase

7-1 General — Aggregate subbase shall be mineral aggregate conforming to Section 25 of the State Standard Specifications for Class 2 Aggregate Subbase and as specified herein.

7-2 Materials — Mineral aggregate for the aggregate subbase, at the time it is deposited, shall conform to the following requirements:

7-2.1 Quality — Aggregate for aggregate subbase shall be clean and free from vegetable matter and other deleterious substances and shall be of such quality that it will bind readily to form a firm, stable subbase.

7-2.2 Gradation — The percentage composition by weight of aggregate subbase shall conform to the following grading when determined by Test Method No. California 202. (From Section 25-1.02A of the State Standards for Class 2 moving average.)

Sieve Size	Percentage Passing Sieves
3″	100
2½″	90-100
#4	40-90
#200	0-25
#200	0-25

7-2.3 Recycled Aggregate Subbase — Existing uncontaminated asphalt concrete and aggregate base to be removed, may be recycled as aggregate subbase.

The existing asphalt concrete and aggregate base shall be broken up to size conforming to Section 3-2.2, "Gradation," of these Specifications as hereinafter modified. Recycled materials shall be mixed to a uniform gradation prior to spreading and compaction.

7-3 Compacting & Tolerance — Where the required thickness is 0.5 foot or

less, the aggregate subbase may be spread and compacted in one layer. Where the required thickness is more than 0.5 foot, the subbase or base aggregate shall be spread and compacted in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 0.5 foot. Each layer shall be spread and compacted in a similar manner.

At locations where the aggregate subbase is to be placed over areas inaccessible to the spreading equipment, the aggregate subbase or base may be spread and compacted by any approved means to obtain the specified results.

The relative compaction of each layer of compacted aggregate subbase shall not be less than 95 percent as determined by Test Method No. Calif. 216 06 231. The finished surface of the aggregate base shall not vary more than 0.05 foot from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross sections specified are met.

7-4 Tests — The aggregate subbase shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	50 Minimum
Sand Equivalent	217	20 Minimum

The R-Value requirements may be waived provided that the aggregate subbase conforms to the specified grading and has a sand equivalent value of 25 or more.

7-5 Measurement — Measurement shall be by the cubic yard based on the theoretical volume obtained from the planned cross section on the contract plans. Volume shall be based on actual field measurement of the horizontal surface of subbase material placed.

7-6 Payment — The contract limit price per cubic yard shall include all materials, tools, equipment, labor, compacting, water, preparation of recycled material, and incidentals necessary to perform and complete the work and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 8

Aggregate Base

8-1 General — Aggregate base shall consist of a crushed material aggregate conforming to Section 26 of the State Standard Specifications for Class 2, Aggregate Base, and as specified herein.

8-2 Material

8-2.1 Quality — Aggregate furnished for the base shall be free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm stable base. Aggregate may be delivered with water added.

The Coarse Aggregate (material retained on the No. 4 sieve) shall consist of material of which at least 25 percent, by weight, shall be crushed particles as determined by Test Method No. Calif. 205.

8-2.2 Gradation — The percentage composition by weight of aggregate base shall conform to the following grading when determined by Test Method No. Calif. 202, modified by Test Method No. Calif. 905 where there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates. (From Section 26-1.02B of the State Specification for Class 2 Aggregate Base.)

Sieve Size	1½" Maximum Percentage Passing Sieve	¾" Maximum Percentage Passing Sieve
2"	100	
1½"	90-100	
1"	—	100
¾"	50-85	90-100
#4	25-45	35-55
#30	10-25	10-30
#200	2-9	2-9

8-3 Tests — The aggregate base shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	78 Minimum
Sand Equivalent	217	30 Minimum

8-4 Placing — Aggregates for base shall be delivered to the roadbed as uniform mixtures and shall be spread in layers or winrows. Segregation of aggregates shall be avoided and material as spread shall be free from pockets of large or fine material. Segregated materials shall be remixed until uniform.

Where the required thickness is 0.5 foot or less, the aggregate base may be spread and compacted in one layer. Where the required thickness is more than 0.5 foot, the subbase or base aggregate shall be spread and compacted in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 0.5 foot. Each layer shall be spread and compacted in a similar manner.

At locations where the aggregate base is to be placed over areas inaccessible to the spreading equipment, the aggregate subbase or base may be spread and compacted by any means to obtain the specified results.

8-5 Compacting and Tolerance — The relative compaction of each layer of compacted aggregate subbase or base shall not be less than 95 percent as determined by Calif. Test Method No. 216 06 231. The finished surface of the aggregate base shall not vary more than 0.05 foot from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross sections specified are met.

8-6 Measurement — Measurement shall be by the cubic yard based on the theoretical volume obtained form the planned cross section on the contract plans. Volume shall be based on actual field measurement of the horizontal surface of subbase material placed.

8-7 Payment — The contract limit price per cubic yard shall include all materials, tools, equipment, labor, compacting, water, preparation of recycled material, and incidentals necessary to perform and complete the work, and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 9

Asphalt Concrete

9-1 General — This work shall consist of furnishing and placing asphalt concrete as specified in Section 39, "Asphalt Concrete," of the State Standard Specifications, and as modified herein.

Unless otherwise specified in the plans or in the Special Provisions, and as modified herein, asphalt concrete shall be Type B, half-inch maximum for surface course and Type B, three-quarter inch maximum, medium grading, for base course. Asphalt binder shall be paving asphalt, Grade AR-4000.

9-2 Temperature — At the time of delivery to the site of the work, the temperature of the mixture shall not be lower than 250 degrees F, or higher than 320 degrees F. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F, or during unsuitable weather. When feather-edging asphalt concrete between atmospheric temperatures of 40 degrees F to 65 degrees F, any combination of the following methods may be required by the Engineer:

A. Heat existing asphalt.
B. Use ¼" to ⅜" maximum aggregate asphalt.
C. Change paving asphalt viscosity grade.
D. Prohibit traffic on the feather-edge to prevent damage.
E. Other methods as approved by the Engineer.

9-3 Tolerances — The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be specified cross section and grade of the course being constructed. Upon completion, the pavement shall be true to grade and cross section. When a 10-foot straightedge is laid on the finished surface parallel to the center line of the roadway, the surface shall not vary from the edge of the straightedge more than one-eighth inch, except at intersections or at change of grade. Any ares that are not within this tolerance shall be brought to grade immediately following the initial rolling.

However, if the paving material has been cooled below the lower limits of the

spreading temperatures specified, the surface of the pavement shall be brought to a true grade and cross sectioned by removing the paving material in the area to be repaired by an approved method to provide a minimum laying depth of one inch or new pavement material at the join line. Repairs shall not be made to pavement surfaces by feather-edging at the joining. Cost of this work shall be entirely at the Contractor's expense.

9-4 Asphalt Binder — Asphalt binder to be mixed with aggregate shall have a paving asphalt viscosity of AR4000 and conform to the applicable provisions of Sections 39 and 92 of the State Standard Specifications.

MIX DESCRIPTION	PERCENTAGE ASPHALT RANGE
(A) ¾" Max. Size Materials	4.5 to 6.0
(B) ½" Max. Size Materials	5.0 to 7.0

The amount specified by the Engineer shall be within the general range of percentages of the total mixed material as shown above. The actual amount, however, will be determined through a complete asphalt concrete mix design performed on materials intended for use on this project.

The allowable tolerance in percentage of asphalt content from that percentage specified by the Engineer shall be ±0.3 percent.

9-5 Aggregates — Mineral aggregate shall conform to the following requirements:

Percentage Passing Sieve for		
Sieve Size	¾" Maximum	½" Maximum
1"	100	—
¾"	95-100	100
½"	85-100	95-100
⅜"	65-85	80-95
No. 4	45-65	50-75
No. 8	30-50	35-60
No. 30	15-30	20-35
No. 200	3-8	3-8

Note: The amount of asphalt shall be the optimum as determined by Calif. Test No. 367. The exact proportions of asphalt binder and mineral aggregates shall be approved by the Engineer.

procedures, or both, need adjustment. Asphalt concrete spreading operations shall not continue until the Contractor has notified the Engineer of the adjustment that will be made in order to meet the required compaction.

If the test results for any lot of asphalt concrete indicate that the relative compaction is less than 93.0 percent, the asphalt concrete represented by that lot shall be removed and replaced or deducted from contract payments at the discretion of the City. Asphalt concrete spreading operations shall not continue until the Contractor makes significant adjustments to his materials or procedure or both in order to meet the required compaction. The adjustments will be agreed to by the Engineer.

Areas inaccessible to spreading and compaction equipment may be placed and compacted by such procedures as may be approved by the Engineer. Relative density requirements may be reduced to 90 percent in such areas provided they will not be subjected to vehicular traffic. Any compaction less than 90% in such areas shall be cause for rejection.

The pavement surface, when completed, shall be smooth, dense and of uniform texture and appearance. All areas shall drain and be free of standing water. The compacted thickness shall not be less than 0.02 feet of that shown on the plans. The finished surface shall not vary more than 0.02 feet in a 10-foot distance as determined by a straightedge placed in any position on the finished surface, except across flow lines.

9-7 Certificates of Compliance — The Contractor shall furnish the Engineer, at least two (2) weeks prior to the start of work, with a list of material sources together with Certificates of Compliance, indicating that materials to be incorporated in the work fulfill the requirements of these specifications. The Certificates of Compliance shall be signed by the material supplier or representative. The Engineer may permit the use of paving materials, aggregate, cement, lime, anti-strip agents, asphalt, or any combination thereof prior to sampling and testing when accompanied by a Certificate of Compliance.

9-8 Equipment — All equipment used shall be in good working condition and shall be capable of performing the work intended in a safe and satisfactory manner.

Paving Equipment: Asphalt concrete surfacing shall be placed with a self-propelled (vibrator type) asphalt paving machine, except where inaccessibility precludes its use. When approved by the Engineer, surfacing may be spread by means of a spreader box and, where necessary, by hand.

Rollers: Self-propelled compacting rollers shall comply with applicable requirements of the State Standard Specifications.

9-9 Adjustment of Utility and Manhole Covers — The Contractor shall adjust all City-owned (sewer, storm drain, and some street lighting) manhole and utility

9-6 Asphaltic Concrete Placement — A surface course of asphaltic concrete consisting of a mixture of aggregate and asphalt that has been mixed at a central mixing plant shall be spread and compacted on the prepared subgrade to the specified thickness.

The Contractor shall protect all building foundations, planters, screens, etc., form splash, roller scrape, or overspray.

Vegetation between the edge of pavement and gutter lip shall be removed and the area treated with an approved weed killer.

Any surface to be overlaid shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt, and all other extraneous material. Pavements impregnated with grease, oil, or fuel shall be thoroughly scrubbed and then flushed and swept clean.

The asphalt concrete shall be placed in a compacted thickness as indicated on the plans.

If the pavement is constructed in lifts using an asphalt concrete base in the first lift, the base shall be thoroughly cleaned by whatever means necessary prior to the application of tach coat and the placement of the surface layer.

Initial rolling shall be performed when the sum of the air temperature and the temperature of the asphaltic concrete is between 300 and 375 degrees F.

Finish rolling shall be started after the pavement has cooled sufficiently to permit removal of the roller marks, and shall be continued in whatever direction is necessary to produce a pavement surface free of indentations.

Asphalt density is to be measured through use of a nuclear density gauge, or core tests. the nuclear gauge is preferred since results can be more conveniently determined at the time of paving.

Asphalt concrete shall be compacted to 95% relative compaction and shall be finished to the lines, grades, and cross section shown on the plans. In-place density of asphalt concrete will be determined prior to opening the pavement to public traffic.

Relative compaction will be determined by California Test 375. Laboratory specimens will be compacted in conformance with California Test 304. Lots will be established for asphalt concrete areas to be tested as specified in California Test 375.

If the test results for any lot of asphalt concrete indicates that the relative compaction is below 95.0 percent, but above 92.9 percent, the Contractor will be advised that he is not attaining the required relative compaction and that his materials or his

covers (and all other similar structures) to finished grade in accordance with the provisions of Section 301-1.6 and Section 302-5.7 of the Standard Specifications for Public Works Construction, except as modified herein.

The Contractor shall locate and reference all manholes, valve covers, and survey monuments prior to construction.

All manholes, survey monuments and water valve covers shall be thoroughly cleaned of any construction debris resulting from the Contractor's operations.

Survey monument covers shall be adjusted as directed by the Engineer. The survey monument shall be protected in place by the Contractor. For monuments requiring resetting, the work shall be performed by a licensed land surveyor and all costs shall be at the Contractor's expense.

Manholes, meters and valve covers not owned by the City shall be adjusted to grade by the utility owner involved and at the utility company's expense. It shall be the responsibility of the Contractor to notify affected utility companies and coordinate their work with his/hers.

9-10 Prime Coat — The prime coat shall be liquid asphalt grade MC-70 in conformance with Sections 38-4 and 93 of the State Standard Specifications. A prime coat shall be applied to the finish surface of aggregate base at a rated of 0.25 gallons pe square yard prior to asphalt concrete pavement construction.

9-11 Tack Coat — The tack coat shall be asphalt grade RS-1 in accordance with Section 94 of the State Standard Specifications. A tack coat shall be applied to all vertical surfaces abutting the asphalt concrete paving, to all surfaces upon which asphalt concrete overlay or resurfacing is to be constructed and to such other areas as may be directed by the Director of Public Works, at the rate of 0.02 to 0.10 gallons per square yard. The exact rate shall be as approved by the Engineer and shall provide a thorough coating of the area to receive asphalt concrete leveling course. Surfaces to receive tack coat shall be clean and free of loose and foreign material before application.

9-12 Measurement — Asphalt concrete shall be measured by the ton. Measurement by tons will be based on certified weighmeters, certificates showing gross, tare and net weight, and plant source; and the type and grading of the mix for each load. No measurement shall be made, regardless of acceptance of certifications, for any surfacing not meeting requirements, placed outside the lines shown, or rejected for any reason. Certificates must be given to the City at the time of delivery of the asphalt concrete. Certificates will not be accepted after the fact. When payment is by the ton, no payment for asphalt quantities exceeding five percent of the contract bid amount plus extra quantities added by contract change order will be made; such excess material shall be at no expense to the City.

9-13 Payment — Shall be at the unit price bid, which price and payment shall be full compensation for furnishing and placing the surfacing, complete in place, in accordance with the plans and specifications, including all labor, materials, equipment, compacting, prime coat, tack coat, and incidentals, and no additional compensation shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 10

Asphaltic Seal Coats

10-1 General

10-1.1 General — The Contractor shall arrange for and coordinate the notification of the neighborhoods and individuals as necessary to accomplish the removal and general clearing of parked vehicles from the area of work to the extent he shall require to execute his work in a reasonable and efficient manner. The Contractor shall notify residents in advance of all paving operations or other operations that would restrict parking. This will include, but not be limited to, placing a notification at each residence or business, and on each parked car not less than thirty-six (36) hours prior to paving operations. Notification shall be reviewed and approved by the Engineer prior to issuance.

Prior to beginning operations, the Contractor shall submit a plan for maintaining traffic movements during all of his operations. Said traffic plan shall be approved by the Engineer prior to commencement of any work.

The Contractor shall execute his work in a safe, orderly and expeditious manner and shall specifically exercise due care and consideration to minimize inconvenience to residents and businesses of the project areas relative to parking of vehicles, access to properties and the movement of vehicles and persons through the work areas. To that end, general clean-up and debris removal shall be scheduled to precede surface preparation and paving work by the least feasible period of time.

10-1.2 Weather Limitations — The asphaltic seal shall be applied only when the existing surface is clean and free of visible moisture. The slurry seal shall be applied only when the pavement is above 50 degrees F and the atmospheric temperature is at least 60 degrees F and rising. The slurry seal may be applied at a lower atmospheric temperature (minimum 50 degrees F) upon the approval of the Engineer. The slurry seal shall not be applied if rainfall is forecast for the next four (4) hours or if air temperatures below 35 degrees F are predicted for the next 24 hours.

10-1.3 Trial Applications — Prior to the start of work, the Contractor shall place a test strip of at least 60 square yards in an area designated by the Engineer. The test section shall be placed using the same equipment and methods as will be used on the job. The Contractor shall also furnish the Engineer with a calibration sheet for each mixing machine used to lay the test strip. Slurry mixture placed in the test strip shall conform to the job mix. Work shall not commence without the Engineer's approval of the test strip.

10-1.4 Pre-Inspection — The seal coat shall not be applied until an inspection of the surface has been made by the Engineer, and the Engineer has determined the surface is suitable for seal coat application.

10-1.5 Pavement Markers — Immediately prior to applying the slurry seal, all pavement markers shall be masked, and all utility covers shall be protected with butcher paper and a thin layer of 30-mesh sand or by means approved by the Engineer. Upon completion of the slurry seal application, pavement marker masking shall be removed and the markers shall be cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

10-1.6 Surface Preparation — Preparatory repair work shall be completed prior to application of the asphalt-rubber. Repairs shall be performed when the weather will not damage the quality of the finished product. Asphaltic concrete patches shall be allowed to set a minimum of twenty-four (24) hours before asphalt-rubber is applied.

Vegetation between the edge of pavement and gutter lip shall be treated with an approved weed killer and removed.

The surface shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt, and all other extraneous material. Pavements impregnated with grease, oil, or fuel shall be thoroughly scrubbed with water and an approved detergent and then flushed and swept clean.

For the cape seal, all pavement markers shall be masked prior to applying the asphalt-rubber. In contrast, all markers shall be removed, by means approved by the Engineer, prior to applying the first asphalt-rubber lift of the double cape seal. For both the cape and double cape seals, all utility covers shall be protected by means approved by the Engineer.

No segregation of the emulsion and aggregate will be permitted.

No streaks such as caused by oversized aggregate shall be left in the finished surface. No excessive build-up nor unsightly appearance shall be permitted on longitudinal or transverse joints.

Evidence of solidification of the asphalt, balling or lumping of the aggregates, or the presence of uncrated aggregates shall be cause for rejection of the slurry.

The slurry shall be applied in such a manner that no ridges will remain.

The Contractor shall exercise care to prevent slurry from being deposited on other than asphaltic concrete surfaces. Slurry on surfaces not designated to be sealed shall be removed at the Contractor's expense. The method of slurry removal shall be approved by the Engineer.

At the direction of the Engineer and at the Contractor's expense, the Contractor shall repair and reseal all areas which have not been properly or completely sealed.

Hand squeegees shall be used to spread slurry in areas inaccessible to the slurry mixer. Care should be exercised to leave no unsightly appearance from hand work. Burlap drags, suitable to even the surface and leave a rough texture of slurry application, shall be used if the spreader box is equipped with a burlap drag.

Where the completed slurry is not uniform in color, the areas affected shall be treated to eliminate the color variation at the Contractor's expense.

10-1.7 Post Sweeping — All pavements shall be vacuum swept before striping, or two (2) weeks after slurry placement, whichever is sooner.

10-1.4 Pre-Inspection — The seal coat shall not be applied until an inspection of the surface has been made by the Engineer, and the Engineer has determined the surface is suitable for seal coat application.

10-2 Slurry Seal

10-2.1 General — Slurry seal shall be Type II conforming to Section 37-2, "Slurry Seal," of the State Specifications, and as modified herein.

An emulsified asphalt slurry seal surface shall be applied at all locations designated on the Plans.

All incidental work such as surfacing returns, shall be done concurrently with surfacing of the street proper, and shall not be postponed for completion at a later date. All covers for utility structures and monuments shall be adequately protected before the slurry seal is applied.

The slurry seal surface shall consist of a mixture of emulsified asphalt, mineral

aggregate and water, properly proportioned, mixed and spread evenly on the surface as specified herein and as directed by the Engineer. The cured slurry shall have a homogenous appearance, fill all cracks, adhere firmly to the surface and have skid resistant texture.

10-2.2 Materials

10-2.2.1 General — Emulsion-aggregate slurry shall be a stable mixture of emulsified asphalt, mineral aggregate and water. It is intended for surface sealing of bituminous pavements.

The average applied aggregate weight per square yard based on materials applied and area covered per day shall conform to the following requirements. Additionally, the Asphalt Emulsion content and the Residual Asphalt content shall conform to the limits listed below:

	TYPE II
Asphalt Emulsion Content Percentage of Aggregate by Dry Weight	11-25
Residual Asphalt Content Percentage of Aggregate by Weight	7.5-13.5
Pounds of Aggregate per Square Yard	10-15

The slurry mixture shall be composed of asphalt emulsion, aggregate, mineral filler, and water. The amount of emulsified asphalt shall be determined by the wet track abrasion test results and by trial laboratory mixes in accordance with ASTM D3910. The aggregate fractions and mineral filler shall be sized, uniformly graded and combined in such proportions that the resulting mixture meets the grading requirements of the JMF. The combined aggregate and filler shall be graded smoothly and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve. The slurry seal mixture shall have the following additional characteristics:

10-2.2.2 Consistency — The slurry seal mixture shall contain the minimum amount of water necessary to obtain a consistency of 3-5 cm in accordance with ASTM D3910. For placing slurry on grade of 8 percent or more, adjustments shall be made to the consistency of the mixture as directed by the Engineer.

10-2.2.3 Non-Segregation — The mixture shall not segregate during or

after application to the pavement.

10-2.2.4 Water — Water shall be clear, potable, and compatible with the slurry mixture, and shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place.

10-2.2.5 Asphalt Emulsion — The emulsified asphalt shall conform to the requirement of Section 94 of the State Specifications using CRSI Cationic Asphaltic Emulsion.

10-2.2.6 Aggregate — The mineral aggregate shall consist of natural or manufactured sand, crushed rock or gravel, and approved fines. Smooth-textured sand of less than 1.25 percent water absorption shall not exceed 50 percent of the total combined aggregated. The aggregate shall be clean and free from dirt, vegetable matter and other deleterious substances.

Mineral fillers such as portland cement, limestone dust, and aluminum sulphate fly ash shall be considered s part of the blended aggregate and shall be used in minimum required amounts. Mineral fillers shall only be used if needed to improve the workability of the mix of gradation of the aggregate.

10-2.2.7 Gradation of Aggregate — The combined mineral aggregated shall conform to the following gradation.

Sieve Size	TYPE II Percent Passing
3/8	100
No. 4	90-100
No. 8	65-90
No. 16	45-70
No. 30	30-50
No. 50	18-36
No. 100	10-24
No. 200	5-15

All equipment, tools and machines sued in the performance of this work shall be maintained in satisfactory working order at all times.

10-2.2.8 Accelerator or Retardant — The retardant shall be of the type stated in the JMF and approved by the Engineer. The amount of accelerator to be included in the mixture shall be that amount necessary to ensure the applied slurry can support vehicular traffic within four (4)

hours after the last application.

10-2.3 Equipment

10-2.3.1 General — Only equipment conforming to these specifications shall be used in performance of the work and all such equipment shall be maintained in safe and satisfactory working condition at all times.

10-2.3.2 Mixer — The slurry machine shall be capable of rapid discharge of the mixed materials into a spreader. The self-contained slurry unit shall be mounted on a truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation so that the slurry is spread evenly.

The slurry mixing machine shall be a continuous flow mixing unit, capable of accurately delivering a predetermined proportion of aggregate, water, emulsified asphalt, and accelerator and retardant to the mixing chamber. The mix chamber shall discharge the thoroughly mixed product on a continuous basis.

The aggregate shall be pre-wetted immediately prior to mixing the emulsified asphalt.

The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together.

The mixing machine shall be equipped with an approved fines feeder that provides a method to accurately introduce a predetermined proportion of mineral filler at the same time and location that the aggregate is fed into the mixer. The fines feeder shall be used whenever added mineral filler is a part o the aggregate blend or a dry chemical additive is used.

The mixing machine shall be equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface ahead of the spreading equipment with an application up to 0.05 gallons per square yard.

Sufficient machine storage capacity to properly mix and apply a minimum of 5 tons of the slurry shall be provided.

Proportioning devices shall be calibrated prior to placing the seal coat. The Contractor shall furnish the Engineer with a calibration sheet for each mixing machine prior to use on the job.

10-2.3.3 Slurry Spreading Equipment — Attached to the mixer machine

shall be a mechanical type squeegee distributor, having suitable controls to allow adjustment for variations in pavement grades and slope, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor which may result from varying grade or crowns.

A lateral control device and a flexible strikeoff shall be provided.

The spreader box shall have an adjustable width. The box shall be kept clean, and build-up of asphalt and aggregate on the box will not be permitted.

10-2.3.4 Cleaning Equipment — Power brooms, power blowers, air compressors, water flushing equipment, and hand brooms shall be suitable for cleaning the surface and cracks of the old pavement.

10-2.3.5 Hand Tools — Hand squeegees, shovels, hand burlap drags, and other equipment shall be available for those areas inaccessible to the spreader box.

10-3 Application of the Slurry

10-3.1 General — The amount of asphalt emulsion, aggregate, and water shall be proportioned according to Section 37-2.03 of the State Specifications and as specified herein. The Engineer shall give final approved to the deign and rate of application used.

10-3.2 Mixing Slurry — The mixing of the slurry shall be sufficient to produce a uniform mixture of the desired consistency in accordance with the JMF. Under no circumstances shall the emulsion content be changed to control the consistency of the mix. If breaking, hardening, segregation, balling, or lumping occurs during the mixing process, the batch shall be discarded. All aggregate particles shall be uniformly coated with asphalt.

10-3.3 Slurry Seal Application — The surface shall be fogged with water directly preceding the spreader at a rate of 0.03 to 0.05 gallons per square yard.

The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. The water content shall be adjusted to maintain the proper consistency at the point of application.

A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained.

No segregation of the emulsion and aggregate will be permitted.

No streaks such as caused by oversized aggregate shall be left in the finished surface. No excessive build-up nor unsightly appearance shall be permitted on longitudinal or transverse joints.

Evidence of solidification of the asphalt, balling or lumping of the aggregates, or the presence of uncoated aggregates shall be cause for rejection of the slurry.

The slurry shall be applied in such a manner that no ridges will remain.

The Contractor shall exercise care to prevent slurry from being deposited on other than asphaltic concrete surfaces. Slurry on surfaces not designated to be sealed shall be removed at the Contractor's expense. The method of slurry removal shall be approved by the Engineer.

At the direction of the Engineer and at the Contractor's expense, the Contractor shall repair and reseal all areas that have not been properly or completely sealed.

Hand squeegees shall be used to spread slurry in areas inaccessible to the slurry mixer. Care should be exercised to leave no unsightly appearance from hand work. Burlap drags suitable to even the surface and leave a rough texture of slurry applications shall be used if the spreader box is equipped with a burlap drag.

Where the completed slurry is not uniform in color, the areas affected shall be treated to eliminate the color variation at the Contractor's expense. The method of treatment shall be approved by the Engineer.

10-3.4 Testing

10-3.4.1 General — Samples of the slurry seal mixture to be incorporated in the work shall be taken by the Engineer at the point of application. Testing of these samples shall be done at the discretion of the Engineer.

The Contractor will be notified within five (5) working days of the results of any tests performed.

10-3.4.2 Slurry Mixture — Each sample of slurry mixture shall be tested for conformance to the JMF. The following tests shall be performed:

Water content as percent of dry weight of slurry before extraction.

Residual asphalt content as percent of dry weight of aggregate shall be determined in accordance with ASTM D2172.

Gradation of extracted aggregate shall be determined in accordance with

ASTM C136.

Percent of emulsified asphalt in slurry mixture based on weight of dry aggregates shall be calculated.

Wet track abrasion in accordance with ASTM D3910.

10-3.4.3 Tolerances — Tolerances for individual materials as well as the slurry seal mixture are as follows:

After the designed residual asphalt content is determined, a ± One (1) percentage point variation will be permitted.

The percent of aggregate passing each sieve shall not vary more than ± 4.0 percent from the JMF.

The percent of aggregate passing shall not go from the high end to the low of the specified range of any two successive sieves.

The slurry consistency shall not vary more than ± 0.5 cm from the JMF after field adjustments.

10-3.4.4 Access — Where necessary to provide vehicular or pedestrian crossings over the fresh slurry, the Engineer shall direct the spreading of sufficient sand to eliminate tracking or damage to the slurry mixture. Otherwise, Contractor shall provide barricades and flagmen to keep traffic off the fresh slurry.

10-3.4.5 Measurement — Measurement for slurry seal shall be at the square foot of surface completed as shown and specified to the nearest square foot. No deduction will be made for manhole or valve covers cleaned after the project. No measurement will be made for slurry seal outside the limits of work or not furnished and installed according to specifications.

10-3.4.6 Payment — Payment for slurry seal will be made at the contract unit bid price which price and payment shall include furnishing and placing, site preparation, traffic control, cleaning up, protection of all utility covers, labor, material, equipment and all incidentals to complete the work as shown and specified.

10-4 Specifications for Application of Asphalt-Rubber Cape Seal

10-4.1 General

10-4.1.1 Scope — The work to be accomplished under these specifications includes such equipment, personnel, materials, and skill as may be necessary to place an asphalt-rubber cap seal onto an existing asphaltic concrete pavement.

10-4.1.2 Description — As referenced in these specifications, the term "cape seal" is defined as the application of an asphalt-rubber chip seal, followed by the application of a conventional aggregate slurry seal. Similarly, "double cape seal" is defined as the application of two consecutive asphalt-rubber chip seals, followed by the application of conventional aggregate slurry seal.

10-4.1.3 Control of Materials

Certified Test Reports: The Contractor shall submit certified test reports stating that the following materials are in compliance with these specifications:

- Mineral Aggregates
- Bituminous Materials

Manufacturer's Data: The Contractor shall submit the temperature-viscosity relationship of the asphalt cement.

Certificate of Compliance: The Contractor shall furnish the Engineer, at least two (2) weeks prior to the start of work, with a list of material sources together with Certificates of Compliance, indicating that materials to be incorporated in the work fulfill the requirements of these specifications. The Certificates of Compliance shall be signed by the material supplier or representative.

10-4.1.4 Job Mix Formula — The Contractor shall furnish the Engineer with a Job Mix Formula (JMF) for the slurry seal. The JMF prepared by the Contractor must represent materials that have been used within the previous six (6) months. The JMF must be submitted no later than two (2) weeks prior to the commencement of work. The JMF shall indicate the type and quantity of asphalt emulsion, the quantity and type of chemical additive, the residual asphalt content, the water content, aggregate type and gradation, type and quantity of mineral filler, rate of application, the abrasion loss from the wet track abrasion test, results of

consistency test, and set time and cure time in accordance with ASTM D3910. Samples of materials to be used on the job shall be used to determine the job mix.

10-4.1.5 Delivery and Storage — Materials delivered to the site shall be inspected by the Engineer for contamination and damage. Materials shall be unloaded and stored with a minimum of handling. Aggregates shall be stored in such a manner to protect them from contamination and segregation. All storage sites must be approved by the Engineer.

10-4.1.6 Samples — The Engineer shall have the right to obtain samples of all materials to be used in the work and to test such samples for the purpose of determining specification compliance. The Engineer reserves the right to obtain said samples at the point of delivery and/or at the point of manufacture. The Engineer shall also have the right to inspect sources of materials to be used in the work to determine acceptability of procedures used by the materials supplier.

10-5 Materials

10-5.1 General — Only materials conforming to these specifications shall be incorporated in the work.

10-5.2 Rubberized Chip Seal

Asphalt: The grade of asphalt cement of the asphalt-rubber mixture shall be AR-4000 and shall comply with the requirements of ASTM D3381.

If indicated necessary by laboratory testing, an approved anti-stripping additive may be added to the asphalt cement up to 1.0 percent by weight of asphalt.

Granulated Reclaimed Rubber: The granulated reclaimed rubber used shall be produced primarily from the processing of automobile and truck tires. The rubber shall be produced by ambient temperature grinding processes only.

The gradation of the granulated reclaimed rubber, when tested in accordance with ASTM C136 and using a 50 gram $\pm$ 1 gram sample, shall meet the following requirements:

SIEVE SIZE	PERCENT PASSING
No. 8	100
No. 10	95 - 100
NO. 30	0 - 10
No. 50	0 - 5

The use of rubber from multiple sources is acceptable provided that the overall blend of rubber meets the gradation requirements.

The individual granulated rubber particles, irrespective of diameter, shall not be greater in length than 3/16th inch (5 mm).

The granulated rubber shall have a specific gravity of 1.15 $\pm$ 0.05 and shall be free of loose fabric, wire and other contaminants except that up to 4 percent (by weight of rubber) calcium carbonate or talc may be added to prevent rubber particles from sticking together. The rubber shall be sufficiently dry so as to be free-flowing and not produce a foaming problem when blended with the hot asphalt cement.

The granulated reclaimed rubber shall be accepted by certification from the rubber supplier.

Diluent: The diluent shall have the following properties:

Flash Point	130°F Minimum
Initial Boiling Point (ASTM D86)	340°F Minimum
Dry Point (ASTM D86)	390° - 415°F
Total Saturates	85% Minimum

Diluent shall not be added to the first asphalt-rubber lift of the double cape seal.

Polymer: For the second asphalt-rubber lift of the double cape seal, a granulated polymer modifier shall be added with the rubber to the asphalt. The type of polymer shall be approved by the Engineer and shall replace 2½ to 3 percent, by weight, of the rubber in the asphalt-rubber mixture.

Asphalt-Rubber: The asphalt-rubber supplier shall furnish to the Engineer, a minimum of two (2) weeks before the beginning of placement, the asphalt-rubber mix formulation which shall contain the following information:

Asphalt Cement Source of Asphalt Cement Grade of Asphalt Cement Percentage of Asphalt Cement by total weight of the asphalt-rubber mixture
Granulated Reclaimed Rubber Source of Granulated Rubber Grade of Granulated Rubber Percentage of Granulated Rubber by total weight of the asphalt-rubber mixture If granulated rubber from more than one source is utilized, the above information will be required for each granulated rubber used.
Diluent Source of Diluent Grade of Diluent Percentage of Diluent-allowable by volume of the asphalt-rubber mixture.

10-5.3 Screened Aggregate — The cover material shall be crushed stone, crushed gravel, or both, and shall consist of clean, sound, durable particles, free of soft or disintegrated fragments and foreign matter. At least 90 percent by weight of the screenings shall consist of crushed particles as determined by California Test Method 205, and at least 90 percent by weight of the particles shall have at least two fractured faces.

Screened aggregate shall be of such nature that a thorough coat of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Drying may be required, as directed.

The cover material shall be precoated, one-quarter (0.25) to three-quarters (0.75) percent, with AR-4000 paving grade asphalt at a temperature of 300 to 375 degrees F.

Maximum aggregate size for the cape seal and for the second asphalt-rubber lift of the double cape seal shall conform to the following grading as per ASTM C136 and C117:

SIEVE SIZE	PERCENT PASSING 3/8" x NO. 6
3/4"	—
1/2"	100
3/8"	90-100
No. 4	5-30
No. 8	0-10
No. 16	0-5
No. 30	—
No. 200	0-1

Maximum aggregate size for the first asphalt-rubber lift of the double cape seal shall conform to the following grading as per ASTM C136 and C117:

SIEVE SIZE	PERCENT PASSING 1/2" x NO. 6
5/8"	100
1/2"	95-100
3/8"	0-40
1/4"	0-15
No. 8	0-2
No. 200	0-1

Aggregate screenings shall also conform to the following requirements:

TEST	RESULTS
Loss in L.A. Rattler per ASTM C131 (after 100 revolutions)	10% Max
Loss in L.A. Rattler per ASTM C131 (after 500 revolutions)	40% Max
Film Stripping per California Test Method 302	25% Max
Cleanness Value per California Test Method 227	75 Min

Samples of the proposed aggregate shall be submitted to the asphalt-rubber supplier, a minimum of twenty-one (21) days prior to application, to test for aggregate stripping characteristics. The results shall be submitted to the Engineer.

10-5.4 Equipment

10-5.4.1 General — Only equipment conforming to these specifications shall be incorporated in the work and all such equipment shall be maintained in safe and satisfactory working condition at all times.

10-5.4.2 Rubberized Chip Seal

General: The equipment used by the Contractor shall include a self-propelled rotary power broom or mobile pickup broom for pavement cleaning and excess cover material removal.

Asphalt-Rubber Equipment: All equipment utilized in the production and application of the asphalt-rubber shall be as described as follows:

An asphalt heating tank with a hot oil heat transfer system or retort heating system, capable of heating asphalt cement to the necessary temperature for blending with the granulated rubber. This unit shall be capable of heating a minimum of 3,000 gallons of asphalt cement.

An asphalt-rubber mechanical blender with a two-stage continuous mixing process, capable of producing a homogenous mixture of asphalt cement and granulated rubber, at the mix design specified ratios, as directed by the Engineer. This unit shall be equipped with a granulated rubber feed system capable of supplying the asphalt cement feed system, as not to interrupt the continuity of the blending process. A separate asphalt cement feed pump and finished product pump are required. The mechanical blender shall have both an asphalt cement totalizing meter in gallons and a flow rate meter in gallons per minute.

A truck or trailer mounted self-powered distributor truck equipped with a retort heating unit, and an internal mixing device capable of maintaining a uniform mixture of asphalt cement and granulated rubber. It shall be equipped with a full circulating spreader bar and a pumping system capable of applying asphalt-rubber material within $\pm$ 0.05 gallons per square yard tolerance of the specified application rate and must give a uniform covering of the surface to be treated. The distributor shall have a boot board on the rear of the vehicle and a bootman shall accompany the distributor. The bootman shall ride in a position so that all spray bar tips are in full view and readily accessible for unplugging if a plugged tip should occur. The distributor shall also include a tachometer, pressure gauge, volume measuring device and a thermometer.

The Engineer reserves the right to order the discontinuance of use of equipment, which, in his opinion, fails to produce a satisfactory distribution

of asphalt-rubber in accordance with these specifications.

Cover Material Spreader: The cover material (Chip) spreader shall be a self-propelled machine with an aggregate receiving hopper in the rear, belt conveyors to carry the aggregate to the front, and a spreading hopper equipped with a full-width distribution auger and spread roll. The spreader shall be in good mechanical condition and be capable of applying the cover material uniformly across the spread at the specified rate.

Rolling Equipment: A minimum of three operational self-propelled pneumatic-tired rollers shall be used for the required rolling of the cover material. The pneumatic-tired rollers shall carry a minimum loading of 3,000 pounds on each wheel and a minimum air pressure of 100 pounds per square inch in each tire.

Hauling Equipment: Trucks for hauling cover material shall be tailgate discharge and shall be equipped with a device to lock onto the hitch at the rear of the cover material spreader. Haul trucks shall also be compatible with the cover aggregate spreader so that the dump bed will not push down on the spreader when fully raised, or have too short a bed which results in aggregate spillage while dumping into the receiving hopper.

10-5.4.3 Slurry Seal

Mixer: The slurry machine shall be capable of rapid discharge of the mixed materials into a spreader. The self-contained slurry unit shall be mounted on truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation so that the slurry is spread evenly.

The slurry mixing machine shall be a continuous flow mixing unit, capable of accurately delivering a predetermined proportion of aggregate, water, emulsified asphalt, and accelerator and retardant to the mixing chamber. The mix chamber shall discharge the thoroughly mixed product on a continuous basis.

The aggregate shall be pre-wetted immediately prior to mixing the emulsified asphalt.

The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together.

The mixing machine shall be equipped with an approved fines feeder that provides a method to accurately introduce a predetermined proportion of mineral filler at the same time and location that the aggregate is fed into

the mixer. The fines feeder shall be used whenever added mineral filler is a part of the aggregate blend or a dry chemical additive is used.

The mixing machine shall be equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface ahead of the spreading equipment with an application up to 0.05 gallons per square yard.

Sufficient machine storage capacity to properly mix and apply a minimum of 5 tons of the slurry shall be provided.

Proportioning devices shall be calibrated prior to placing the seal coat. The Contractor shall furnish the Engineer with a calibration sheet for each mixing machine prior to use on the job.

Slurry Spreading Equipment: Attached to the mixer machine shall be a mechanical type squeegee distributor, having suitable controls to allow adjustment for variations of pavement grades and slope, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor which may result from varying grades or crowns.

A lateral control device and flexible strikeoff shall be provided.

The spreader box shall have an adjustable width. The box shall be kept clean, and build-up of asphalt and aggregate on the box will not be permitted.

The use and condition of burlap drags or other drags shall be approved by the Engineer.

Cleaning Equipment: Only vacuum sweepers will be permitted to clean the cape seal surface prior to slurry seal placement.

Hand Tools: Hand squeegees, shovels, hand burlap drags, and other equipment shall be available for those areas inaccessible to the spreader box.

10-5.5 Execution

10-5.5.1 General

Notification of Work: A minimum of ten (10) working days prior to the start of any work, the Contractor shall submit a Work Phasing Schedule for the approval of the Engineer.

Prior to the start of any construction, the Contractor shall notify the Albany Fire Department and the County Sheriff giving the approximate starting date, anticipated completion date, and the name and telephone number of a person who may be contacted at any hour in the event of a critical condition requiring immediate attention. It shall also be the Contractor's responsibility to notify the Engineer seventy-two (72) hours prior to the start of construction to review traffic control plans.

Material Disposal: The Contractor shall remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up of spillage will be at the Contractor's expense.

All material removed from the site shall e disposed of at the Contractor's expense at a site approved by the Engineer.

10-5.5.2 Asphalt-Rubber

General: Due to the handling characteristics of the asphalt-rubber, when radii and other irregular areas are to be sealed, it is recommended that this be done with an RS or CRS chip seal emulsion or paving grade asphalt cement.

Asphalt-Rubber Mixing Reaction: The percentage of granulated rubber shall be 23 percent $\pm$ 3 percent by weight of total asphalt-rubber mixture, the exact granulated rubber content shall be as determined by the mix design submitted by the asphalt-rubber supplier. During membrane placement, the granulated rubber percentage shall not fluctuate by more than one (1) percent by weight of total asphalt-rubber mixture.

The temperature of the asphalt cement shall be between 350 and 425 degrees F at the addition of the granulated rubber. The asphalt and rubber shall be combined and mixed together in the asphalt-rubber blending unit and reacted in the distributor for a period of time as required by the Engineer which shall be based on laboratory testing by the asphalt-rubber supplier. The temperature of the asphalt-rubber mixture shall be above 325 degrees F during the reaction period.

After the reaction between asphalt cement and granulated rubber has occurred, the viscosity of the hot asphalt-rubber mixture may be adjusted for spraying and/or better "wetting" of the cover material by the addition of a diluent. The diluent shall comply with the requirements of Section 2.2.3 herein and shall not exceed 7.5 percent by volume of the hot asphalt-rubber mixture.

When a job delay occurs after full reaction, the asphalt-rubber may be

allowed to cool. The asphalt-rubber shall be reheated slowly just prior to application but not to a temperature exceeding 350 degrees F. And additional quantity of diluent not exceeding 3 percent by volume of the hot asphalt-rubber mixture may be added after reheating.

Application of Asphalt-Rubber Material: Placement of the asphalt-rubber will be permitted only under the following conditions:

- The pavement surface temperature is 60 degrees F and rising.
- The pavement surface is clean and absolutely dry.
- The wind conditions are not excessive.
- All construction equipment such as asphalt-rubber distributor, cover material spreader, haul trucks with cover material, and rollers are in position and ready to commence asphalt-rubber placement operations.

As directed by the Engineer, the asphalt-rubber mixture shall be applied at a temperature of 290 to 340 degrees F at a rate of 0.50 to 0.55 gallons per square yard for the cape seal and the second lift of double cape seal, and at a rate of 0.70 gallons per square yard for the first lift of the double cape seal.

Transverse joints shall be constructed by placing building paper across and over the end of the previous asphalt-rubber application. Once the spraying has progressed beyond the paper, the paper shall be removed immediately and disposed of as directed by the Engineer. All longitudinal joints shall not exceed a four inch overlap.

The asphalt-rubber shall not be applied until sufficient screenings are on hand for immediate cover.

The asphalt-rubber shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one application.

The asphalt-rubber shall not be spread a greater distance than can be immediately covered by aggregate screenings, unless otherwise permitted by the Engineer.

Spreading of Screened Aggregate: Cover material shall be spread immediately and uniformly over the asphalt-rubber at a spreading rate of 30 to 34 pounds per square yard.

At the time of application to the asphalt-rubber, cover material shall be surface dry so as to gain proper adhesion to the asphalt-rubber material.

The joint between adjacent applications of aggregate shall coincide with the line between designated traffic lanes.

Operating the aggregate-spreading equipment at speeds which cause the chips to roll over after striking the asphalt-rubber 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 aggregate prior to precoating will be permitted; however, any contamination resulting from storage or reloading will be cause for rejection. No stockpiling of precoated aggregate will be permitted.

Finishing: After the screenings have been spread upon the asphalt-rubber, any piles, ridges, or uneven aggregate distribution shall be carefully removed to insure against permanent ridges, bumps or depressions in the completed surface before the surface is rolled. Additional screenings shall be spread in whatever quantities necessary to prevent picking up by the rollers or traffic.

At least 3 operational pneumatic-tired rollers complying with the requirements of Section 3.2.4 shall be provided to accomplish the required embedment of the cover material. At some project locations, or where production rates dictate, 2 operational pneumatic-tired rollers may be utilized as directed by the Engineer.

Sufficient rollers shall be used for the initial rolling to cover the width of the aggregate spread with one pass. The first pass shall be made immediately behind the cover material spreader, and if the spreading is stopped for an extended period, the cover material spreader shall be moved ahead or off the side, so that all cover material may be immediately rolled. Four complete passes with rollers shall be made with all rolling completed within one hour after the application of the cover material.

Sweeping of loose cover material can begin a minimum of one (1) hour after placement and shall be completed no later than twenty-four (24) hours after placement.

Excess screenings which in the opinion of the Engineer are not salvageable and which interfere with drainage shall be removed and disposed of by the Contractor at the Contractor's expense. The removed screenings shall be

disposed of as directed by the Engineer.

The completed surface shall present a uniform appearance and shall be thoroughly compacted and free from ruts, humps, depressions, and irregularities due to an uneven distribution of asphalt-rubber or aggregate screenings.

The second asphalt-rubber lift shall be applied a minimum of twenty-four (24) hours after the cover aggregate for the first lift is placed. All loose cover material shall be swept prior to the application of the second asphalt-rubber lift.

Pavement Markers: For the cape seal, pavement marker masking shall be removed and the markers cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

Set and Cure Time: Except when it is necessary that hauling equipment must travel on the newly applied membrane, traffic of all types shall be kept off the membrane until it has had time to set properly. The speed of all hauling equipment shall not exceed 15 miles per hour when traveling over a membrane which is not adequately set. The minimum traffic-free period shall not be less than one (1) hour.

For optimum results, the asphalt-rubber chip seal (single and double applications) should be allowed to cure for a minimum of one (1) week prior to the application of the emulsified asphalt slurry seal.

10-5.5.3 Slurry Seal

Mixing Slurry: The mixing of slurry shall be sufficient to produce a uniform mixture of the desired consistency in accordance with the JMF. Under no circumstances shall the emulsion content be changed to control the consistency of the mix. If breaking, hardening, segregation, balling, or lumping occurs during the mixing process, the batch shall be discarded. All aggregate particles shall be uniformly coated with asphalt.

Slurry Seal Application: The surface shall be fogged with water directly preceding the spreader at a rate of 0.03 to 0.05 gallons per square yard.

The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. The water content shall be adjusted to maintain the proper consistency at the point of application.

A sufficient amount of slurry shall be carried in all parts of the spreader

at all times so that complete coverage is obtained.

Pavement Markers: Upon completion of the slurry seal application for the cape seal, pavement marker masking shall be removed and the markers cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

Sweeping: All pavements shall be vacuum swept before striping, or two (2) weeks after slurry seal placement, whichever is sooner.

Adjustment of Utility and Manhole Covers: For the double cape seal, the Contractor shall adjust all manhole and utility covers (and all other similar structures) to finished grade in accordance with the provisions of Section 301-1.6 and Section 302-5.7 of the Standard Specifications, except as modified herein.

The Contractor shall locate and tie out all manholes, valve covers, and survey monuments prior to construction.

All manholes, survey monuments and water valve covers shall be thoroughly cleaned of any construction debris resulting from the Contractor's operations.

Survey monument covers shall be adjusted as directed by the Engineer. The survey monument shall be protected in place by the Contractor. For monuments requiring resetting, the work shall be performed by a licensed land surveyor and all costs shall be at the Contractor's expense.

Manholes, meters and valve covers not owned by the City shall be adjusted to grade by the utility owner involved and at the utility company's expense. It shall be the responsibility of the Contractor to notify affected utility companies.

10-5.5.4 Measurement and Payment — Payment for the cape seal and the double cape seal shall be made at the contract unit price per square yard in the Bid Schedule and shall be based on as placed field measurements. The contract unit price shall include full compensation for all labor, equipment, and materials necessary to complete the cape and double cape seal applications, including mobilization, pavement cleaning, posting of notices, masking and cleaning of pavement markers (cape seal only), adjusting utility and manhole covers (double cape seal only), and all other incidental work.

10-5.5 Testing

10-5.5.1 General — Samples of the component materials and slurry mixture to be

incorporated in the work shall be taken by the Engineer at the point of application. Testing of materials shall be done at the discretion of the Engineer.

The Contractor will be notified within five (5) working days of the results of any tests performed.

10-5.5.2 Rubberized Chip Seal — Samples of component materials shall include asphalt cement, asphalt-rubber, and aggregate screenings.

10-5.5.3 Slurry Mixture — Each sample of slurry mixture shall be tested for conformance to the JMF. The following tests shall be performed:

- Water content as percent of dry weight of slurry before extraction.
- Residual asphalt content as percent of dry weight of aggregate shall be determined in accordance with ASTM D2172.
- Gradation of extracted aggregate shall be determined in accordance with ASTM C136.
- Percent of emulsified asphalt in slurry mixture based on weight of dry aggregates shall be calculated.
- Wet track abrasion in accordance with ASTM D3910.

10-5.5.4 Tolerances — Tolerances for individual materials, as well as the slurry seal mixture, are as follows:

After the designed residual point asphalt content is determined, a $\pm$ one (1) percentage point variation will be permitted.

The percent of aggregate passing each sieve shall not vary more than $\pm$ 4.0% from the JMF.

The percent of aggregate passing shall not go from the high end to the low of the specified range of any two successive sieves.

The slurry consistency shall not vary more than $\pm$ 0.5 cm from the JMF after field adjustments.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 11

Hot Surface Recycling

11-1 General – The work covered by this section of the specifications consists of furnishing all labor, equipment and materials and performing all operations in connection with heating, scarifying, leveling, compacting, and applying a recycling agent.

11-2 Cleaning – Prior to commencing heater scarifying operations, the pavement shall be cleaned of all loose material and vegetation. Power brooms shall be supplemented when necessary by hand brooming and such other tools as required to bring the surface to a clean, suitable condition, free of deleterious material. Any required failed area repair shall be completed prior to beginning the process. The locations of required repair will be marked in the field by the Engineer. Intruding concrete and asphalt concrete ramps in the street shall be removed as approved by the Engineer.

11-3 Equipment – The equipment used to heat and scarify asphalt surfaces shall fully meet State and Local Air Pollution Standards. The combustion chamber shall be insulated and totally enclosed to provide sufficient heat to the pavement in order to achieve specified performance. The machine shall be equipped with multiple rows of spring equalized scarifier to insure a viscous shearing of the heated asphalt and to provide uninterrupted scarification contiguous to rigid structures. A competent operating crew shall be provided.

The equipment used to distribute and level the scarified material shall be an approved paving machine equipped with a heated tamping or vibratory screed. The contractor may furnish another type screed if approved by the Engineer. The machine must be capable of screeding the full width of scarified material. A competent operating crew shall be provided.

One twelve (12) ton or greater pneumatic-tired roller and operator shall be furnished to compact the scarified material.

On cab-controlled, liquid spreader with operator shall be furnished to distribute the asphalt recycling agent.

11-4 Construction Methods – Contractor shall heater-scarify from the gutters toward the center of streets in a manner as approved by the Engineer. A minimum of two heater units will be utilized in tandem so that the heat emitted and the rate of travel will achieve specified requirements.

The number of additional heater units shall be determined by the contractor; however, only the scarifier rake on the final heater unit of the series shall scarify.

The existing asphalt surface shall be heated from 6 to 12 inches wider than the width to be processed. The temperature of the scarified material shall be a minimum of 220°F and shall not exceed 300°F when measured with a stick thermometer immediately behind the scarifier.

The weight of existing asphalt surface has been estimated to be approximately 144 pounds per cubic foot. On this basis, a minimum of nine pounds per square foot of existing surface shall be scarified to obtain a depth of not less than 0.07 feet. IF the tests indicate that the material weighs either less than 137 or more than 151 pounds per cubic foot, the weight per square foot requirement will be adjusted accordingly by the Engineer.

Scarification will be deemed acceptable when the moving average of three consecutive random weight tests per hour indicates that the required depth has been scarified. The weight of the existing asphalt surface will be determined in accordance with the requirements of AASHTO T-166 from scarified material compacted in accordance with requirements of AASHTO T-245, with the exception that the compaction temperature shall be a minimum of 260°F.

The scarified material shall be distributed and leveled only for the width processed and rolled immediately while it possesses sufficient heat to be properly compacted. The specified grade of recycling agent shall be applied diluted 2 parts recycling agent, preferably within 30 minutes, but in no event more than 8 hours after compaction. The rate of application shall be determined by the Engineer based on preconstruction laboratory analysis and adjustments for varying field conditions.

It is the contractor's responsibility to notify and arrange with utility companies for the protection and modification of their improvements in hot surface recycling areas, and to protect all City-owned utility covers, of no expense to the City.

The asphalt recycling agent shall be composed of a petroleum base resin uniformly emulsified with water and shall conform to the following physical and chemical requirements:

GUIDELINES FOR ASPHALT RECYCLING AGENTS

	Test Method		Requirements			
			Light Grade		Medium Grade	
Test on Emulsion:	**ASTM**	**AASHTO**	**Min.**	**Max.**	**Min.**	**Max.**
Viscosity @ 25°C, SFS	D244-77	T59-74	15	85	15	85
Residue, %	D244-77 (Mod)[1]	T59-74 (Mod)[1]	60	—	60	—
Cement Mixing Test, %	D255-77	T59-74	—	2.0	—	2.0
Sieve Test, %	D244-77 (Mod)[2]	T59-74 (Mod)[2]	—	0.1	—	0.1
Particle Charge Test	D244-77	T59-74	Positive		Positive	
Test on Base Oil[3]:						
Original						
Viscosity @ 60°C, cST	D2170-76	T201-74	80	500	1000	4000
Flash Point, COC, °C	D92-78	T48-74	204	—	210	—
Saturates, %[4]	D2007-75	—	—	30	—	2.5
Asphaltenes, %	D2006-70	—	—	1.5	—	9.0
PC/S Ratio[5]	D2006-70	—	0.5	—	0.5	—
Maltenes Distribution Ratio $(PC+A_2)/(S+A_2)$[5]	D2006-70	—	0.2	1.0	0.2	1.2
Test on Residue From RTF-C Oven Test @ 163°C	D2872-77	T240-73				
Viscosity Ratio[6]	D2170-76	T201-74	—	3.0	—	2.5
RTF-C Oven Wt. Change, %	D2872-77	T240-73	—	6.5	—	2.0

[1]ASTM D244 Modified Evaporation Test for percent residue is made by heating a 50 gram sample to 149°C until foaming ceases, then cool immediately and calculate results.

[2]Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2% sodium oleate solution.

[3]Values obtained on the emulsion's residue may vary slightly from the base oil.

[4]ASTM D2006-70 can be used for the determination of saturates.

[5]In the Maltenes Distribution Ratio Test by ASTM Method D2006-70
PC = Polar Compounds A_1 = First Acidaffins
A_2 = Second Acidaffins S = Saturates

[6]Viscosity Ratio = $\frac{\text{RTC-C Viscosity @ 60°C, cST}}{\text{Original Viscosity @ 60°C, cST}}$

11-5 Prequalification Clause — The Engineer shall require the successful bidder to submit a list of five comparable size projects performed using the equipment and techniques specified. Said list shall include the agency, name. address and telephone number of Engineers in charge.

In lieu of the above, the Contractor may qualify his equipment by a demonstration on this or comparable work to the satisfaction of the Engineer. Equipment not approved by the Engineer shall be removed form the project and acceptable machines supplied. The cost of this demonstration shall be borne by the supplier.

Street trees and plants in the parking strip area shall be sprayed with water to protect from heat and flame immediately prior to heater scarifying operation.

11-6 Air Quality Preservation — The machine shall be operated in compliance with standards of the Bay Area Air Quality Control District.

11-7 Application of overlay — Asphalt concrete surfacing in accordance with Section 9 of these specifications shall be done immediately after hot surface recycling. The Contractor shall clean the surface of the area to be paved prior to the paving operation.

11-8 Measurement — Heating, scarifying, leveling and compacting of the pavement shall be paid for at the contract unit price per square yard.

11-9 Payment — The contract unit price paid per square yard of hot surface recycling shall include full compensation for furnishing all labor, materials, tools, recycling agent and equipment, and doing all other incidental work involved in recycling the existing asphalt concrete surface as specified, and no additional payment should be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 12

Asphalt Concrete Leveling Course & Crack Fill Repairs

12-1 Asphalt Concrete Leveling Course

12-1.1 — Asphalt leveling course shall be placed in areas designated by the Engineer prior to placing any designated asphalt seal coat, interlayer or asphalt concrete overlay.

The area to be leveled shall be well cleaned, loose material removed and a tack coat applied.

12-1.2 Tack Coat — Tack coat shall be asphalt grade RSW-1 in accordance with Section 94 of the State Standard Specifications. It shall be applied at the rate of 0.02 to 0.10 gallons per square yard; the exact rate of application shall be as approved by the Engineer and shall provide a thorough coating of the area to receive asphalt concrete leveling course.

12-1.3 Material for Leveling Course — The asphalt concrete leveling course shall be of such aggregate gradation to ensure a smooth conform with the existing pavement surface can be achieved. The maximum size aggregate shall be ⅜-inch.

12-1.4 Placement — The asphalt leveling course shall be placed in areas as marked by the Engineer. The material shall be placed and compacted in such a manner as to ensure a uniform cross section is achieved with the adjacent existing surface.

In place density of the leveling course shall not be less than as specified by Section 9-6 of the Technical Provisions.

12-1.5 Measurement — The quantity of asphalt concrete leveling course will be measured on a square foot basis or tonnage basis as indicated in the bid proposal. Final qualities for payment purposes must be agreed upon by the Engineer prior to placing any subsequent seal coat, interlayer or asphalt paving.

12-1.6 Payment — The contract unit price paid for placing asphalt concrete leveling course shall be at unit price.

12-2 Crack Fill Repair

12-2.1 General — This work shall consist of placing asphalt concrete and/or asphalt rubber crack sealant in pavement cracks as directed by the Engineer.

12-2.2 Preparation — Cracks designated to be repaired shall be cleaned to a minimum depth of ¾-inch by blast cleaning or hand methods, followed by high pressure air jets, to remove all vegetation, residue, moisture and foreign matter. Cracks from which vegetation is removed shall receive an application of a nonpetroleum-based weed killer.

Cracks wider than one (1) inch and greater than three (3) inches in depth shall be filled to within one (1) inch of surface grade with sand and hand tamped. The sand shall be ±1 percent saturated surface dry at the time it is placed and compacted. Cleaned cracks shall receive a tack coat in accordance with Section 12-1.2.

Cracks designated to be repaired with an average clear opening of ⅛-inch or more in width and less than ⅜-inch in width shall be routed to provide a minimum sealant reservoir of 1 inch wide by ¾-inch deep. Cracks having an average clear opening width of ⅜-inch or greater need not be routed, but shall be cleaned to a minimum depth of ¾-inch. Cracks less than ⅛-inch clear opening width will not be sealed.

12-2.3 Asphalt Repairs — Cracks greater than one (1) inch in width and three (3) inches in depth shall receive a one (1) inch thick application of hand compacted asphalt concrete, after placing the sand backfill as specified in Section 12-2.2.

The maximum gradation of aggregate for the asphalt concrete for crack repairs shall be ⅜-inch.

The asphalt concrete crack repair shall be placed and compacted in such a manner as to provide a finish surface flush with the surrounding pavement.

12-2.4 Asphalt Rubber Crack Sealant — The sealant shall consist of a mixture of paving grade asphalt and vulcanized granulated crumb rubber. The mixture shall contain not less than 25 percent granulated reclaimed rubber, by weight. Rubber gradation shall conform to the following requirements:

Sieve Size	Percent Passing
No. 8	100%
No. 10	98–100%
No. 30	—
No. 40	0–10%

The sealant shall conform to the following requirements:

Cone Penetration, 77 degrees F	40 Max
Softening Point, degrees F	175 Min
Resilience, 77 degrees F, %	30 Min

The sealant shall be capable of being melted and applied to cracks at temperatures below 400 degrees F. When heated, the material shall readily penetrate cracks ¼-inch in width or wider.

Modifiers may be used to facilitate blending.

Each lot of sealant shipped to the job site shall be accompanied by a Certificate of Compliance.

Exposed surfaces shall be dry at the time the sealant is applied.

Sealant materials shall be heated and placed in conformance with the manufacturer's written instructions. Joint sealant materials shall not be placed when the pavement surface temperature is below 50 degrees F.

Sufficient sealing material shall be placed in the cracks so that upon completion of the work the surface of the sealant in the crack shall be flush with the adjacent pavement surface, or at the elevation directed by the Engineer. The Contractor shall "spot up" or refill to the proper elevation, at the Contractor's expense, all unsatisfactory cracks.

All cracks shall be leveled and excess crack sealant removed immediately after placing. Sand shall be applied to sealed cracks, as necessary and at the direction of the Engineer, to absorb excess material.

The finished crack sealant shall be bonded to the faces of the crack. There shall be no separation or opening between the sealant and the faces, and there shall be no crack, separation, or other opening in the sealant.

<u>12-2.5 Measurement</u> — Crack filling shall be measured on a per foot basis for the type of repair.

12-2.6 Payment — The contract unit price paid for the type of crack repair shall be considered as including full compensation for all labor, tools, material, equipment, including but not limited to preparation and tack coat and no additional compensation shall be made therefor.

If there is no bid item in the "Bid Proposal" form, then compensation for crack repairs designated by the City shall be paid for as extra work.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 13

Cold Planing

13-1 General — The work to be accomplished under these specifications includes such equipment, personnel, materials and skill as may be necessary to complete all operations associated with planing an existing bituminous pavement in accordance with these specifications.

As referenced in these specifications, the term "cold plane" is defined as milling the existing asphaltic concrete surface to a uniform depth of two (2) inches, except adjacent to existing curbs where the depth shall be one (1) inch.

13-2 Surface Preparation — Prior to commencing work, the existing pavement shall be cleaned of all loose material and all interfering pavement markers shall be removed. Power brooms shall be supplemented, when necessary, by hand brooming in order to bring the surface to a clean, suitable condition, free of deleterious material, acceptable to the Engineer.

13-3 Equipment

13-3.1 General — Only equipment conforming to these specifications shall be used and all such equipment shall be maintained in safe and satisfactory working condition at all times.

13-3.2 Planer — The equipment for removing the asphaltic concrete pavement shall be a commercially designed and manufactured machine capable of performing the work in a manner satisfactory to the Engineer.

The machine shall be power-operated and self-propelled, and shall have sufficient power, traction and stability to remove a thickness of bituminous surface to a specified depth, and provide a uniform profile and cross slope. The machine shall be capable of accurately and automatically establishing profile grades (within ± 1/8 inch) along each edge of the machine by referencing form the existing pavement by means of a ski or matching shoe, or from an independent grade line. The machine shall have an automatic system for controlling grade elevation and

cross slope. The machine shall be equipped with a means to effectively control dust generated by the cutting operation.

13-4 Planing Operation — The nature and condition of the planer and the manner in which the work is performed shall be such that the pavement is not torn, gouged, shoved, broken, or otherwise damaged by the planing operation. The surface resulting from the cold planing operation shall be characterized by uniform, discontinuous longitudinal striations or other uniform pattern.

The Contractor shall furnish one or more planing machines and an experienced operator for each machine.

Removal shall consist of planing and cutting the pavement to form a keyway header cut or full width regrading, and removing the loosened material. If required by the Engineer, a one-inch minimum header shall be cut along structures to eliminate feathering and permit new asphalt concrete to be laid in full thickness.

Sufficient passes or cuts shall be made so that all irregularities and high spots are eliminated to the satisfaction of the Engineer.

Asphaltic concrete that cannot be removed by cold planing equipment because of physical or geometrical restraints will be removed by other methods acceptable to the Engineer.

The surface tolerance produced shall be such that a ten-foot straight edge laid laterally will indicate variances of less than 1/4 inch.

Before opening the milled surface to traffic, all loose material shall be removed from the milled surface and the surface swept with a power broom.

If the road is to remain open to traffic, longitudinal and vertical drop-offs in excess of two (2) inches at a lane line or at centerline shall not be left unattended.

Transverse faces existing at the end of a work period should be tapered in a manner approved by the Engineer to avoid a hazard for traffic.

No aggregate shall remain on the project at the end of each work day. Aggregate material loosened and designated for removal shall become the property of the Contractor and shall be disposed off site, or may be incorporated as trench backfill or material in compliance with other applicable provisions of these Specifications.

13-5 Material Disposal — The Contractor shall remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up of spillage will be at the Contractor's expense.

All material removed from the site shall be disposed of at the Contractor's expense at a site designated and approved by the Engineer.

13-6 Measurement and Payment — Asphalt planing performed and completed in accordance with these specifications shall be paid for by the measured square yardage, regardless of depth as measured on site by the Engineer.

The contract unit price shall be full compensation for furnishing all labor, materials, equipment, tools and incidentals to complete the work specified, including but not limited to the hauling of milled material, replacement of vehicle detector loops, working around existing surface improvements and protecting adjacent improvements from damage, and no additional compensation shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 14

Pavement Reinforcing Fabric

14-1 General — Pavement reinforcing fabric shall be placed on 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.

14-2 Materials — Pavement reinforcing fabric shall be manufactured from polyester, polypropylene, or polypropylenenylon material. The fabric shall be nonwoven, and shall conform to the following:

Weight, ounces per square yard	
ASTM Designation: D 1910	3.0 to 8.0
Grab tensile strength (1-inch grip), pounds min.	
ASTM Designation: D 1117	90
Elongation at break, percent min.	
ASTM Designation: D 1117	40
Fabric thickness, mils.	
ASTM Designation: D 461	12 to 100

The following fabrics have been found to meet the requirements of these specifications: Amoco, Amopave, Petromat, Fibretex AO, or approved equal designed specifically for asphalt overlays. When these materials are used, a mill certificate or affidavit indicating that the material to be installed is the same material as one of those named above, and that the fabric does meet the specifications, shall be submitted to the Engineer.

14-3 Surface Preparation — Before placing the pavement reinforcing fabric, a binder of paving asphalt shall be applied to the surface to receive the pavement reinforcing fabric at an approximate rate of 0.25-gallon 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 width of the fabric mat plus 3 inches on each side.

The temperature of the asphalt binder shall be greater than 300 degrees F when applied, but shall not exceed 325 degrees F when the fabric is placed. The width of the sprayed application shall be no more than 6 inches and no less than 2 inches wider than the fabric width.

Before applying binder, large cracks, spalls and chuckholes in existing pavement shall be repaired as directed by the Engineer, and such repair work will be paid for provided by Section 5, "Street Failed Area Repair," and Section 9, "Asphalt Concrete," of these specifications.

14-4 Placing — The fabric shall be stretched, 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 is 1/2 inch or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. Lap in excess of 2 inches shall be removed.

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

If manual laydown methods are used, the fabric shall be unrolled, stretched, aligned, and placed in increments of approximately 30 feet.

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.

Seating of he fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicle shall be gradual and kept to a minimum to avoid damage.

A small quantity of asphalt concrete, to be determined by the Engineer, may be spread over the fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being picked up by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric, except that public cross traffic shall be allowed to cross the fabric, under traffic control, after the Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of he fabric with rolling equipment. If necessary, exposed binder material shall be covered lightly with sand.

14-5 Measurement — Pavement reinforcing fabric will be paid by the square

yard of horizontal surface area covered. Overlaps and materials wasted by the Contractor will not be measured for the purpose of payment.

14-6 Payment — The contract unit price paid for pavement reinforcing fabric shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work in finishing and placing pavement reinforcing fabric, as specified and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 15

Pavement Delineation

15-1 General — The Contractor shall apply all traffic striping, markings and all other directional information or pavement delineation on the surfaces of streets, detour roads, parking lots, median strips and curbing in accordance with the plans, Special Provisions and as specified herein, in conformance with the applicable provisions of the State Specifications and California Vehicle Code. Where no plans for pavement delineation have been provided and the existing delineation is to be covered or obliterated by the Contractor's work, the existing delineation shall be restored. Restoration shall conform to the requirements specified herein. When part of a pavement marking has been removed or obliterated, the entire marking shall be restored.

Unless otherwise specified in the plans or Special Provisions, all replacement delineation shall be thermoplastic.

15-2 Layout, Alignment and Spottings — All layouts, spotting and tracking required shall be performed by and at the expense of the Contractor, and approved by the Engineer prior to placement of pavement striping or markings.

When no previously applied figures, markings, or traffic striping are available to serve as a guide, suitable layouts shall be spotted in advance of the permanent paint application by any means satisfactory to the Engineer.

The Contractor shall mark or otherwise delineate the traffic lane in the new roadway or portion of roadway, or detour before opening it to traffic.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the pavement delineation.

The Contractor shall furnish all equipment, materials, labor and supervision necessary for installing pavement striping and markings in accordance with the contract plans or temporary detours required for the safe control of traffic through and/or around the project.

15-3 Pavement Markers — Pavement markers shall be installed in accordance with Section 85 of the State of California Standard Specifications, and as specified herein and in the Special Provisions.

Should the Contractor elect to alter the existing traffic stripes and markings, or to divert the flow of traffic on construction projects for his own convenience and there are no special pavement markings or delineations shown on the plans or in the Special Provisions, he shall, at no expense to the City, provide the necessary temporary striping in accordance with the State Traffic Manual, unless otherwise directed by the Engineer. Removal of such striping shall be at the Contractor's expense. The Contractor shall remove all existing or temporary detour striping or marking that may confuse the public. When temporary detour striping or markings are no longer required, they shall be removed prior to applying the new traffic stripes or markings.

Standard word markings, letters, numerals and symbols shall be as shown on the plans. In the absence of such information, all stencils and templates shall be identical with those used by the City. The Contractor shall provide stencils for all required legends.

Unless otherwise specified in the Special Provisions or contract plans, all pavement striping and markings, including restoration (except temporary), shall be thermoplastic.

15-4 Removal of Existing Markings — Existing striping and pavement markings that will be in conflict with the finish traffic circulation shall be removed as directed by the Engineer in accordance with Section 15-2.02 of the State Standard Specifications.

15-5 Thermoplastic Striping — The installation of thermoplastic striping and marking shall conform to Section 84-2 and 84-3 of the State Standard Specifications.

15-6 Painted Striping and Markings — General: Paint for pavement striping and markings, if such are required, shall conform to State Specifications 721-80-97 with color required and as specified herein.

15-7 Red Curb Painting — Red curb painting shall be applied as shown on the plans and as directed by the Engineer. Red curb painting shall include the application of two coats of traffic paint with glass beads incorporated in the second coat. Top and face of curb shall be painted.

15-8 Glass Beads — All traffic stripes, except the black separation line, shall be beaded.

15-8.1 General — Glass beads shall be applied directly and uniformly to the traffic

line with a bead dispenser machine, placed the proper distance behind the paint spray nozzle.

Glass beads shall be applied to pavement marking and crosswalks by a special paint spray gun developed for this purpose.

15-8.2 Application Rate

Broken Stripe

First Painting
New Surface, first coat: 4 to 5 gallons per mile
Second Coat: 7 to 7.4 gallons per mile

Restriping: 7 to 7.4 gallons per mile

Glass Beads: 42 pounds per mile

Solid Stripe

First Painting
New Surface, first coat: 12 to 14 gallons per mile
Second Coat: 16 to 18 gallons per mile
Glass Beads with second coat: 110± pounds per mile

Restriping: 16 to 18 gallons per mile
Glass Beads: approximately 110 pounds per mile
Black Traffic paint: approximately 8 gallons per mile

Pavement Markings

First Painting: light application to seal pavement
Second Coat: 1 gallon per 100 square feet
Glass Beads: 6 pounds per gallon of paint

Restriping: 1 gallon per 100 square feet
Glass Beads: 6 pounds per gallon of paint

15-9 Raised Bars

15-9.1 General Description — These specifications apply to pre-cast, cast-in-place or extruded raised bars intended to be used as traffic delineators or bumper stops. This work consists of furnishing and installing pre-cast, cast-in-place or extruded raised bars at the locations shown on the plans or directed by the Engineer and

to the requirements specified in these specifications and the Special Provisions.

Raised bars shall conform to the details and dimensions shown on the plans.

15-9.2 Classification Types — Raised bars are classified by type in accordance with the minimum supportive strength of the bar. The types are as follows:

Type A — 400 pounds minimum load
Type B — 150 pounds minimum load

The type of bar to be used shall be as shown on the plans or specified in the Special Provisions. If the type designation of the bar is not shown on the plans or specified in the Special Provisions, Type A will be used.

Type A raised bars may be either pre-cast, cast-in-place, or extruded, at the option of the Contractor. Type B raised bars shall be pre-cast.

15-9.3 Materials

Pre-cast Raised Bars — Pre-cast raised bars shall be constructed of 560-D-3000 concrete. Other materials such as glass fiber and wood chips may be substituted for the aggregate in raised bars provided the portland cement content is adjusted to such materials and such use of other materials is approved by the Engineer.

Cast-in-Place Raised Bars — Concrete used in cast-in-place raised bars shall be 560-D-3000 concrete containing calcium chloride at the rate of 2 pounds per 100 pounds of cement. The slump of the concrete shall be not less than ½ inch and not greater than 1½ inches and within these limits the consistency shall be regulated as necessary to provide a dense bar having the shape shown on the plans.

Concrete used in forming bars by the extrusion process shall consist of a homogeneous mixture of portland cement, aggregate, and water in which an air-entraining agent may be incorporated.

Cast-in-place or extruded raised bars in place, represented by test bars that do not comply with the strength requirement at the end of 72 hours, shall be removed from the work and be replaced with acceptable bars by the Contractor at his expense. No payment will be made for bars so replaced.

Each pre-cast bar shall be properly cured and, at the time of shipment, shall be capable of supporting the minimum load for each type as specified. Pre-cast bars shall be tested as described above.

Pre-cast bars shall be marked with the date of manufacture and the identifying mark of the manufacturer.

The manufacturer of pre-cast raised bars shall establish the necessary quality control and inspection practice to assure compliance with thee specifications.

15-9.4 Extruded Raised Bars Equipment — The machine used for extrusion shall be capable of forming bars of the dimensions shown on the plans. Raised bars shall be extruded onto a previously placed adhesive.

The extrusion machine shall be so operated as to produce a well compacted mass free from large torn areas in the surface. If minor surface pits or small torn areas are formed, the surface of the bar shall be worked with a template type trowel until defects have been eliminated. The ends of the bars while plastic shall be formed to the shape and angle shown on the plans. When bars are placed over an open joint or crack, an open joint shall be formed through the bar at that point.

15-10 Measurement — The quantity of paint of traffic striping and markings shall be measured by one or more of the following methods: lineal footage, the area in square feet, or one lump sum item as provided in the bid proposal.

15-11 Payment — The contract lump sum or unit prices paid for the various types of pavement striping and markers shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in striping and markings, complete in place, as shown on the plans, as specified in these specifications and the Special Provisions, and as directed by the Engineer, and no additional payment shall be made therefor.

Where the bid proposal contains no item for pavement delineation or restoration, full payment shall be considered as included in the various contract items of work and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 16

Traffic Signs

16-1 General – Any permanent traffic control sign as required on the plans or in the specifications shall conform with the provisions of Section 56 of the State of California Standard Specifications and the manual on Uniform Traffic Control Devices for Streets and Highways, and the following provisions.

16-2 Base Metal – The base metal shall be new sheet aluminum of alloys conforming to State Specifications Section 56. The thickness of the aluminum sheet shall be .080 gauge unless otherwise specified. The material shall be subject to inspection prior to installation.

The fabrication of all signs shall be accomplished in a uniform and workmanlike manner. The sign panels are to be cut as shown on the size specification sheets. The dimensional tolerance of the panels shall be plus or minus one-sixteenth (1/16") inch. Metal panels shall be cut to size and shape and shall be free of buckles, wrap, dents, cockles, burrs, sharp edges and any other defects resulting from fabrication.

All possible fabrication, including shearing, cutting and punching of holes, shall be completed prior to the base metal preparation.

16-3 Base Metal Preparation – The aluminum base metal shall be thoroughly cleaned and anodized as per State Standard Specifications.

16-4 Reflective Sheeting – Reflective sheeting shall be Scotchlite brand high intensity grade or equal unless otherwise indicated on the plans.

Vendors shall present proof that the type of reflective sheeting they intend to use in the manufacture of the signs has been used on highway signs located on California highways for period of at least two (2) years and has proven entirely satisfactory.

The surface of the reflective sheeting shall be of a flexible, transparent plastic material and shall be smooth. The backing medium shall be of synthetic sheet resin or other suitable non-cellulosic material. The bonding adhesive shall have no staining effect

and shall be mildew resistant. The sheeting shall permit cutting and color processing at temperatures of 60 to 100°F and a relative humidity of twenty (20) to eight (80) pereent. The sheeting shall be heat resistant and permit force curing of unapplied sheeting at temperatures up to 150°F and up to 200°F on applied sheeting. The sheeting surface shall be solvent resistant to gasoline, naphtha, mineral spirits, turpentine and methanol.

The reflective sheeting shall be applied to the face of the sign by an approved vacuum applicator using a combination of vacuum and heat, as recommended by the reflective sheeting manufacturer. After aging for forty-eight (48) hours, the adhesive shall produce a durable bond equal to or greater than the strength of the reflective sheeting. No air pocket or bubbles shall exist between the sheeting and the base material.

Repairs to damaged reflective sheeting due to poor workmanship or defective material will not be allowed. Defective items shall be replaced at no expense to the City.

Reflective sheeting screening coats shall be oven cured as recommended by the reflective sheeting manufacturer.

15-5 Splices — Vacuum applied sheeting: there shall be no splices in the reflective sheeting on panels with a minor dimension of forty-eight (48) inches or less. On all rectangular signs with a minor dimension or more than forty-eight (48) inches, the splice shall be horizontal.

No finished sign shall have more than one splice and no splice shall fall within two (2) inches of the sign edge. When splices do occur, the adjoining reflective sheeting shall be color matched under both incident and reflected light.

16-6 Edge Sealing — The edges of each completed reflective sheeting sign face and of all cutout letters, numbers, arrows, symbols and borders shall be sealed in a manner and with a sealing solution as recommended by the manufacturer of the reflective sheeting.

16-7 Finish — The finished sign shall be flat within a ratio of 0.04 inches per linear foot when measured across the plane of each panel from the opposite corners, or at any location on the panel. All finished signs shall have smooth flat surfaces without defects or objectionable marks of any kind on either the front or back faces.

All letters and designs shall be clearly cut and sharply defined, meeting State Standard Specifications.

16-8 Legend — The legend shall be of high intensity cutout reflective sheeting applied in the same manner as the reflective sheeting specified herein.

16-9 Manufacturer's Identification — The manufacturer's identification shall be according to the State of California Standard Specifications unless otherwise directed by the Engineer.

16-10 Sign Posts — Except as shown on the plans, all traffic signs shall be mounted on green coated, Unisdent posts, or equal, at a mounting height meeting State Specifications and traffic code standards and as shown on the plans.

Signs to be located in existing sidewalk area may be placed by drilling a hole in the sidewalk one inch (1″) larger than the pole.

16-11 Inspection — All materials and finished signs are subject to inspection by the Public Works Department and shall be subject to final inspection by the Engineer. The finished signs shall be clean and free from all router chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting and aluminum marks. Signs with any defects or damage that would affect their appearance or serviceability will not be acceptable. No repairs shall be made to the face sheet without the approval of the City. All signs not conforming in all respects to the requirements of these specifications will be rejected and replaced at Contractor's cost.

16-12 Removal and Relocation of Existing Signs — Traffic control signs are to be removed or relocated as shown on the plans.

Existing mountings may be used; however, the Contractor shall furnish, at his expense, additional mountings necessary to complete the reinstallation.

Any damage to an existing traffic control sign during removal and reinstallation shall be repaired by the Contractor at his expense.

16-13 City Identification — All traffic signs shall have the date of manufacture and the "City of Albany, CA" stamped on the back side of the sign as follows:

City of Albany } 1/2″
X 5″ X
Date: (Month-Day-Year) } 1/4″
X 2-1/2″ X

16-14 Measurement — The quantity of each type of sign shown in the bid proposal will be measured in units determined from actual count in place.

16-15 Payment — The contract unit prices paid for the types of traffic signs shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in furnishing and placing signs complete in place, including adhesives, backing, bolts, frames, posts, caps, cement and all other costs as shown on the plans as specified in these specifications and the special provisions, and as directed by the Engineer and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 17

Concrete Construction

17-1 Portland Cement Concrete Materials

17-1.1 General Requirements

17-1.1.1 General — Concrete shall consist of portland cement, concrete aggregates, water, and admixture when approved for use, in accordance with these provisions. Concrete will be specified by class or by compressive strength. When specified by class, the concrete will be designated by a symbol consisting of a number, a letter and a number. The first number is the weight of cement in pounds per cubic yard, the letter is the combined aggregate gradation and the last number in the minimum compressive strength of 28 days. The concrete class used shall be in accordance with Subsection 17-1.1.2, unless otherwise specified. Concrete specified by compressive strength shall be designed by the Contractor in accordance with Subsection 17-1.1.3.

Approved admixtures shall be in accordance with Subsection 17-1.2.4. Additional cement is permitted to obtain high early strength in concrete, except that total cement shall not exceed 700 pounds of cement per cubic yard (420 kg/m^3) unless otherwise approved by the Engineer. Type III cement (High Early Strength) may be used in lieu of Type II cement in the same batch quantities as specified or approved for Type II cement.

Where Type V cement is specified, a combination of Type II cement with a minimum of 25 percent by weight Class F fly ash may be substituted provided the other provisions of Subsection 17-1.2.5 are satisfied.

17-1.1.2 Concrete Specified by Class — The concrete class and maximum slump for the various types of construction shall be as designated in the following table. The exact proportions of aggregates and water to be used in the concrete will be determined by the Engineer from test of the material to be used.

Concrete Class Use Table

Construction	Concrete Class	Maximum Slump Inches	Maximum Slump mm
Street Surface Improvements			
Concrete Pavement (not integral with curb)	520-A-2500	3	75
Curb, Integral Curb and Pavement, Gutter, Walk, Alley Aprons	520-C-2500	4	100
Extruded Curb, Curb & Gutter	520-C-2500	2	50
	520-D-2500	2	50
Sewer and Storm Drainage Facilities			
Pipe Collars, Beam Support for Pipe, Pre-Cast Manhole Components, Catch Basins, Sidewalk Culverts	560-C-3250[2]	5	125
Sidehill Surface Drainage Facilities	500-C-2500	3	75
Pipe Bedding and Encasement,[1] Anchors and Thrust Blocks, Wall support for Pipe	420-C-2000[2]	4	100
Tunnel Backfill	480-C-2000	5	125
Trench Backfill Slurry	100-E-100	5	125
Reinforced Structures			
Bridges, Buildings, Retaining Walls	560-C-3250[2]	4	100
Cast-In-Place Piles	560-C-3250[2]	4	100
Channels and Boxes			
Invert	560-B-3250	4	100
Walls and deck	560-C-3250	5	125
Miscellaneous			
Street Light and Traffic Signal Foundations, Survey Monuments	560-C-3250	4	100
Fence and Guardrail Post Foundations	500-C-2500	5	125
Concrete not Otherwise Specified	560-C-3250	5	125
Air Placed Concrete, Method B	600-E-3250	4	100

1. Use limited to bedding concrete over which backfill will be placed not less than 40 hours after placement. For backfill after 24 hours, add 3 pints (1.4L) of calcium chloride. For backfill after 16 hours and removal of sheeting after 18 hours, use 660-C-3750 with 3 pints (1.4L) calcium chloride solution.

2. Use B Aggregate gradation when placing conditions permit.

17-1.1.3 Concrete Specified by Compressive Strength — When so specified, the Contractor shall determine the mix proportions of concrete specified on the Plans by its 28-day compressive strength within the minimum cement, maximum size coarse aggregate, and admixtures limitations designed herein or in the Specifications. The concrete shall contain not less than 560 pounds of cement or cement and fly ash per cubic yard (330 kg/m^3) for concrete strengths of 3250 psi (22 MPa) or greater.

Calcium chloride may be used only with the approval of the Engineer. Admixtures proposed for use shall be evaluated in accordance with Subsection 17-1.2.4.

The proposed mix design shall be evaluated from field tests of a trial batch conforming to the size of load, materials, proportions, slump, mixing and placing equipment and procedures to be used in the actual work. The trial batch procedure herein may be waived when test data of prior performance of the proposed mix deign is presented by the Contractor and approved by the Engineer. The Contractor may utilize any strength data on file with the Agency for this purpose.

When approved by the Engineer, trial batches may be placed in the Work at designated locations where concrete of a lower quality is specified. Concrete so placed will be considered for purpose of payment to be of the type of concrete specified at that location.

Test cylinders, when required by the Engineer, shall be molded form the trial batch containing the maximum water content indicated by the mix design. Fifty percent of the cylinders shall be tested at 7 days in order to establish 7-day average compressive strength information. The remaining cylinders shall be tested at no more than 28 days after molding and the average compressive strength of the five cylinders shall be at least 600 psi (4MPa) greater than the specified strength. The minimum strength of any one cylinder shall not be less than the specified strength.

The placing of concrete specified by compressive strength shall not begin until the mix design has qualified in accordance with the aforesaid test criteria. Should the source of materials or establish procedures change, new trial batches may be required.

17-1.1.4 Test for Portland Cement Concrete — Portland cement concrete shall be sampled and tested, when required by the Engineer, in accordance with the following ASTM and California Tests:

1) Sampling Fresh Concrete	C 172
2) Obtaining Drilled Cores	C 42
3) Molding and Curing Specimens	C 31
4) Compressive Strength	C 39
5) Flexural Strength	C 78
6) Slump	C 143
7) Air Content	C 173 or C 231
8) Unit Weight Yield	C 138
9) Setting of Mortar	C 191 or C 266
10) Mortar Cube Test	Calif. Test 515
11) Drying Shrinkage (with admixture)	Calif. Test 530

A compressive strength test shall consist of the average strength of two cylinders fabricated from a single load of concrete except that, if any cylinder should show evidence of improper handling, molding, or testing, said cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

The frequency of sampling will be determined by the Engineer. The Contractor shall afford the engineer all reasonable access, without charge, for the procurement of samples of fresh concrete at time of placement.

Concrete specified by class under Subsection 17-1.1.2 shall attain the minimum 28-day strength designated.

Concrete specified by compressive strength under Subsection 17-1.1.3 shall attain the following 28-day strength: the average of any three consecutive strength tests shall be equal to or greater than the specified 28-day strength. Not more than 10 percent of the tests shall be less than specified 28-day strength. No test shall be less than 85 percent of the specified 28-day strength.

17-1.2 Materials

17-1.2.1 Portland Cement — All cement to be used or furnished shall be Type II low alkali portland cement conforming to ASTM C 150, or Type IP (MS) portland-pozzolan cement conforming to ASTM C 595, unless otherwise specified. Either cement shall conform to the low alkali requirements of Table IA of ASTM C 150. Type IP (MS) cement shall contain no more than 20 percent pozzolan, which shall be inter-ground with the clinker.

The Contractor shall furnish a Certificate of Compliance signed by the manufacturer identifying the cement and stating that the cement complies with

these requirements. Supporting test data shall be furnished when required by the Engineer.

Whenever suitable facilities approved by the Engineer are available for handling and weighing bulk cement, such facilities shall be used. Otherwise, the cement shall be delivered in original unopened sacks that have been filled by the manufacturer. They shall be plainly marked with the manufacturer's name or brand, cement type and weight.

Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling, and suitably protected against contamination or moisture. Should any cement delivered show evidence of contamination or be otherwise unsuitable, the Engineer may reject it and require that it be removed form the site.

All portland cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

17-1.2.2 Aggregates — Aggregates shall conform to the requirements prescribed in Section 8 and shall be approved by the Engineer prior to use. Aggregate shall be of such character that it will be possible to produce workable concrete within the limits of slump and water content in Subsections 17-1.1.2 and 17-1.3.3.

Methods of handling materials resulting in segregation, degradation or the combining of materials which results in failure to meet specifications shall not be permitted. The free moisture content of sand shall not exceed 8 percent at the time of batching.

Aggregates shall be nonreactive when tested in accordance with ASTM C 289 and evaluated in accordance with Appendix A-1 of ASTM C 33. Aggregates found to be potentially reactive may be used only upon written approval of the Engineer.

17-1.2.3 Water — Water used for concrete shall not contain deleterious substances. Water shall not contain an amount of impurities that will cause a change in the time of setting of portland cement of more than 25 percent nor a reduction in relative mortar strength at 7 and 28 days of more than 10 percent compared to results obtained with distilled water.

In conventionally reinforced concrete work, water shall not contain more than 1,000 ppm (mg/L) of chlorides calculated as Cl, nor more than 1,000 ppm (mg/L) of sulfates calculated as SO_4.

In prestressed concrete work, water shall not contain more than 650 ppm

(mg/L) of chlorides calculated as Cl, nor more than 800 ppm (mg/L) of sulfates calculated as SO_4.

In nonreinforced concrete work, water shall not contain more than 2,000 ppm (mg/L) of chlorides calculated as Cl, nor more than 1,500 ppm (mg/L) of sulfates calculated as SO_4.

17-1.2.4 Admixtures

a) General Requirements. Admixtures shall be used as specified or approved by the Engineer. The admixture shall be measured into each batch or load in liquid form by a mechanical dispensing device and method approved by the Engineer. The quantity dispensed shall not vary more than 5 percent from the quantity specified. If moire than one admixture is used, each shall be dispensed by separate equipment in liquid form. Calcium chloride shall not be used in prestressed concrete. Admixtures containing chloride ions in excess of 1 percent by weight of admixtures shall not be used in prestressed concrete. Calcium chloride may be used in reinforced concrete only upon approval of the Engineer. Admixtures to be used in grouting ducts in prestressed units shall not contain chloride ions in excess of 0.25 percent by weight of admixture.

   Samples of the admixture proposed for use shall be submitted by the Contractor to the Engineer sufficiently in advance of their intended use to determine compliance with specified requirements. Approval to use an admixture shall not relieve the Contractor of the designated concrete strength requirements.

b) Air-entraining Admixtures. Air-entraining admixtures shall conform to ASTM C 260. Tests by an approved laboratory shall provide sufficient data to determine the time-strength characteristics of the concrete mix with the admixture.

   When the air-entraining agent consists of a vinsol resin-water solutio that has been neutralized with caustic soda (sodium hydroxide), the Contractor may use such air-entraining admixtures without presentation of test data. In lieu of test data, the Contractor shall furnish a certificate signed by the manufacturer attesting to this fact and stating the ratio of sodium hydroxide to vinsol resin, the percentage of solids based on the residue dried at 105°C, and that no other additive or chemical agent is present in this solution.

   The concentration of dilution of the admixture shall be such that it is dispensed into each batch of concrete at a rate of not less than ½ fluid ounce per 100 lbs. (0.33mL/kg) of cement.

Adjustments shall be made in the weights of the aggregates sued per batch to compensate for changes in yield due to air-entrainment.

If the Contractor elects to use an air-entraining admixture, the Engineer may required that additional cement be added to the concrete mixture when the air content exceeds 4 percent. In no case shall air content exceed 6 percent.

The air content shall not deviate form the percentage specified or permitted by more than 2½ percentage points.

c) Water Reducing, Set Retarding and Accelerating Admixtures — Water reducing, set retarding, and accelerating admixtures other than calcium chloride shall conform to ASTM C 494, and shall not be used in greater dosages than those recommended by the manufacturer, or permitted by the Engineer. The permitted dosage of the admixture shall not exceed that which will result in an increase in the drying shrinkage of the concrete in excess of 20 percent when used in precast and pre-stressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount proposed shall, at the age of 48 hours and longer, be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the Engineer.

d) Calcium Chloride — When calcium chloride is permitted or required to accelerate setting time and to reduce the time necessary for the concrete to reach it specified strength, it may be processed from either a brine solution or flake. If prepared from flake it shall conform to ASTM D 98. The calcium chloride solution shall contain not less than 32 percent of anhydrous calcium chloride and the hydrogen ion concentration (pH) shall be not more than 10.4 nor less than 6.0. Calcium chloride solution shall be used at the rate of not more than 3 pints per 100 pounds (30mL/kg) of cement.

17-1.2.5 Fly Ash

a) General — Class C or Class F fly ash may be used as a substitute for part of the required Type II portland cement in a concrete mix when approved by the Engineer. The amount of Type II portland cement replaced shall be based upon trial batches in accordance with Subsection 17-1.1.3. at least an equal weight of fly ash is required as a substitute for the replaced portland cement. The maximum amount of portland cement replaced shall not exceed 30 percent by weight. Fly ash shall not be used with Type IP (MS) or Type III portland cement.

The Contractor shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ah complies with ASTM C 618 and these Specifications. Supporting test data shall be furnished when requested by the Engineer. All testing and sampling procedures shall conform with ASTM C 311.

Separate silo storage facilities shall be provided. Suitable facilities shall be provided to discharge the fly ash into the cement hopper in accordance with Subsection 17-1.3.1. Fly ash shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling and be suitably protected against contamination or moisture. Should any fly ash show evidence of contamination or moisture or be otherwise unsuitable, the Engineer may reject it and require that it be removed from the site.

All fly ash used in concrete for any individual project shall be from the same source and of the same class, unless otherwise approved by the Engineer.

b) Class F Fly Ash — Class F fly ash shall conform to ASTM C 618 and the following specifications:

Loss on ignition	4% maximum
SO_3 content	3% maximum
Moisture content	1% maximum
R-Factor* (only required where Type V cement is specified)	0.75 maximum

$$*R = \frac{(\% \text{ Ca0-5})}{\% \text{ Fe}_2\text{0}_3} \quad \text{from fly ash oxide analysis}$$

c) Class C Fly Ash — Class C fly ash shall conform to ASTM C 618 and the following specifications:

Loss of ignition	2% maximum
$S0_3$ content	4% maximum
Moisture content	1% maximum

17-1.3 Proportioning

17-1.3.1 General — Aggregates and cement shall be proportioned by weight except that when the amount of concrete required for any one contract is 10 cubic yards ($8m^3$) or less, the materials may be measured by volume. Materials that are proportioned by volume shall be measured in containers of known capacity.

Weight hoppers shall be charged from bins located directly over them or from conveyor belts. When conveyor belts are used, there shall be a separate belt for each size aggregate. There shall be a moisture meter installed, accurate within 1 percent of the actual moisture content, to indicate the moisture in the sand.

Bulk cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge. The cement hopper shall be attached to a separate scale for individual weighing.

The amount of water to be added to the mixture shall be measured into the mixing drum through a valve with a positive cutoff. When water is measured by weight, it shall be weighed on a separate scale.

Whenever a portable batch plant is set up at a new location, the scale assemblies shall be inspected and certified regardless of the date the scales were last tested.

Scales utilized in proportioning shall be either springless dial, multiple beam type, or solid-state digital strain gage transducer type. Scale graduations shall be no greater than the following:

Aggregate Scales	25 lbs.	(10 kg)
Cement Scales	5 lbs.	(2 kg)
Water Scales	5 lbs.	(2 kg)

If a multiple beam type scale is used, the scale shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or under weight. The indicator shall be so designed that it will operate during the addition of the last 400 lbs. (180kg) of any weighing. The over travel of the indicator hand shall be at least one-third of the loading travel. Indicators shall be enclosed against moisture and dust.

Weighing equipment shall be insulated against vibration and movement of other operating equipment in the plant. When the entire plant is running, the scale reading at cutoff shall not vary from the weight designated by more than 1 percent for cement, 1 percent for water, 1½ percent for any size of aggregate, nor 1 percent for the total aggregate in any batch.

17-1.3.2 Combined Aggregate Gradings — The combined aggregates shall conform to the gradings specified in the following table:

Combined Gradings for Portland Cement Concrete Percentage Passing Sieves					
Sieve Size	Grading A	Grading B	Grading C	Grading D	Grading E
2" (50mm)	100	100			
1½" (38mm)	95-100	95-100	100		
1" (25mm)	64-80	80-96	95-100		
¾" (19mm)	55-71	64-80	77-93	100	100
⅜" (10mm)	37-53	40-52	50-70	92-100	90-100
No. 4	32-42	35-45	39-51	42-60	60-80
No. 8	25-35	28-38	31-41	33-47	50-70
No. 16	18-28	21-31	22-32	22-38	33-53
No. 30	10-18	10-20	12-22	17-25	19-35
No. 50	3-9	3-9	3-9	6-12	5-15
No. 100	0-3	0-3	0-3	1-5	2-6
No. 200	0-2	0-2	0-2	0-2	0-2

17-1.3.3 Concrete Consistency — The amount of water added at the mixer shall be regulated to take into account the free water in the aggregates. Free water is defined as the total water minus the water absorbed by the aggregate in a saturated surface-dry condition.

The amount of water used in the mixture shall not exceed the amount necessary to permit practical placement and consolidation of the concrete. Total free water in the mixture shall not exceed an amount producing the maximum slump specified in Subsection 17-1.1.2, and shall not exceed amounts shown in the following table:

Maximum Free Water					
Aggregate Grading	POUNDS PER CUBIC YARD (Kg/m³) of concrete Slump in inches (mm)				
	1(25)	2(50)	3(75)	4(100)	5(125)
A	270(160)	280(166)	290(172)	300(178)	310(184)
B	275(163)	285(169)	295(175)	305(181)	315(187)
C	290(172)	300(178)	310(184)	320(190)	330(196)
D	320(190)	335(199)	350(208)	365(216)	375(222)
E	335(199)	350(208)	365(216)	380(225)	395(234)

When adverse or difficult conditions affect the placement of concrete, the

Engineer may authorize a greater slump to be used, provided the cement is increased. Water shall be added at a ratio not to exceed 32 percent of added cement per cubic yard of concrete, and such additional water and cement shall be at the Contractor's expense.

17-1.4 Mixing

17-1.4.1 General — Machine mixing will be required in all cases other than those in which it would obviously prove to be impractical, in which event hand mixing will be permitted. Mixing shall be commenced as soon as possible after the cement is placed in contact with the aggregates, but in no event shall the intervening period exceed 30 minutes.

All concrete mixers shall be of such design and construction and so operated as to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed. Mixers shall be maintained in proper and serviceable working condition and any part or portion thereof that is out of order, or becomes worn to such extent as to detrimentally affect the quality of mixing, shall be promptly repaired or replaced. Mixers shall not have any aluminum parts which will have direct contract with concrete.

17-1.4.2 Paving and Stationary Mixers — Paving and stationary mixers shall be equipped with an accurate automatic timing device so designed and constructed as to lock the discharge lever before aggregate and cement enter the drum, and release such lever only after the specified mixing time has elapsed. The regulation of the setting of said device shall be under the supervision of the Engineer. Water control equipment shall also be provided with each concrete mixer.

The proper proportions of aggregate, cement, and water for each batch of concrete shall be placed in the mixer, and shall be mixed for a period of not less than 1 minute after all such materials are in the drum. The minimum mixing time per batch for reinforced concrete, however, shall not be less than 1½ minutes.

The rotating speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

The total volume of materials mixed in any one batch shall exceed neither the water level capacity of the mixer nor the manufacturer's guaranteed capacity of the mixer.

17-1.4.3 Transit Mixers — The type, capacity, and manner of operation of the mixing and transporting equipment for ready-mix concrete shall conform to the current "*Standards for Operation of Truck Mixers and Agitators of the*

National Ready-Mixed Concrete Association" and the "*Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers Bureau.*" Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate or plates, installed by the manufacturer on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced.

The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than 70 nor more than 100 revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as agitating speed. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum.

When concrete is being placed for pavement or concrete structures, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For all other work, the mixer shall be empty or may carry 10 gallons of water in the drum. Adequate control of ready-mixed concrete will normally require that additional water be added and mixed into the batch at the point of discharge. Water so added shall be mixed into the load for a minimum of 30 revolutions at the rated mixing speed. Water shall not be added to the load during transit.

The total elapsed time between the addition of water at the batch plant and discharging the completed mix shall not exceed 90 minutes. Under conditions contributing to quick setting, the total elapsed time permitted may be reduced by the Engineer.

The Engineer shall be provided with a legible certified weighmaster certificate. When mix proportions have been designated for a project and are identified by number, the Engineer may accept a legible certified weighmaster certificate which shall contain the following information:

1) Name of Vendor
2) Name of Contractor
3) Project Location
4) Number of cubic yards in the load
5) Mix designation number
6) Amount of water added at the plant (including water in aggregates)
7) Maximum allowable water
8) Time and date of batching

When the mix proportions are not designated by number, or when required by the Engineer, the certificate shall contain the following additional information:

1) Actual weights of cement and of each size of aggregate
2) Brand and type of cement
3) Brand, type, and amount of admixture

Space shall be provided on the certificate so that amount of water added on the job may be indicated.

17-1.4.4 Hand Mixing — Hand mixing will be permitted when the amount of concrete required for any one job is one cubic yard ($0.8m^c$) or less. Hand mixed concrete shall be mixed on a watertight platform or in a mortar box in batches not to exceed ⅓ cubic yards ($0.3m^3$) each. The aggregates shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained. Methods of hand mixing which allow the loss of mixing water will not be permitted.

17-1.5 Transporting Batched Materials and Mixed Concrete — The compartments of trucks or other equipment used for the purpose of transporting proportioned dry aggregate and cement, or mixed concrete, shall be suitably constructed to adequately protect and prevent loss or leakage of the contents during charging, transit or discharging.

17-2 Steel Reinforcement for Concrete

17-2.1 General — Bar, wire and wire mesh reinforcement shall conform accurately to the dimensions and details indicated on the plans or otherwise prescribed. Before being placed in any concrete work, it shall be cleaned thoroughly of all rust, mill scale, mortar, oil, dirt, or coating of any character which would be likely to destroy, reduce, or impair its proper bonding with the concrete.

17-2.2 Reinforcing Steel — unless otherwise specified, reinforcing steel shall be either Grade 40 or grade 60 billet steel conforming to ASTM A 615.

Steel bending processes shall conform to the requirements of the *Manual of Standard Practice of the Concrete Reinforcing Steel Institute.*

Bending or straightening shall be accomplished so that the steel will not be damaged. Kinked bars shall not be used.

17-2.3 Wire Reinforcement — Wire reinforcement shall in all respects fulfill requirement prescribed in ASTM A 82.

17-2.4 Wire Mesh Reinforcement — Mesh reinforcement shall conform to ASTM A 185. The gage of the wire and the dimensions of the mesh shall be as shown on the Plans or in the Specifications. The wire mesh reinforcement shall be so constructed as to retain its original shape and form during the necessary handling. The effective cross-sectional area of the wire shall be equal to that specified or indicated on the Plans.

17-2.5 Samples for Testing

17-2.5.1 General — No reinforcing steel will be accepted until it has been approved by the Engineer. When required by the Engineer, samples shall be taken from bars selected by the Engineer and cut in the Engineer's presence. The Contractor shall furnish a certified mill test report for each heat or size of steel when required by the Engineer.

17-2.5.2 Reinforcing Steel Bars — When required by the Engineer, two sample bars, each 3 feet (0.9m) long and cut from different bars, shall be taken from each bar size delivered to the job site on a cumulative tonnage basis in accordance with the following schedule:

Bar Sizes (Number)	Cumulative Weight of Steel per Bar Size Delivered to Job Site	
	Tons	kg
2	1/2	(450)
3	1	(900)
4	2	(1800)
5	3	(2700)
6	4	(3600)
7	5	(4500)
8	7	(6300)
9	9	(8100)
10	11	(10000)
11	13	(12000)
14	20	(18000)
18	35	(32000)

Note: At least two sample bars shall be taken from each bar size.

17-2.5.3 Wire Reinforcement — When required by the Engineer, one sample consisting of two pieces, each 3 feet (0.9m) long, shall be taken from each 2-ton (1800kg) lot or less of each size of wire delivered to the job site.

17-2.5.4 Wire Mesh Reinforcement — When required by the Engineer, two samples of a size suitable for testing shall be taken from each 3,000 square feet (280m^2) of fabric or fraction thereof.

17-3 Expansion Joint Filler and Joint Sealants

17-3.1 General — This section specifies joint fillers and sealants to be used for treating joints in portland cement concrete.

All joints which are to be sealed shall be formed with filler. The filler shall be placed in correct position before concrete is placed against it. Holes or joints in the filler shall be filled with mastic to prevent the passage of mortar or concrete from one side of the joint to the other.

17-3.2 Premolded Joint Filler — Premolded joint filler material shall consist of premolded stirps of a durable resilient material.

Unless otherwise specified, premolded joint filler shall be one of the following types:

Preformed Expansion Joint Filler (Bituminous Type)
ASTM D 994

Nonextruding and Resilient Filler (Bituminous Type)
ASTM D 1751

Nonextruding and Resilient Filler (Non-bituminous Type)
ASTM D 1752

17-4 Concrete Curing Compound

17-4.1 General — Curing compound shall consist of a liquid which, when applied to fresh concrete by means of a spray gun, will form an impervious membrane over the exposed surfaces of the concrete.

The membrane may be either asphaltic or paraffin derivatives to which other waterproofing materials may have been added. Concrete curing compounds shall be designated by type as follows:

Type 1—Clear or translucent with red fugitive dye.
Type 2—White pigmented.
Type 3—Light gray pigmented.
Type 4—Black pigmented.

All compounds shall be furnished by the Contractor and shall be delivered ready-mixed in sealed original containers bearing the manufacturer's name and product identification. At the time of use, pigmented curing compounds shall be thoroughly mixed, with the pigment uniformly dispersed throughout the mixture.

The rate of application shall be such that the compound forms a continuous, unbroken film when applied to the work. The Engineer will determine the permissible rate of coverage of a curing compound.

Unless otherwise specified, Type 1 curing compound shall be used.

17-4.2 Test Requirements — Curing compounds shall be tested in accordance with ASTM C 309.

17-5 Cement Mortar

17-5.1 General — Cement mortar shall consist of a mixture of portland cement, sand and water. Cement and sand shall first be combined in the proper proportions, and then thoroughly mixed with the required amount of water.

Cement mortar shall be designated by class and proportioned by loose volume as follows:

Mortar Designation Class	Proportions	
	Parts Cement	Parts Sand
A	1	1
B	1	1½
C	1	2
D	1	2½
E	1	3
F	1	3½

The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixture sufficiently workable for the purpose intended.

Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Retempering of mortar will not be permitted.

17-5.2 Cement — Cement shall conform to the requirements of Subsection 17-1.2.1.

17-5.3 Sand — Sand shall conform to the requirements of Subsection 17-1.5.3. In proportioning the sand, it shall be measured loose (without shaking or compacting) in measuring boxes or other suitable containers of known capacity.

17-5.4 Water — Water shall conform to the requirements of Subsection 17-1.2.3.

17-5.5 Admixtures — No admixture shall be used in mortar unless otherwise specified or approved by the Engineer.

17-5.6 Quick Setting Grout — Quick setting grout shall be a high strength, non-staining grout approved by the Engineer prior to use. It shall reach an initial set within 90 minutes at 70°F (21°C) and shall reach minimum compressive strength of 2,500 psi (17mPa) within 24 hours. Shrinkage shall be less than 0.1 percent when tested, using the test procedures of ASTM C 596. The grout shall be mixed, handled, and placed in accordance with the manufacturer's instructions.

17-6 Concrete Structures

17-6.1 General — Concrete bridges, culverts, catch basins, retaining walls, abutments, piers, footings, foundations and similar structures shall be constructed in conformity with the Plans and Specifications. Concrete for use in work

constructed under this section shall conform to the requirements of Subsection 17-1.

Safe and suitable ladders shall be provided to permit access to all portions of the work.

The compressive strength of the concrete referred to in this section will be based on the results of concrete test cylinders made and tested by the Engineer. The cylinders shall be cured under conditions similar to those affecting the structure.

When plastic-lined concrete structures are required by the Plans, the plastic liner materials shall comply with Subsection 17-2 and the installation of the liner shall be in accordance with Subsection 311-1 of the Standard Specifications for Public Works Construction.

17-6.2 Subgrade for Concrete Structures — Earth subgrade upon which concrete is placed shall be firm and free from water. Groundwater shall be kept below subgrade until the concrete has set. When the subgrade is in dry earth, it shall be thoroughly dampened with water to ensure that no moisture will be absorbed from the fresh concrete.

When the design details for the project provide for the construction of filter or drain material consisting of gravel (or combination of gravel and sand), which material will be subgrade for concrete, the placing of steel reinforcement and placement of concrete shall follow the installation of the filter or drain material as closely as practical. The filter or drain material shall be kept dewatered to the extent necessary to prevent any portion of concrete materials being deposited in water. No payment will be made for dewatering other that a may be included in the prices bid for various items of work or when an item for dewatering is provided.

When the concrete is to be deposited on rock, the rock shall be fully uncovered, cleaned, and its surface shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled off or cut to approximately horizontal and vertical steps. Seams in the rock shall be grouted under pressure or otherwise treated as the Engineer may direct. Grouting seams in rock or otherwise treating them will be paid for as provided in the Specifications.

17-6.3 Forms — forms shall be of suitable material and of a type, size, shape, quality, and strength to ensure construction as designed. The forms shall be true to line and grade, mortar-tight, and sufficiently rigid to resist deflection during placing of the concrete. The responsibility for their adequacy shall rest with the Contractor. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and

holes that would deface the finished surfaces. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent which will leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete.

Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber, or material which will provide a surface at least equal to surfaced lumber or plywood. Any lumber or material which becomes badly checked or warped, prior to placing concrete, shall not be used.

Forms for all exposed surfaces of bridges, viaducts, over-crossings and similar structures shall be constructed of plywood or an approved equal. Plywood for forms shall be of the grade "Exterior B-B (concrete form)," conforming to the latest Product Standard for Soft Plywood, Construction and Industrial, of the national Bureau of Standards. Plywood shall be furnished and placed in 48-inch (1.2m) widths and in uniform lengths of not less than 96 inches (2.4m), except where the dimension of the member formed is less than the specified panel dimension. Plywood shall be placed with the grain of the outer plies in the direction of the span. Where plywood is attached directly to the studs or joists, the panels shall be not less than ⅝-inch (16mm) thick, and the studs or joists shall be spaced not more than 12-inches (300mm), center to center. Plywood less than ⅝-inch (16mm) thick, otherwise conforming to the requirements specified herein, may be used with a continuous backing of ¾-inch (19mm) sheeting. All form panels shall be placed in a neat, symmetrical pattern with the horizontal joints level and continuous. All joints shall be filled with an approved quick-setting compound and finished flush with the interior of the form.

Wooden forms for copings and curbs shall have a thickness of not less than 1⅝ inches (41mm) and a width of not less than the full depth of coping or curb.

Unless otherwise shown on the Plans, all sharp edges shall be chamfered with ¾-inch by ¾-inch (19mm by 19mm) triangular fillets. Forms for curved surfaces shall be so constructed and placed that the finished surface will not deviated from the arc of the curve.

Forms shall be so constructed that portions, where finishing is required, may be removed without disturbing portions of forms to remain in place.

Joists and stringers supporting slabs and overhangs shall be considered as falsework and designed in accordance with Subsection 303-1.6 of the Standard Specification for Public Works Construction.

Forms for girders and slabs shall be cambered as may be required by the Engineer.

Forms shall, as far as practicable, be so constructed that the form marks will conform to the general lines of the structure.

Form clamps or bolts, approved by the engineer, shall be used to fasten forms. The use of twisted-wire loop ties to hold forms in position will not be permitted, nor shall wooden spreaders be used unless authorized by the Engineer. Clamps or bolts shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back 1 inch (25mm) inside 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 or bolts shall extend through and fasten such wales.

Forms for cast-in-place concrete drain conduit or sewer structures will not be required for concrete to be placed directly against the sides of the excavation or sheeting, provided the following conditions are met:

1) If concrete is placed directly against the faces of the excavation, the faces must be firm, compact, able to stand without sloughing, and must be outside the concrete lines shown on the Plans at all points. The entire faces of excavation, against which concrete is to be placed without the use of outside forms, shall be gunited to sufficient thickness to prevent raveling of the exposed earth faces during the placing of reinforcing steel, forms and concrete.

2) If concrete is placed against sheeting, such sheeting shall be closely fitted and all points shall be outside the concrete lines shown on the Plans. Those surfaces against which the concrete is to be placed shall be faced with building paper. except as otherwise specified herein, all sheeting shall be removed, but not until at least 7 days after placing concrete, or until the concrete has attained strength in compression of 2,000 pounds per square inch (14 MPa).

   Care shall be used in removing sheeting so as to avoid damaging the concrete. Voids left by the removal of sheeting, piles or similar sheeting components shall be backfilled with material having a sand equivalent of not less than 30 and consolidated by jetting as approved by the Engineer. When field conditions or the type of sheeting or methods of construction used by the Contractor are such as to make the removal of sheeting impracticable, that portion of the sheeting against which concrete has been placed may be left in place.

3) The reinforcing steel shall be set accurately and firmly in place.

4) The Contractor shall assume all risks of damage to the Work or to existing

improvements that may be attributable to this method of construction.

5) Should this method of construction prove unsatisfactory, the Contractor shall discontinue this method and construct the conduit by using outside forms.

6) No direct payment will be made for building paper, sheeting, gunite, for concrete placed outside of concrete lines shown on the Plans, or for cement used in such gunite and concrete. The cost thereof shall be included in the prices bid for the various items of work.

17-6.4 Removal of Forms

17-6.4.1 General — The periods of time for form removal set forth herein are permissive only and subject to the Contractor assuming all risks that may be involved. The time periods are minimum with no allowance therein for external loads. At times of low temperature, or other adverse conditions, the Engineer may require the forms to be kept in place for longer periods of time.

The time periods are predicated on the use of concrete to which no admixtures have been added for the purpose of obtaining a high early strength, and upon the use of the same type of cement throughout the structure. The Engineer may permit the use of admixtures, additional cement, or different types of cement in accordance with Subsection 17-1.2.4. If such permission is granted, the minimum time periods for stripping forms will be established by the Engineer in accordance with the materials, methods to be used, and the stresses to which the structure may be subjected.

When the Contractor elects to use Type IP (MS) cement in accordance with Subsection 17-1.2.1, minimum form removal times may be longer than indicated in the following subsections.

Forms and falsework supporting the bottom slab of the superstructure of box girder structures shall remain in place 14 days after placing the deck of the superstructure. Forms for the webs of box girders shall be removed before the deck slab is placed. Forms for the upper deck slab which are to remain in place shall be supported by bolts through the girder webs or some equally satisfactory method that will prevent the transfer of any load to the lower deck slab. Forms supporting the concrete deck slab of box girders may be left in place. all interior forms in box girders except those permitted to remain in place, shall be removed completely and the inside of the box girder cleaned of all loose material.

Side forms for beams, girders, columns, railings, or other members in which the forms do not resist dead load bending, may be removed within a period of 2 to 5 days, as authorized by the Engineer, provided that satisfactory

arrangements are made to cure and protect the concrete thus exposed.

Side forms for arch rings, columns, and piers shall be removed before the members of the structure which they support are cast so that the quality of the previously placed concrete may be inspected. Such forms shall be so constructed that they may be removed without disturbing other forms which support direct load or resist bending stress.

17-6.4.2 Miscellaneous Structures — The periods of time set forth herein are based on the use of Type II cement.

Forms for concrete members (except bridges) subject to bending stresses, where the member relies upon forms for vertical support, may be removed 7 days after concrete is placed.

Curb forms shall not be removed until the concrete has set sufficiently to hold its shape but shall be removed tin time to permit proper finishing.

Stairway forms shall be removed and the finish of the steps completed on the day the concrete is placed. Metal stairway treads, if required by the drawings, shall be installed immediately after the steps have been poured.

17-6.4.3 Standard Structures

a) General — Except as otherwise stipulated, the periods of time set forth herein for removal of forms are based on the use of Types II, III, IV, or V portland cement.

b) Standard Catch Basins

   1) Outside forms and inside wall forms which do not support the top slab forms—16 hours.

   2) Top slab forms—48 hours if Type II or V cement is used; 24 hours if Type III cement is used.

c) Standard Transition Structures

   1) Outside forms and inside wall forms which do not support the top slab form—16 hours.

   2) Top slab forms—as specified for box section slab forms.

17-6.4.4 Channels and Conduits

a) General — Except as otherwise specified, the periods of time se forth herein are based on the use of Types II, III, IV or V portland cement.

b) Forms Removal — Forms for open channels and forms and shoring for box sections and arch sections of sewers and storm drains may be removed as follows:

1) Forms for open channel walls—16 hours.

2) Outside forms of box sections and inside wall forms of box sections which do not support the slab forms—16 hours.

3) Arch sections in open cut—12 hours.

4) Slab forms for box sections—

(a) Type II cement—48 hours or 6 hours per foot (20 hours/m) of span between supports, whichever is greater.

(b) Type III cement—24 hours or 3 hours per foot (10 hours/m) of span between supports, whichever is greater.

(c) Type V cement—56 hours or 7 hours per foot (23 hours/m) of span between supports, whichever is greater.

17-6.5 Falsework

17-6.5.1 General — The Contractor shall submit detailed plans of the falsework proposed to be used. Such plans shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, and typical soil conditions.

Falsework may be bolted or spiked at the option of the Contractor, but the use of bolts and spikes shall not be combined in the same connection. The allowable spacings and connection values of bolts and spikes shall be in accordance with the National Design Specifications for Stress-Grade Lumber and its Fastenings as recommended by National Lumber Manufacturers Association, except that an additional allowance of 25 percent for temporary use shall be added to the connection values for bolts and spikes.

Ends of columns bearing on wedges shall be tied in both directions by girts.

17-6.6 Placing Reinforcement

17-6.6.1 General — Except for minor structures, driveways and sidewalk construction, the Contractor shall submit a reinforcing steel placing plan for approval.

Reinforcing bars shall be placed in accordance with the size and spacing shown on the plans. Reinforcing bars shall be firmly and securely held in position in accordance with the "*Manual of Standard Practice*" of the Concrete Reinforcing Steel Institute, using concrete or metal chairs, spacers, metal hangers, supporting wires and other approved devices of sufficient strength to resist crushing under full load. Metal chairs which extend to the surface of the concrete (except where shown on the Plans) and wooden supports, shall not be used. Tack welding on reinforcing bars will not be permitted.

Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted. Before placing in the form, all reinforcing steel shall be cleaned thoroughly of mortar, oil, dirt, loose mill scale, loose or thick rust, and coatings of any character that would destroy or reduce the bond. No concrete shall be deposited until the placing of the reinforcing seal has been inspected and approved.

Bar spacing is center to center of bars. Bar cover is clear distance between surface of bar and face of concrete and shall be 2 inches (50mm) unless otherwise noted on the Plans. Reinforcement shall terminate 2 inches (50mm) from concrete surfaces and expansion joints, unless otherwise noted on the Plans.

Reinforcement used in post-tensioned concrete shall be adjusted or relocated during the installation of prestressing products or tendons, as required to provide planned clearances to the prestressing tendons, anchorages, jacks and equipment, as approved by the Engineer.

17-6.6.2 Splicing — Splices of bars shall be made only where shown on the Plans or as approved by the Engineer. Where bars are spliced, they shall be lapped at least 30 diameters, unless otherwise shown on the Plans.

Splicing shall be accomplished by placing the bars in contact with each other and wiring them together.

Welding of reinforcing steel will not be permitted unless specifically authorized by the Engineer.

17-6.6.3 Bending Reinforcement — Bends and hooks in bars shall be made in the manner prescribed in the "*Manual of Standard Practice*" of the Concrete

Reinforcing Steel Institute.

Bars shall not be bent or straightened in a manner which will injure the material. Bars with kinds or unspecified bends shall not be used.

17-6.6.4 Welded Wire Fabric — Welded wire fabric shall be spliced not less than two meshes. It shall be lifted carefully into its specified position after the concrete is placed but still plastic.

17-6.7 Placing Concrete

17-6.7.1 General — Concrete shall be conveyed, deposited, and consolidated by any method which will preclude the segregation or loss of ingredients. Equipment used in conveying and depositing concrete shall not have any aluminum component in direct contact with the concrete.

All surfaces against which concrete is to be placed shall be thoroughly moistened with water immediately before placing concrete. All ponded and excess water shall be removed to leave surfaces moist but not flooded.

Chute used in conveying concrete shall be sloped to permit concrete of the consistency required to flow without segregation. Where necessary to prevent segregation, chutes shall be provided with baffle boards or a reversed section at the outlet.

Where a sequence for placing concrete is shown on the Plans, no deviation will be permitted unless approved in writing by the Engineer.

17-6.7.2 Grouting — Where concrete is to be deposited against hardened concrete at horizontal construction joints, placing operations shall begin by conveying a grout mixture through the placing system and equipment and depositing the mixture on the joint. The grout mixture shall consist of a modification of the concrete specified to reduce the quantity of coarse aggregate in the mix larger than pea-gravel size to one-half the quantity specified.

17-6.7.3 Depositing — To avoid segregation, concrete shall be deposited as near to its final position as is practicable. The use of vibrators for extensive shifting of the mass of concrete will not be permitted. Concrete that has partially hardened, has been retempered, or is contaminated by foreign materials shall not be deposited in the structure.

Concrete shall be placed in horizontal layers insofar as practical. Placing shall start at the low point and proceed upgrade unless otherwise permitted by the Engineer. Concrete shall be placed in a continuous operation between

construction joints and shall be terminated with square ends and level tops unless otherwise shown on the Plans.

Concrete shall not be permitted to fall more than 6 feet (1.8m) without the use of pipes or tremies. Pipes and tremies shall be at least 6 inches (150mm) in diameter, or the equivalent cross-sectional area for rectangular sections. Concrete shall not be placed in horizontal members or sections until the concrete in the supporting vertical members of sections has been consolidated and a 2-hour period has elapsed to permit shrinkage to occur.

17-6.7.4 Consolidating — Concrete shall be thoroughly consolidated in a manner that will encase the reinforcement and inserts, fill the forms, and produce a surface of uniform texture free of rock pockets and excessive voids.

Structural concrete, except slope paving such as spillway aprons and channel lining, and concrete placed under water, shall be consolidated by means of high frequency internal vibrators of a type, size and number approved by the Engineer. The location, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without separation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface. Internal vibrators shall not be held against the forms or reinforcing steel.

The number of vibrators employed shall be sufficient to consolidate the concrete within 15 minutes after it has been deposited in the forms. At least two vibrators in good operating condition shall be available at the site of the structure in which more than 25 cubic yards ($19m^3$) of concrete is to be placed.

Approved external vibrators for consolidating concrete will be permitted when the concrete is not accessible to internal vibration. Forms and falsework shall be designed and constructed to resist displacement or damage from external vibration.

17-6.7.5 Walkways — Walkways and platforms shall be provided for personnel and equipment at a level convenient for the concrete placement and to permit the performance of all operations necessary for the completion of such work including finishing.

Where bridge decks are to be constructed to final roadway grade, walkways shall be provided outside the deck area along each side and for the full length of the structure. These walkways shall be of sufficient width and so constructed as to provide for the support of the bridges from which the longitudinal floats specified are to be operated.

17-6.7.6 Joints — The work shall be so prosecuted that construction joints will occur at designated places shown on the Plans unless otherwise authorized by the Engineer. The Contractor shall construct, in one continuous concrete placing operation, all work comprised between such joints. Joints shall be kept moist until adjacent concrete is placed.

All construction joints having a keyed, stepped, or roughened surface shall be cleaned by sandblasting prior to placement of the adjacent concrete, unless otherwise directed by the Engineer. Any quality of sand may be used which will accomplish the desired results.

The sandblasting operations shall be continued until all unsatisfactory concrete, laitance, coatings, stains, debris, and other foreign materials are removed. The surface of the concrete shall be washed thoroughly to remove all loose material. The method used in disposing of wastewater employed in washing the concrete surfaces shall be such that the wastewater will not stain, discolor, or affect exposed surfaces of the structures, and will be subject to the approval of the Engineer.

Expansion and contraction joints in concrete structures shall be formed where shown on the plans. No reinforcement shall be extended through the joints, except where specifically noted or detailed on the Plans.

No direct payment will be made for furnishing and placing asphalt paint, premolded asphalt filler, or other types of joint separators. The cost therefor shall be included in the price bid for the item of work of which they are a part.

17-6.7.7 Application of Joint Sealants

a) General — All joint sealants shall conform to the general requirements for application and special requirements for each specific material shown below. Prior to sealing joints containing waterstops, the expansion joint filler, hardboard, concrete spillage, and all foreign material shall be removed from the deck joint down to a depth of the waterstops. All such material shall be removed from the entire depth of joins in curbs, sidewalks, railings, and the overhanging portion of deck slabs. Immediately before applying the joint sealant, the joint shall be thoroughly cleaned by abrasive blasting or other approved means to remove all mortar, laitance, scale, dirt, dust, oil, curing compounds and other foreign material. The joints shall be blown out with high pressure compressed air to remove all residue.

   If sealant is shown in the sidewalk, saw-cutting of grooves at concrete railing locations shall be completed prior to constructing the railings. Joint

seal material shall be protected during the construction of the railing.

At the time of applying the joint sealant, the joint shall be surface dry, and acceptable to the Engineer. No sealant shall be placed during unsuitable weather or when the atmospheric temperature is below 50°F (10°C), or when weather conditions indicate that the temperature may fall below 32°F (0°C) within 24 hours.

The joint shall be filled from the bottom to the top without formation of voids. The top of the finished joint seal shall be between ¼ inch and ⅜ inch (6 and 10mm) below the finished surface.

All adjoining surfaces shall be carefully protected during the joint sealing operations, and any stains, marks or damage thereto, s a result of the Contractor's operations, shall be corrected in a manner satisfactory to the Engineer.

17-6.7.8 Placing Concrete Under Adverse Weather Conditions — Concrete for structures shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below 35°F(2°C), unless adequate means are employed to heat the aggregates nad water, and satisfactory provisions have been made for protecting hte work.

Concrete slabs shall not be placed on frozen ground, nor shall concrete be mixed or placed when the atmospheric temperature is below 35°F (2°C), or when conditions indicate that hte tempeature may fall to 35°F (2°C) within 24 hours, except with the written permission of the Engineer nad only after such precautionary measures for hte protection of the pavement have been taken as the Engineer may direct.

Concrete shall be effectively protected from freezing or frost for a period of 5 days after placing.

Concrete for strucures shall not be mixed or placed while the atmospheric temperature is above 115°F (46°C) unless adequate means are emmployed to cool the aggregate and waer and satisfacotry provisios have been made for ptoecting hte work. In any case, teh temperature of hte concrete as placed shall not exceed 90°F (32°C).

Concrte placement shall be stopped when rainfall is sufficent to cause damage to the work.

17-6.8 Surface Finishes

(a) General — The classes of surface finish described herein shall be applied

to various parts of concrete structures as specific in the Special Provisions, and herein.

The invert of cast-in-place sewers and sewer structures shall be given a steel trowel finish. The invert in circular conduit is defined as the unlined portion of lined conduit or the bottom 60 degrees of circumference of the inside of unlined conduit. Unless otherwise specified, the invert of cast-in-place storm drains shall be given a wood-float finish.

(b) Ordinary Surface Finish — Immediately after the forms have been removed, all exterior form bolts shall be removed to a depth of at least 1 inch (25mm) inside the surface of the concrete and the resulting holes or depressions cleaned and filled with mortar, except on the interior surfaces of box girders the bolts may be removed flush with the surface of the concrete. Mortar shall be Class "C." White cement shall be added to the mortar in an amount sufficient to tint the mortar a shade lighter than the concrete to be repaired. Mortar shall be mixed approximately 45 minutes in advance of use. Care shall be exercised to obtain a good bond with the concrete. After the mortar has thoroughly hardened, the surface shall be rubbed with a carborundum stone in order to obtain the same color in the mortar as in the surrounding concrete. All fins caused by form joints, and other projections shall be removed and all pockets cleaned and filled. Mortar for filling pockets shall be treated as specified for bolt holes.

Ordinary surface finish shall be applied to all concrete surfaces either as a final finish or preparatory to a higher-class finish. On surfaces which are to be buried underground or surfaces which are completely enclosed (such as the cells of box girders), the removal of fins and form marks and the rubbing of a mortared surface to a uniform color will not be required. Ordinary surface finish, unless otherwise specified, shall be considered as a final finish on the following surfaces:

1) The undersurface of slab spans, box girders, filled-spandrel arch spans and floor slabs between T-girders of superstructures except for grade-separation structures.

2) The exposed surfaces of channel walls and the inside vertical surface of T-girders of superstructures except for grade-separation structures.

3) Surfaces which are to be buried underground, covered with fill, or for surfaces of culverts above finish grade which are not visible from the traveled way.

4) Top surfaces which are to be buried underground shall be struck off and given a float finish.

17-6.9 Curing — As soon after the completion of the specified finishing operations as the condition of the concrete will permit without danger of consequent damage thereto, all exposed surface shall either be sprinkled with water, covered with plastic sheet, or covered with earth, sand or burlap, or when not required to be painted, sprayed with Type 1 curing compound conforming with Subsection 17-4.1.

When an impervious membrane (curing compound) is used, it shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely cover and seal all exposed surfaces of the concrete with a uniform film. The membrane shall not be applied to any surface until all of the finishing operations have been completed; such surface being kept damp, until the membrane is applied. All surfaces on which a bond is required, such as construction joint, shear planes, reinforcing steel, and the like, shall be adequately covered and protected before starting the application of the curing compound in order to prevent any of the compound from being deposited thereon; and any such surface with which the compound may have come in contact shall immediately thereafter be cleaned. Care shall be exercised to prevent any damage to the membrane seal during the curing period. Should the seal be damaged before the expiration of 10 days after the placing of the concrete, additional impervious membrane shall be immediately applied over the damaged area.

Should any forms be removed sooner than 10 days after the placing of the concrete, the surface so exposed shall either be immediately sprayed with a coating of the curing compound, or kept continuously wet by the use of burlap or other suitable means until such concrete has cured for at least 10 days.

When tops of walls are cured by the curing compound method, the side forms, except for metal forms, must be kept continuously wet for the 10 days following the placing of the concrete.

If there is any likelihood of the fresh concrete checking or cracking prior to the commencement of the curing operations (due to weather conditions, materials used, or for any other reason), it shall be kept damp, but not wet, by means of an indirect fine spray of water until it is not likely that checking or cracking will occur, or until the curing operations are started in the area affected.

17-6.10 Payment — Payment for concrete structures will be made in conformity with the terms of the Contract and will be based on unit prices or lump sums as set forth in the Bid. When payment is provided for on a lump sum basis, such payment shall include full compensation for furnishing all labor, materials, tools and equipment and doing all work required to construct the structure in conformity with the Plans and Specifications.

Where concrete is scheduled for payment on the basis of cubic yards (m^3), the

calculation of the quantity of concrete for payment will be made only to the neat line of the structures as shown on the Plans and on the basis of the concrete having the specified dimensions. However, all concrete shall be placed to line and grade within such tolerances, as determined by the Engineer, are reasonable and acceptable for the type of work involved. The quantity of such concrete will be calculated considering the mortar used to cover construction joints as being concrete and no deductions will be made for rounded or beveled edges, space occupied by reinforcing steel, or metal inserts or openings 6 square feet ($0.5m^2$) or less in area. The cost of cement used in mortar for covering construction joints, patching, or other uses in the structure being constructed, in excess of that required for the design mix of the adjacent concrete, shall be included in the item of work of which said mortar is a part.

The quantity of reinforcing steel, when scheduled as a separate item, will be calculated for payment on the basis of the number of each type bar actually placed in accordance with the Plans and approved changes. The weight will be calculated using the actual lengths of bards placed and the unit weights per linear foot (m) specified in ASTM A 615, A 616, and A 617.

Steel for laps indicated on the Plans, or required by the Engineer, will be paid for at the Contract Unit Price. No payment will be made for reinforcing steel in laps (whether specified or optional) which are not used, and payment will not be made for additional steel in laps which are requested by the Contractor for its convenience, or for steel used in chairs or other devices for supporting the required reinforcement. The cost of tie wire shall be included in the unit price bid.

Payment for longitudinal steel reinforcement will be made on the basis that the longest standard mill lengths will be placed; and not more than one lap will be paid for between two consecutive construction joints, unless otherwise authorized by the Engineer. The standard mill length for bar sizes No. 4 and larger is specified as 60 feet (18m).

when optional longitudinal construction joints are indicated on the Plans or specified, the Contractor will be permitted to lap the transverse reinforcing steel at said joints and the reinforcing steel used in such laps will be paid for at the Contract Unit Price.

17-7 Concrete Curbs, Walks, Gutters, Cross Gutters, Access Ramps and Driveways

17-7.1 General — Concrete curbs, walks, gutters, cross gutters, access ramps and driveways shall be constructed of portland cement concrete of the class and other requirements prescribed in Subsection 17-1.1.2. The finish coat to be applied to

curbs shall consist of Class "B" mortar prepared as prescribed in Subsection 17-5.

Unless otherwise specified on the Plans, the minimum thickness of walks shall be 4 inches. The minimum thickness of gutters, cross gutters, alley intersections, access ramps and driveway aprons shall be 6 inches (150mm).

17-7.2 Drainage Outlets Through Curb — Where existing building drains occur along the line of work, the new curb shall be suitably sleeved to provide for such drains. Similar sleeves shall be installed to serve low areas on adjacent property where drainage has been affected by the work.

The location and size of the sleeves and construction of connecting sidewalk drains shall be in accordance with the Plans.

17-7.3 Driveway Entrances — Driveway entrances shall be provided in new curb at all existing driveways along the line of the work, at locations shown on the plans, and at such other locations as may be designated by the Engineer.

The fully depressed curb opening at driveway entrances shall be 1 inch (25mm) above gutter flowline at the curb face. The top of the fully depressed portion of the curb shall be finished to a transverse slope toward the gutter of ¾ inch (20mm).

Where walk is to be constructed across driveways to commercial establishments, the thickness thereof shall be 6 inches (150mm) unless otherwise specified or indicated on the plans. At residential driveways, the thickness of the walk will be 6 inches (150mm) unless otherwise specified.

17-7.4 Forms — Form material shall be free from warp, with smooth and straight upper edges, and if used for the face of curb, shall be surfaced on the side against which the concrete is to be placed. Wooden forms for straight work shall have a net thickness of at least 1½ inches (40mm). Metal forms for such a work shall be of a gage that will provide equivalent rigidity and strength. Curb face forms used on monolithic curb and gutter construction shall be of a single plank width when the curb face is 10 inches (250mm) or less, except for those used on curb returns. All forms used on curb returns shall be not less than ¾ inch (20mm) in thickness, cut in the length and radius as shown on the plans, and held rigidly in place by the use of metal stakes and clamps. The curb face form shall be cut to conform exactly with the curb face batter as well as being cut to the required length and radius. Forms shall be of sufficient rigidity and strength, and shall be so supported, as to adequately resist springing or deflection from placing and tamping the concrete.

Form material shall be clean at the time it is used; and shall be given a coating of light oil, or other equally suitable material, immediately prior to the placing of

the concrete.

All forms except back planks of curb shall be set with the upper edges flush with the specified grade of the finished surface of the improvement to be constructed, and all forms shall be not less than a depth equivalent to the full specified thickness of the concrete to be placed.

Back forms shall be held securely in place by means of stakes driven in pairs at intervals not to exceed 4 feet (1.2m), one at the front form and one at the back. Clamps, spreaders, and braces shall be used to such extent as may be necessary to ensure proper form rigidity. Forms for walk, gutter, and similar work shall be firmly secured by means of stakes driven flush with the upper edge of the form at intervals not to exceed 5 feet (1.5m). Form stakes shall be of sufficient size and be driven so as to adequately resist lateral displacement.

Commercial form clamps for the curb and gutter may be used provided they fulfill the requirements specified herein.

17-7.5 Placing Concrete — Concrete shall be placed on a subgrade sufficiently dampened to ensure that no moisture will be absorbed from the fresh concrete.

Concrete shall be placed in curb, gutter, and curb and gutter forms in horizontal layers not exceeding 6 inches (150mm) in thickness, each layer being spaded along the forms and thoroughly tamped. Concrete may be placed in layers of more than 6 inches (150mm) in thickness only when authorized by the Engineer and the spading and tamping is sufficient to consolidate the concrete for its entire depth.

After the concrete for walk has been placed, a strikeoff shall be used to bring the surface to the proper elevation when compacted. It shall be spaded along the form faces and tamped to assure a dense and compact mass, and to force the larger aggregate down while bringing to the surface not less than ⅜ inch (10mm) of the free mortar for finishing purposes.

Concrete shall be placed in cross gutters in horizontal layers of not more than 4 inches (100mm) in thickness, each layer being spaded along the form faces and thoroughly tamped into a dense and compact mass. If internal vibrators are used, the full specified thickness may be placed in one operation.

After the concrete has been placed and tamped, the upper surface shall be struck off to the specified grade.

17-7.6 Joints

(a) General — Joints in concrete curb, gutter, and walk shall be designated as expansion joints and weakened plane joints. When replacing sidewalk

adjacent to existing sidewalk with varying joints and score lines, new joints and score line shall be placed to provide a reasonable resemblance to the existing patterns. A weakened plane joint shall be placed at all locations where utility boxes and other similar structures are located.

(b) Expansion Joints — Expansion and weakened plane joints shall be constructed in curb, walk and gutter as shown on the Plans or as specified herein. No such joints shall be constructed in cross gutters, alley intersections, access ramps or driveways except as may be approved by the Engineer.

One-quarter-inch (6mm) joints shall be constructed in curb and gutter at the end of all returns except where cross gutter transitions extend beyond the curb return, in which case they shall be placed at the ends of the cross gutter transition. No joints shall be constructed in returns. Where monolithic curb and gutter is constructed adjacent to concrete pavement, no expansion joins will be required except at EC and BC of curb returns.

One-quarter-inch (6mm) joints shall be constructed in walk returns between the walk and the back of curb returns when required by the Engineer. At the EC and BC and around utility poles, the joint filler-strips shall extend the full depth of the concrete being placed. Joint filler-strips between walk and curb shall be the depth of the walk plus 1 inch (25mm) with the top set flush with the specified grade of the top of curb.

All expansion joint filler strips shall be installed vertically, adn shall extend to the full depth and width of the work in which they are installed, and be constructed perpendicular to straight curb or radially to the line of the curb constructed on a curve. Expansion joint filler materials shall completely fill thee joints to within ¼ inch (6mm) of any surface of the concrete. Excess filler material shall be trimmed off to the specified dimension in a neat and workmanlike manner. During the placing and tamping of the concrete, the filler strip shall be held rigidly and securely in proper position.

(c) Weakened Plane Joints

(1) General — Weakened plane joints shall be straight and constructed in accordance with Subsections (2) or (3) below, unless otherwise shown on the Plans.

In walk, joints shall be transverse to the line of work and at regular intervals not exceeding 10 feet (3m). At curves and walk returns, the joints shall be radial.

In gutter, including gutter integral with curb, joints shall be at regular intervals not exceeding 20 feet (6m). Where integral curb and gutter is

adjacent to concrete pavement, the joints shall be aligned with the pavement joints where practical.

(2) Control Joint — After preliminary trowelling, the concrete shall be parted to a depth of 2 inches (50mm) with a straightedge to create a division in the coarse aggregate. The concrete shall then be refloated to fill the parted joint with mortar. Headers shall be marked to locate the weakened plane for final joint finishing, which shall be accomplished with a jointer tool having a depth of ½ inch (13mm) and a radius of ⅛ inch (3mm). The finished joint opening shall not be wider than ⅛ inch (3mm).

(3) Plastic Control Joint (Score Line) — The joint material shall be a T-shaped plastic strip at least 1-inch (25mm) deep, having suitable anchorage to prevent vertical movement, and having a removable stiffener with a width of at least ¾ inch (20mm). After preliminary trowelling, the concrete shall be parted to a depth of 2 inches (50mm) with a straightedge. The plastic strip shall be inserted in the impression so that the upper surface of the removable stiffener is flush with the concrete. After floating the concrete to fill all adjacent voids, the removable stiffener shall be stripped. During final trowelling, the edges shall be finished to a radius of ⅛ inch (3mm), using a slit jointer tool.

17-7.7 Finishing

(a) General — Finishing shall be completed as specified herein for the type work being performed.

(b) Curb — The front forms may be stripped as soon as the concrete has set sufficient. Class "B" mortar, as prescribed in Subsection 17-5 and thinned to the consistency of grout, shall be immediately applied to the top and face of the curb if needed. If monolithic curb and gutter is being constructed, this mortar shall be applied to the full exposed curb face; otherwise, it shall extend 2 inches (50mm) below the gutter surface.

The face and top of the curb shall then be carefully trowelled to a smooth and even finish; the top being finished to a transverse slope of ¼ inch (6mm) toward the gutter, with both edges rounded to a radius of ½ inch (13mm). The trowelled surface shall be finished with a fine-hair broom applied parallel with the line of the work. The edge of the concrete at all expansion joints shall be rounded to a ¼-inch (6mm) radius. The surface of the work shall be finished as prescribed; after which the name of the Contractor, together with the year in which the improvement is constructed, shall be stamped therein to a depth of ¼ inch (6mm) in letters not less than ¾ inch (20mm) high, at BC and EC of curb returns.

Joints shall conform to Subsection 17-7.6.

(c) Walk — The forms shall be set to place the finished surface in a plane sloping up form the top of curb 2 percent when measured at right angles to the curb.

Following placing, the concrete shall be screened to the required grade, tamped to consolidate the concrete and to bring a thin layer of mortar to the surface, and floated to a smooth, flat uniform surface. The concrete shall then be edged at all headers, given a preliminary trowelling and provided with weakened plane joints.

Walk shall be steel trowelled to a smooth and even finish. All formed edges shall be rounded to a radius of ½ inch (13mm). Edges at expansion joints shall be rounded to a radius of ⅛ inch (3mm). Preliminary trowelling may be done with a longhandled trowel or "Fresno," but the finish trowelling shall be done with a hand trowel. After final trowelling, walk on grades of less than 6 percent shall be given a fine hair-broom finish applied transverse to the center line. On grades exceeding 6 percent, walk shall be finished by hand with a wood float. Walk shall be remarked as necessary after final finish, to assure neat uniform edges, joins, and score lines.

Scoring lines, where required, shall have a minimum depth of ¼ inch (6mm) and a radius of ⅛ inch (3mm). When longitudinal scoring lines are required, they shall be parallel to, or concentric with, the lines of the work. Walk 20 feet (6m) or more in width shall have a longitudinal center scoring line. In walk returns, one scoring line shall be made radially midway between the BCR and ECR. When directed by the Engineer, longitudinal and transverse scoring lines shall match the adjacent walk. The Contractor shall have sufficient metal bards, straightedges, and joint tools on the project.

Headers shall remain in place for at lest 16 hours after completion of the walk but must be removed before the Work is accepted.

(d) Gutter — After the concrete has been thoroughly tamped in such manner as to force the larger aggregate into the concrete and bring to the top sufficient free mortar for finishing the surface shall be worked to a true and even grade by means of a float, trowelled with a long-handled trowel or "Fresno" and wood float-finished. The flowline of the gutter shall be trowelled smooth for a width of approximately 4 inches (100mm) for integral curb and gutter and 4 inches (100mm) on either side of the flowline on cross gutters and longitudinal gutters. The outer edges of the gutter shall be rounded to a radius of ½ inch (3mm).

Side forms shall remain in place for at least 24 hours after completion of the

gutter, but must be removed before the work will be accepted.

Joints shall conform to Subsection 17-7.6.

(e) Access Ramps and Driveways — Alley intersections, access ramps and driveways shall be constructed as specified for concrete pavement in Subsection 17-7.5 except final finishing for access ramps and the sloping portion of driveways shall be done by hand with a wood float and the remaining portion of the driveway finished as specified for walks in accordance with Subsection 17-7.7(c).

17-7.8 Curing — Immediately after finishing operations are completed, Type 1 concrete-curing compound shall be applied.

The curing compound shall be applied under pressure, by means of a spray nozzle, in such manner and quantity as to entirely cover all exposed surfaces of the concrete with a uniform film Curing compounds shall be as specified in Subsection 17-4.

No power equipment used for the preparation of subgrade will be permitted adjacent to concrete curb, gutter, or alley intersections until the fourth day following placement of the concrete. The placement of bituminous pavement adjacent to concrete curb, gutter, or alley intersections will not be permitted until the seventh day following the placement of concrete nor will concrete paving operations be permitted until the seventh day where placing or finishing equipment will ride on the previously placed concrete. If admixtures, additional cement or Type III cement is used to obtain high early strength concrete in accordance with Subsection 17-1.1.1, grading operations will be permitted on the second day following the placement of the concrete and paving options on the third day.

17-7.9 Repairs and Replacements — Any new work found to be defective or damaged prior to its acceptance shall be repaired or replaced by the Contractor at no expense to the Agency.

17-7.10 Backfilling and Cleanup — Backfilling to the finished surface of the newly constructed improvement must be completed before acceptance of the Work.

Upon completion of the work the surface of the concrete shall be thoroughly cleaned and the site left in a neat and orderly condition.

17-7.11 Measurement and Payment — Payment for concrete curbs, walks, gutters, cross gutters, access ramps and driveways will be made as shown in the Bid.

Measurements to determine the pay quantities will be made in horizontal planes,

including but not limited to removal of existing concrete, disposal, subgrade preparation backfilling and cleanup.

The price bid shall be considered to include full payment for all materials, labor, equipment and incidentals require to construct the concrete improvements in accordance with the plans and Specifications.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 18

Sanitary Sewers & Storm Drains

18-1 Trenching

18-1.1 General — For the purpose of shoring or bracing, a trench is defined as an excavation in which the depth is greater than the width of the bottom of the excavation.

Excavations for appurtenant structures, such as but not limited to manholes, transition structures, junction structures, vaults, valve boxes, catch basins, thrust blocks, and boring pits shall, for the purpose of shoring and bracing, be deemed to be in the category of trench excavation.

Excavation shall include the removal of all water and materials of any nature which interfere with the construction work. Removal of groundwater to a level below the structure subgrade will be necessary only when required by the plans or specifications.

Excavation for conduits shall be by open trench unless otherwise specified or shown on the plans. However, should the Contractor elect to tunnel or jack any portion not so specified, they shall first obtain approval from the Engineer. Payment for such work will be made as though the specified methods of construction had been used.

18-1.2 Maximum Length of Open Trench — Except by permission of the Engineer, the maximum length of open trench where prefabricated pipe is used shall be 500 feet (150m) but no more than the amount of pipe installed and backfilled in a single day. The distance is the collective length at any location, including open excavation, pipe laying and appurtenant construction.

Except by permission of the Engineer, the maximum length of open trench in any one location where concrete structures are cast in place will be that which is necessary to permit uninterrupted progress. Construction shall be pursued as follows: excavation, setting of reinforcing steel, placing of floor slab, walls, and

cover slab or arch. Each shall follow the other without any one operation preceding the next nearest operation by more than 200 feet (60m).

Failure by the Contractor to comply with the limitations specified herein may result in an order to halt the work until such time as compliance has been achieved.

18-1.3 Maximum and Minimum Width of Trench — For pipe (except corrugated steel pipe), the minimum and maximum width of trench permitted shall be as indicated on the Plans or Standard Drawings.

For corrugated steel pipe, the trench shall be at least 16 inches (400mm) wider than the diameter of the pipe to be installed.

If the maximum trench width is exceeded, the Contractor shall provide additional bedding, another type of bedding, or a higher strength of pipe, as shown on Plans or approved by the Engineer, at no additional cost to the City.

18-1.4 Access to Trenches — Safe and suitable ladders which project 2 feet (0.6m) above the top of the trench shall be provided for all trenches over 4 feet (1.2m) in depth. One ladder shall be provided for each 50 feet (156m) of open trench, or fraction thereof, and be so located that workers in the trench need not move more than 25 feet (7.5m) to a ladder.

18-1.5 Removal and Replacement of Surface Improvements — Bituminous pavement, concrete pavement, curbs, sidewalks or driveways removed in connection with construction shall be removed and replaced in accordance with the other provisions of these Standard Specifications.

18-1.6 Bracing Excavations — The manner of bracing excavations shall be as set forth in the rules, orders, and regulations of the Division of Industrial safety of the State of California.

Prior to commencing the excavation of a trench 5 feet (1.5m) in depth or greater and into which a person will be required to descend, the Contractor shall first obtain a permit to do so form the Division of Industrial Safety.

Should the bracing system utilize steel H-beams or piles or other similar vertical supports, driving of said vertical supports will not be permitted except for the last 4 feet (1.2m). The vertical supports shall be placed in holes drilled to a depth of 4 feet (1.2m) above the proposed bottom of pile, except where this procedure is impracticable. The vertical support may then be driven to the required depth, not to exceed 4 feet (1.2m). During the drilling and driving operations the Contractor shall take care to avoid damage to utilities.

At locations where the drilling of such holes is impracticable because of the existence of rocks, running sand, or other similar conditions, and provided said impracticability is demonstrated to the satisfaction of the Engineer by actual drilling operations by the Contractor, the Engineer may, upon request of the Contractor, approve the use of means other than drilling for the purpose of placing the vertical support. Such other means, however, must be of a nature which will accomplish, as nearly as possible, the purpose of the drilling, namely, the prevention of damage to existing surface or sub surface improvements, both public and private. All costs for this work shall be included in the prices bid for the items involved.

If sheeting is used to support the excavated trench, the sheeting shall be removed by the Contractor, and no such sheeting will be permitted to remain in the trench. When field conditions, the type of sheeting, or methods of construction used by the Contractor are such as to make the removal of sheeting impracticable, the Engineer may permit portions of the sheeting to be cut off to a specified depth and remain in the trench.

18-2 Bedding — Bedding shall be defined as that material supporting, surrounding and extending to between six inches and one foot above the top of the pipe, as shown in the details. Where it becomes necessary to remove boulders or other interfering objects at subgrade for bedding, any void below such subgrade shall be filled with the bedding material designated on the Plans. Where concrete is specified to cover the pipe, the top of the concrete shall be considered as the top of the bedding.

If soft, spongy, unstable, or other similar material is encountered upon which the bedding material or pipe is to be placed, this unsuitable material shall be removed to a minimum depth of 18 inches beneath the bottom of the pipe or as ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the amount required by the Plans or Specifications, will be paid for as provided in the Bid Schedule. If the necessity for such additional bedding material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of groundwater, the Contractor shall bear the expense of the additional excavation and bedding.

Bedding material for pipe shall first be placed to a depth of 4 inches below the pipe. If the pipe is to be laid in a rock cut, there shall be at least 6 inches of bedding below the pipe. Then the remainder of the bedding shall be placed. Bedding shall be compacted by hand or mechanical tampers prior to backfilling. All bedding material shall be placed carefully to achieve uniform contact with the pipe and a minimum relative compaction of 90 percent, as determined by ASTM D-1557 (AASHTO T-180) laboratory density. Unless the sheeting or shoring is to be cut off and left in place, densification of bedding for pipe shall be accomplished after the sheeting or shoring has been removed from the bedding zone.

In dry trench conditions or where otherwise specified, bedding material for pipe shall be sand, Class II Aggregate Base, native free-draining granular material having a sand equivalent of not less than 30. Where water is encountered, or where trench dewatering is used, Wet Condition Material, meeting the requirements presented in Table 1, shall be used.

TABLE 1	
PIPE BEDDING GRADATION REQUIREMENTS FOR WET TRENCH CONDITION	
Sieve Size	**Percent Passing**
1½ inches	100
3/4 inches	55 to 100
3/8 inches	8 to 50
No. 4	0 to 8
No. 200	0 to 2

Crushed stone or gravel meeting these requirements include No. 3 concrete aggregate, as specified in the Public Works Specifications, and concrete gravel designated ASTM C33, Gradation 67.

Concrete used for bedding shall be one of the classes of concrete specified herein for the indicated time periods before backfill.

Continuity of bedding material shall be interrupted by low permeability groundwater barriers to impede passage of water through the embedment. Barrier material shall be low permeability clay material and shall be compacted to 95 percent of maximum density. Material may be finely divided suitable job excavated material, free from stones, organic matter, and debris. A groundwater barrier of compacted soil shall be placed at or near each manhole or special structure along the sewer line. The groundwater barrier shall be keyed a minimum of 6 inches into undisturbed material on the trench sides and trench bottom and shall extend vertically to the top of the pipe embedment. The barrier shall be 18 inches thick.

18-3 Pipe Materials & Installation (New or Replacement)

18-3.1 General

18-3.1.1 General — Pipe will be inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer and shall be at no cost to the City.

When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connection is made.

Pipe shall be laid up-grade with the socket or collar ends of the pipe upgrade unless otherwise authorized by the Engineer.

Pipe shall be laid to Plan line and grade, with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the socket or collar, which shall not bear upon the sub grade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken up and relaid at the Contractor's expense.

Pipe sections shall be laid and jointed in such a manner that the offset of the inside of the pipe at any joint will be held to a minimum at the invert. The maximum offset at the invert of pipe shall be 1 percent of the inside diameter of the pipe or ⅜-inch (10mm), whichever is smaller.

In joining socket and spigot pipe, the spigot of each pipe shall be so seated in the socket of the adjacent pipe as to give a minimum of ⅜-inch (10mm) annular space all around the pipe in the socket. Unavailable offsets shall be distributed around the circumference of the pipe in such a manner that the minimum offset occurs at the invert.

When pipe is laid in a sheeted trench, all sheeting against which concrete cradle is to be placed shall be faced with at least one thickness of building paper and the sheeting shall be withdrawn without displacing or damaging the cradle.

After the joints have been made, the pipe shall not be disturbed in any manner.

At the close of work each day, or whenever the work ceases for any reason, the end of the pipe shall be securely closed.

<u>18-3.1.2 Marking</u> — Each length of pipe shall be marked by the manufacturer with the trade name, nominal size, D-load, date of manufacture and lot number. The D-load and lot number designations shall be marked on the inside of the pipe.

A lot is defined as 100 lengths of pipe, or a fraction thereof, of one

diameter and D-load manufactured within a 24-hour period.

Each coupling shall be marked with the nominal size and D-load for the pipe with which it shall be used.

18-3.1.3 Basis for Acceptance — The basis for acceptance of lots shall be: D-load strength test, compliance with Specifications, inspection of pipe manufacture, and inspection of completed pipe.

the Engineer may accept a certification indicating compliance with these specifications in lieu of City inspection.

18-3.1.4 Causes for Rejection — The following defects are cause for rejection of individual pipe lengths:

1) Any crack, any piece broken from the pipe, or other irregularities.

2) Deficiencies or irregularities in wall thickness. Wall thickness shall be at least 95 percent of the manufacturer's specified nominal wall thickness.

3) Improper machining of ends of pipe lengths. When plastic couplings are used, pipe ends shall be machined at least 1/16-inch deep (1.5mm) for a minimum of two-thirds of the full circumference. Unmachined portions of the ends shall be sanded smooth to provide a close-fitting joint.

When a pipe contains localized defects but is otherwise acceptable, the pipe will be accepted when the defective portion is cut off and the end or ends satisfactorily remachined.

18-3.2 PVC Plastic Pipe

18-3.2.1 General — This subsection applies to the requirements for unplasticized polyvinyl chloride (PVC) plastic pipe for gravity flow sewers and house connection sewers. Pipe, fittings, couplings and joints shall be in conformance with the requirements of ASTM D 3033 or D 3034, except as modified herein.

The ASTM designation, SDR, and type of joint shall be as shown on the Plans or in the Specifications. When PVC sewer pipe is specified without further qualification, the pipe shall conform to the requirements of ASTM D 3034, SDR 35, and shall have gasketed joints. All pipe, fittings and couplings shall be clearly marked at an interval not to exceed 5 feet

(1.5m) as follows:

1) Nominal pipe diameter.

2) PVC cell classification.

3) Company, plant, shift, ASTM, SDR, and date designation.

4) Service designation or legend.

For fittings and couplings, the SDR designation is not required.

18-3.2.2 Cell Classification — Pipe shall be made of PVC plastic having a cell classification of 12454-B, 13364-A, or 13364-B as defined in ASTM D 1784. The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C, or 13343-C. PVC compounds of other cell classifications shall be prequalified.

18-3.2.3 Joining Systems — 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 to those used for the pipe.

18-3.2.4 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 the gasket remains in place during the joining operation. The gasket shall be manufactured from a synthetic elastomer.

18-3.2.5 Solvent Cement Joints — Pipe with solvent cement joints shall be joined with a PVC cement conforming to ASTM D 2564.

18-3.2.6 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 (50Pa.s). 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.

18-3.2.7 Test Requirements — General. Pipe, fittings and couplings shall meet the requirements of the section titled "Requirements" of ASTM D 3033 or D 3034. During production of the pipe, the

manufacturer shall perform the specified tests for each pipe marking. A certification by the manufacturer indicating compliance with specification requirements shall be delivered with the pipe. The certification shall include the test result data. The PVC compound shall also meet the chemical resistance requirements.

18-3.2.8 Acceptance — The basis for acceptance shall be the inspection of pipe, fittings and couplings; the tests specified in Subsection 18-3.2.7; and compliance with the specifications. When the pipe is delivered to the work site, the Engineer may require additional testing to determine conformance with the requirements of pipe flattening, impact resistance, pipe stiffness and extrusion quality. Also, pipe which is not installed within 120 days of the latest test shall not be used without prior approval of the Engineer.

18-3.2.9 Selection of Test Pipe — When testing is required by the Engineer, one test pipe shall be selected at random by the Engineer form each 1200 feet (360m) or fraction thereof of each size of pipe delivered to the Work site but no less than one test pipe per lot. A lot shall be defined as pipe having the same identification marking. The length of specimen for each selected pipe shall be a minimum of 8 feet (2.4m).

A pipe lot shall consist of all pipe having the same marking number. The lot test specimen shall have a minimum length of 4 feet (1.2m).

18-3.2.10 Chemical Resistance — The PVC compound for cell classifications not specifically identified herein shall be pre-qualified by the pipe manufacturer by meeting the chemical resistance tests which follow. Compound samples and molded test specimens shall be prepared in accordance with ASTM D 53.

Tensile and Izod impact exposure specimens shall be immersed in the solutions for a period of 112 days. At 4-week intervals, selected specimens shall be removed, washed, surface dried and tested.

Weight change specimens shall be 2 inches (50mm) in diameter and may be molded discs or discs cut from the pipe wall. They shall be conditioned for 7 days at 110° ± 5°F (43° ± 3°C), cooled in a desiccator for three hours at 75° ± 5°F (24° ± 3°C), weighed, and then immersed in the solutions specified in Subsection 2.0-2.3.3 of the Standard Specifications for Public Works Construction. At 4-week intervals, selected specimens shall be removed, washed, surface dried and weighed. These same specimens shall then be reconditioned for 7 days at 110° ± 5°F (43° ± 3°C), cooled in a desiccator for 3 hours at 75° ± 5°F (24° ± 3°C) and again weighed.

Initial and post-exposure specimens shall meet the following requirements when tested at 75° ± 5° (23° ± 2°C):

Property	ASTM Test Method	Cell Class Min. Values		
		12454	13343	13364
Tensile Strength (Yield), psi (MPa)	D 638	7000 (41)	6000 (41)	6000 (48)
Impact Strength, ft-lbs/in. (J/m)	D 256 Method A	0.65 (80)	1.5 (80)	1.5 (35
Weight Change, %	D 543	1.5	1.5	1.5

If any specimen fails to meet the requirements at any time during the 112 days exposure period, the material will be subject to rejection.

18-3.2.11 Pipe Acceptance — At the time of manufacture, each lot of pipe and fittings shall be inspected for defects, and tested for impact, stiffness and flattening in accordance with ASTM D 2751.

When testing subsequent to manufacture the impact requirement shall be excluded. For the flattening requirement, the percentage reduction in pipe diameter shall be not less than 15 percent for pipe marked SDR 23.5 or lower, and not less than 25 percent for pipe marked with higher SDR numbers. The stiffness requirement is unchanged.

The Engineer may require certification by the manufacturer that the test results comply with specification requirements.

18-3.2.12 Marking — Pipe shall have a home mark to indicate full penetration of the spigot when the joint is made. Pipe shall be marked at 5-foot (1.5m) intervals or less with a marking number which identifies the manufacturer, SDR, size, machine, date and shift on which the pipe was produced.

18-3.3 Reinforced Concrete Pipe

18-3.3.1 General — These specifications apply to reinforced concrete pipe intended to be used for the construction of storm drains, sewers, and related structures.

The size, type, and D-load of the concrete pipe to be furnished shall be as shown on the Plans, or as specified under the item of work for the project.

Prior to the manufacture of the pipe, three sets of prints of the pipe line layout diagrams, prepared in accordance with good industry practice, shall be furnished to the Engineer. Catch basin connector pipe need not be included in the pipe line layout; in lieu thereof, a list of catch basin connector pipes shall accompany the layout. The connector pipe list shall include size and D-load of pipe, station at which pipe joins mainline, number of sections of pipe, length of sections, type of sections (straight, horizontal bevel, vertical, bevel, etc.). The diagrams and lists submitted will be used by the Agency for reference only, and their use shall in no way relieve the Contractor of its responsibility for correctness. The Engineer may waive the pipeline layout and connector pipe list requirement.

Cast reinforced concrete pipe shall be manufactured by placing the concrete into stationary, vertical, cylindrical metal forms.

Spun reinforce concrete pipe shall be manufactured by introducing the concrete into a rotating, horizontal, cylindrical metal form.

The interior surface of the pipe shall be smooth and well-finished. Joints shall be of such type and design and so constructed as to be adequate for the purpose intended so that when laid, the pipe will form a continuous conduit with a smooth and uniform interior surface.

Sockets and spigots shall be free from any deleterious substance or condition which might prevent a satisfactory mortar bond at the joints.

If the Engineer determines that the forms, end rings or form gaskets used in the manufacture of the pipe are inadequate for the purpose intended, the Contractor shall replace or repair said equipment to the satisfaction of the Engineer.

Pipe stronger than that specified maybe furnished at the Contractor's option, and at its expense, provided such pipe conforms in all other respects to the applicable provisions of these specifications.

The Contractor shall furnish, install and maintain stulls or other devices in the pipe as may be necessary to meet the limitation on cracks as specified herein, throughout pipe handling, transportation, and field installation.

18-3.3.2 Materials — Pipe greater than 24 inches shall be reinforced concrete pipe in accordance with ASTM C 76 Class IV. Cement used in the manufacture of pipe shall be in accordance with ASTM C 150, Type II, low alkali. At least two 3-edge bearing tests shall be made on each size of pipe. No hydrostatic nor absorption tests will be required except as stated hereinafter.

Joints shall be the rubber gasket type with the gaskets in accordance with ASTM C 361. Connections of reinforced concrete pipe to structures shall be with steel manufacturer's bell ring as detailed on the Plans. Plastic or fiberglass bell rings or collars shall not be used. Rubber gaskets shall be of the O-ring type. The spigot shall be formed with a groove for the gasket.

Fittings required as indicated on the Plan shall be constructed to the standards of the pipe manufacturer. Details of fittings shall be submitted for Engineer's acceptance before fabrication.

18-3.3.3 Installation - The ends of the pipe shall be so formed that, when the pipes are laid together and joined, they shall make a continuous and uniform line of pipe with a smooth and regular surface.

This gasket shall be of circular cross section unless otherwise approved by the Engineer. The length and cross sectional diameter of the gasket, the annular space provided for the gasket, and all other joint details shall be such as to produce a watertight joint. The slope of the longitudinal gasket contact surfaces of the joint with respect to the longitudinal axis of the pipe shall not exceed 2 degrees.

Under ordinary laying conditions, the work shall be scheduled so that the socket end of the pipe faces in the direction of laying. Prior to placing the spigot into the socket of the pipe previously laid, the spigot groove, the gasket and the inside of the socket shall be thoroughly cleaned. Then the spigot groove, the gasket and the first 2 inches (50mm) of the inside surface of the socket shall be lubricated with a soft vegetable soap compound.

The gasket after lubrication shall be uniformly stretched when placing it in the spigot groove so that the gasket is distributed evenly around the circumference.

For pipe in which the inside joints are to be pointed, suitable spacers shall be placed against the inside shoulder of the socket to provide the proper space between abutting ends of the pipe.

After the joint is assembled, a thin metal feeler gage shall be inserted between the socket and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket is not in the proper position, the pipe shall be withdrawn, the gasket checked to see that it is not cut or damaged, the pipe relaid, and the gasket position again checked.

Concrete pipe with elliptical reinforcement shall be laid with the minor axis of the reinforcement cage in a vertical position.

In general, horizontal or vertical curves shall be made by using pipe with beveled ends or by slight deflections in the joints of straight pipe. If necessary, short length pipe shall be made for curve of shorter radius than can be made with beveled pipe of usual length. Detailed layouts of curves shall be submitted to the Engineer by the pipe manufacturer for review and acceptance before fabrication of the beveled pipe. Curves may be made by use of angle bands at joints in lieu of beveled ends. Not more than 15 degrees of deflection angle shall be made in any one joint. Each angle joint shall fall upon the curve of the radius as indicated on the Plan.

18-3.4 Reinforced Thermosetting Resin (RTR) and Reinforced Plastic Mortar (RPM) Pipe and Fittings

18-3.4.1 General — This subsection applies to RTR and RPM pipe and fittings.

18-3.4.2 Type of Service — Types of service shall be as follows:

Types of Service	Uses	ASTM Requirements[1]
I	Storm drains Sanitary sewers	ASTM D3517 for pressure and nonpressure
II		ASTM D3262 for nonpressure ASTM D3754 for pressure

1. Pipe shall comply with ASTM requirements except as modified herein.

18-3.4.3 Material Composition — The RTR and RPM material shall conform to Section 213 of the Standard Specifications for Public Works

Construction.

18-3.4.4 Joints for RTR and RPM Pipe and Fittings — Joints shall be socket (bell) and spigot connections with elastomeric gaskets conforming to ASTM F477. Gaskets shall be new.

18-3.4.5 Joint Adapters for RTR and RPM Pipe and Fittings — Where adapters are required, adapters shall be approved by the Engineer. Fittings shall be manufactured from pipe that has been accepted and hydrotested.

18-3.4.6 Pipe Acceptance — Inspection, testing and acceptance shall conform to Subsection 18-3.1. The Engineer may require certification by the manufacturer that the test results comply with specification requirements. Each length of pipe shall be hydrostatically tested to 150 percent of design pressure.

18-3.4.7 Marking — Each length of pipe and each fitting shall be marked with the type, size, pressure class, lot or serial number, the name or mark of the manufacturer and the hydrostatic test pressure. Identification shall be traceable to location, date and shift of manufacture.

18-3.5 Polyethylene (PE) Solid Wall Pipe and Liner

18-3.5.1 General — Polyethylene (PE) plastic solid wall pipe and liner for use in gravity flow sanitary sewers, storm drains and water systems shall comply with ASTM D 2239 and D 3035. Fittings shall comply with ASTM D 2683, D 3797 and D 3261.

18-3.5.2 Material Composition — Pipe and fittings shall be made from PE resins in accordance with ASTM D 1248, and shall consist of a high-density, high-modulus resin which meets or exceeds the requirements listed below, and shall also meet requirements of ASTM D 3350.

Property	Value	ASTM Test
Density (g/cm^3)	0.941 min.	D 1505
Melt Index	0.41 max.	D 1238
Flexural Modulus (psi)	120,000 min.	D 790
Tensile Strength (psi)	3,000 min.	D 638
Environmental Stress Crack Resistance		D 1693
a. Test Condition	C	
b. Test Duration (hrs.)	192	
c. Failure, max. %	20	
Hydrostatic Design Basic (psi) at 73°F (23°C)	1,250 min.	D 2387
Color	2% Carbon Black min.	

The Engineer may at any time direct the manufacturer to obtain compound samples and to prepare compression molded test specimens in accordance with ASTM D 1928. These specimens shall comply with the minimum property values shown above and ASTM D 3350. The materials shall meet the chemical resistance tests in Subsection 18-3.2.10.

18-3.5.3 Pipe or Liner Acceptance Group — At the time of manufacture, each lot of pipe liner, and fittings shall be inspected for defects and tested for impact, stiffness and flattening in accordance with National Sanitation Foundation (NSF) Standard Number 14.

The liner or pipe shall be homogeneous throughout, uniform in color, free of cracks holes, foreign materials, blisters or deleterious faults.

When testing subsequent to manufacture, the impact requirements shall be excluded. For the flattening requirement, the percentage reduction in pipe or liner diameter shall be not less than 15 percent for SDR 21 or lower, and not less than 25 percent for SDR 22 and above. All of the above requirements shall comply with NSF Standard Number 14.

The Engineer may require certification by the manufacturer that the test results comply with specification requirements.

For testing purposes, a production lot shall consist of all pipe or liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.

The test specimen shall have a minimum length of 4 feet (1.2m).

18-3.5.4 Marking Group — Pipe and liner shall be marked at 5-foot (1.5m) intervals or less with a coded number which identifies the manufacturer, SDR, size, material, machine, date and shift on which the pipe and liner were extruded.

At the end of the production shift, during which a production lot has been extruded, the marking code on the pipe and liner shall be changed to indicate that said time intervals have elapsed and that a new production shift has begun.

Fittings shall be marked with the name of the manufacturer or its logo, size and material from which they were molded or fabricated.

18-3.5.5 Dimensions — Unless otherwise indicated, liner for pipe shall be SDR 32.5. Pipe for direct burial shall have an SDR as shown on the Plans.

18-3.6 Vitrified Clay Pipe — Vitrified clay pipe shall be used only when specified on the contract plans for minor repairs to existing vitrified claypipe sewers.

Except as modified in this subsection, vitrified clay pipe and fittings, including perforated pipe, shall be extra strength manufactured in accordance with ASTM C 700.

All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer's date code. All fabricated bends and/or bevels shall be all standard length straight pipe and shall, in addition to the above, be marked with a manufacturer's date. All fabricated bends and/or bevels shall be manufactured form pipe meeting all requirements of the pipe specifications for the project.

18-4 Pipe Liners (or Pipe Rehabilitation Lines)

18-4.1 General — At the time of manufacture, each lot of pipe, liner, and fittings shall be inspected for defects and tested in accordance with ASTM D 3350.

The liner or pipe shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters or deleterious faults.

The Contractor shall supply certification by the manufacturer that materials used in the manufacture of the pipe and pipe fittings conform to the requirements of these Specifications.

18-4.2 Installer Qualifications — Applicators and welders shall be qualified in

accordance with the Standard Specifications for Public Works Construction.

18-4.3 Preparation of Existing Pipe for Installation of Plastic Liner — Obstructions such as roots, joint offsets, rocks, or other debris that would prevent passage or damage to the liner pipe sections shall be removed or repaired prior to installing the liner pipe(s).

4.4 Installation — The existing sewer shall be maintained in operation during the relining process. Liner pipes shall be inserted one section at a time through an access pit constructed above the existing sewer. The top of the existing sewer exposed in the pit should be removed down to springline level (halfway). Liner pipes shall be inserted spigot end first with the bell end trailing. The pushing force shall be applied to the pipe walls end inside of the bell. Maximum jacking load shall not exceed the following:

Nominal Diameter (Inches)	Safe Compressive Load (Tons)[1]	
	18 PSI Pipe Stiffness	36 PSI Pipe Stiffness
18	—	17
20	—	19
24	23	31
30	36	52
36	52	66
42	71	95
48	93	130
54	123	171
60	155	212
66	175	240
72	209	292
78	252	351
84	307	422
90	357	485
96	411	560

1. Factor of Safety of 4 is included for longitudinal compressive load.

18-4.5 Reinforced Plastic Mortar Liner Piper

18-4.5.1 General — Fiberglass Reinforced Plastic Mortar (RPM) Liner pipe for use in lining sanitary sewers shall comply with ASTM D 3262. Unless otherwise indicated, the minimum pipe stiffness shall be 18 psi as measured by testing in accordance with ASTM D 2412.

Pipe Stiffness (psi)	Maximum Hydrostatic Head (ft.)[1] for Ungrouted Installation[2]
18	10
36	21
46	27
72	43
(Any pipe stiffness)	(0.6 x pipe stiffness)

1. Groundwater surface to bottom of liner pipe.
2. Safety factor and grout support factor not included.

18-4.5.2 Material Composition — Pipes, joints, and fittings shall be made from thermosetting resin, glass fiber reinforcements, and silica sand in combinations meeting all requirements of this subsection. Designation per ASTM D 3262 shall be Type 1, Liner 2, Grade 3, and Pipe Stiffness B, C, D, or as indicate din the Specifications. Rubber gaskets shall conform to the requirements of ASTM F 477.

18-4.5.3 Liner Pipe Acceptance — The liner pipe shall be free of cracks, holes, delaminations, foreign inclusions, blisters, or other defects that would, due to their nature, degree, or extent, have a deleterious effect of the pipe performance as determined by the Engineer.

For testing purposes, a production lot shall consist of all liner pipe having the same lot marking number, but shall not exceed a total of 100 pipes per ASTM D 3262. Pipe length, wall thickness, joint dimensions, pipe stiffness, and deflection characteristics shall be verified by testing for each lot per ASTM D 3262 requirements.

18-4.6 Folded PVC Pipe Rehabilitation System

18-4.6.1 General — Folded PVC extrusion material shall be introduced into sanitary sewers and storm drains in order to rehabilitate the existing pipelines system without excavation. This method applies to the rehabilitation of 4-inch through 12-inch diameter pipe in terms of materials and installation. The standard dimension ratio shall be SDR 35 in relation to the nominal pipe diameter.

18-4.6.2 Material Composition — The folded pipe shall be made from unplasticized PVC compounds having a cell classification of 12334-B or 12454-B, as defined in ASTM D 1784. Additives and fillers, including but not limited to stabilizers, anti-oxidants, lubricants, colorants, etc., shall not exceed 10 parts per 100 by weight or PVC resin in the compound.

18-4.6.3 Material and Equipment Acceptance — At the time of manufacture, the extruded material shall be inspected for defects and physical properties in accordance to the ASTM D 1784, or as indicated in the Specifications.

At the time of installation, the material shall be homogeneous, free of defects, cracks, holes, blisters, foreign materials, or other deleterious faults. Pipes with the aforementioned defects will be rejected.

The Contractor shall furnish and maintain, in good condition, all equipment necessary for proper execution and inspection of the work.

18-4.6.4 Marking — Markings shall conform to the requirements of Subsection 18-3.1.2.

18-4.6.5 Chemical Resistance and Physical Testing — The PVC material shall be tested in accordance with Sections 18-3.2.7 and 18-3.2.10. The various requirements shall be met with samples taken from pipe that had experienced the folding and rerounding process.

18-4.6.6 Installation and Field Inspection:

1) The existing pipeline shall be cleaned of any obstacles, televised and the condition approved by the Engineer prior to the insertion of the folded pipe.

2) A flexible heat containment tube shall be permanently placed inside the existing pipe for the retention of heat necessary to soften the folded pipe. A cable shall be strung through the heat containment tube.

3) Steam at 212°F shall be applied to the folded pipe while in the spool trailer for a minimum of 45 minutes prior to insertion into the existing pipe. Once the material has become pliable, the cable shall be attached to the folded pipe. Using a winch at the termination point, the folded pipe shall then be inserted into the existing pipe through an existing manhole or access point. Pulling force shall not exceed 2,000 pounds.

4) After the folded PVC pipe is inserted into the existing pipe, it shall be cut off at the starting point and restrained at the terminating point. Steam shall be introduced at the insertion end both inside and outside of the folded pipe until a minimum temperature of 200°F is attained at the

terminating end. This temperature shall be held for a minimum of 20 minutes and shall not exceed 240°F.

5) After the material has reached the required temperature, a specifically designed pressure driven rounding device shall be used to progressively round the folded PVC at a maximum rate of 3 feet per second using steam at 5 to 8 psi. The rounding process shall not cause any scraping, tearing, abrasion, movement, or other damage to the liner.

6) When the rounding process is complete, the steam shall be converted to air, maintaining an internal pressure of 5 to 10 psi. After the conversion to air pressure, water shall be introduced until the system is completely filled. The air pressure shall then be turned off and a minimum of 8 psi water pressure shall be maintained until the system is cooled to at least 120°F on both ends. At this point, the water pressure shall be relieved and both ends shall be cut off in the manholes.

18-4.7 PVC Manhole and Wet Well Lining Systems

18-4.7.1 General — This subsection describes the installation of the PVC liner by placing the liner strips so that an annular space is created between the PVC liner and the existing manhole/wet well. This annular space is then filled with cementitious grout or other approved materials that will result in a monolithic manhole/wet well within the existing manhole/wet well.

18-4.7.2 Materials

(a) PVC Liner. The PVC liner shall comply with the applicable requirement in Subsection 18-4.

(b) Grout. Cementitious grout or other approved materials shall conform to applicable provision of these specifications and as indicated on the Plans.

(c) Sealant/Adhesive. Sealant/adhesive shall be as indicated on the Plans or in the Specifications.

18-4.7.3 Chemical Resistance — The PVC material and sealant/adhesive shall conform to Sections 18-03.2.7 and 18-3.2.10.

18-4.7.4 Installation and Field Inspection — Surface preparation shall

consist of thorough cleaning to remove all loose material and surface contaminants. Any protrusions on the wall surface which interfere with the installation of the liner shall be removed. The Contractor, when required, shall provide for the flow of sewage around the manhole/wet well designated for lining. Installation shall be accomplished by either manually spirally winding the PVC strip or manually placing the PVC panels and by engaging the complimentary locks (male/female) at the edges of the strips/ panels in a manner which creates the annular space, as specified and approved by the Engineer.

18-4.8 End Seals — When required by the Engineer, the beginning and end of the new PVC pipe shall be sealed to the existing pipeline structure in order to prevent water movement between the two systems. The end seal material shall be an approved epoxy material and shall provide a watertight seal.

18-4.9 Service Connections — Existing service connections shall be reinstated through the use of a remote controlled unit or excavation.

18-5 Backfill

18-5.1 General — Backfill shall be considered as starting 1 foot (0.3m) above the pipe or conduit, or at the top of concrete bedding over the pipe or conduit. All materials below this point shall be considered as bedding.

Backfill, or fill, as the case may be, for cast-in-place structures such as, but not limited to, manholes, transition structures, junction structures, vaults, valve boxes and reinforced concrete box conduits, shall start at the subgrade for the structure.

All backfill shall be placed as specified herein.

Except where the pipe must remain exposed for force main leakage tests and subject to the provisions herein, the Contractor shall proceed as soon as possible with backfilling operations. Care shall be exercised so that the conduit will not be damaged or displaced. If the pipe is supported by concrete bedding placed between the trench wall and the pipe, the remainder of any bedding material shall be placed to 1 foot (0.3m) over the top of the conduit. The backfill above the concrete bedding shall not be placed nor sheeting pulled until at lest the minimum time after the placement provided by the optional classes of concrete designated in Section 17 for such concrete bedding.

Unless otherwise specified, the periods of time set forth in the following table after which the Contractor may place fill or backfill against or over the top of any cast-in-place structures are predicated on the use of concrete to which no admixture has been added for the purpose of obtaining a high early strength:

OPERATION	LOCATION	
	Against Sides of Structures (Days)	Over Top of Structure (Days)
Placement of Loose Backfill	5	21
Densification of Backfill	7	28

The Engineer may permit the use of admixtures or the use of additional cement in various parts of the structure in accordance with Section 17.

Rocks greater than 6 inches (150mm) in any dimension will not be permitted in backfill placed between 1 foot (0.3m) above the top of any pipe or box and 1 foot (0.3m) below pavement subgrade.

When the trench is wider than 3 feet (0.9m), rocks not exceeding 12 inches (0.3m) in greatest dimension, which originate from the trench, will be permitted in the backfill from 1 foot (0.3m) above the top of any pipe or box to 5 feet (1.5m) below the finished surface.

Rocks greater than 2½ inches (63mm) in any dimension will not be permitted in backfill placed within 1 foot (0.3m) of pavement subgrade.

Where rocks are included in the backfill, they shall be mixed with suitable excavated materials so as to eliminate voids.

Subject to the provisions specified herein, the material obtained from project excavations may be used as backfill provided that all organic material, rubbish, debris, and other objectionable materials are first removed. Broken portland cement concrete and bituminous type pavement obtained form the project excavations will be permitted in the backfill subject to the same limitations as rocks, or provided they are processed to meet all requirements of backfill materials.

Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, the voids remaining after the removal of the boulders shall be backfilled with suitable material and densified as approved by the Engineer.

The removal of all boulders or other interfering objects and the backfilling of voids left by such removals shall be at the expense of the Contractor and no

direct payment for the cost of such work will be made. The costs of such work shall be included in the prices bid for the various items of work.

Voids left by the removal of sheeting, piles and similar sheeting supports shall be immediately backfilled with clean sand which shall be jetted into place to ensure dense and complete filling of the voids.

After the placing of backfill has been started, the Contractor shall proceed as soon as practicable with densification.

18-5.2 Mechanically Compacted Backfill — Backfill shall be mechanically compacted by means of tamping rollers, sheepsfoot rollers, pneumatic tire roller, vibrating rollers, or other mechanical tampers. All such equipment shall be of a size and type approved by the Engineer. Impact-type pavement breakers (stompers) will not be permitted over clay, asbestos, cement, plastic, cast iron, or nonreinforced concrete pipe.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or improvements installed under the Contract. The Contractor shall make its own determination in this regard.

Material for mechanically compacted backfill shall be placed in lifts which, prior to compaction, shall not exceed the thickness specified below for the various type of equipment:

1) Impact, free-fall, or "stomping" equipment — maximum lift thickness of 3 feet (0.9m).

2) Vibratory equipment, including vibratory plate, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers — maximum lift thickness of 2 feet (0.6m).

3) Rolling equipment, including sheepsfoot (both vibratory and nonvibratory), grid, smooth-wheel (nonvibratory), pneumatic-tired (nonvibratory), and segmented wheels — maximum lift thickness of 1 foot (0.3m).

4) Hand-directed mechanical tampers — maximum lift thickness of 4 inches (100mm).

Mechanically compacted backfill shall be placed in horizontal layers of thickness (not exceeding those specified above) compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped or rolled until the specified relative

compaction has been attained.

18-5.3 Water Densified Backfill — As used in these specifications, flooding shall mean the inundation of backfill with water, puddled with poles or bars to ensure saturation of the backfill material for its full depth. Jetting shall be accomplished by the use of a jet pipe to which a hose is attached, carrying a continuous supply of water under pressure. Jetting will not be permitted in roadways.

All backfill to be densified by water shall be jetted.

The backfill shall be jetted in accordance with the following requirements:

1) The jet pipe shall consist of a minimum 1½-inch (38mm) diameter pipe to which a minimum 2-inch (50mm) diameter hose is attached at the upper end. The jet shall be of sufficient length to project to within 2 feet (0.6m) of the bottom of the lift being densified.

2) The Contractor shall jet to within 2 feet (0.6m) of the bottom of the lift and apply water in a manner, quantity and at a rate sufficient to thoroughly saturate the thickness of the lift being densified. The jet pipe shall not be moved until the backfill has collapsed and the water has been forced to the surface.

3) The lift of backfill shall not exceed that which can be readily densified by jetting, but in no case shall the undensified lift exceed 15 feet (4.5m).

4) Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at not cost to the Agency, import suitable material for jetting or densify the excavated material by other methods. The backfill shall be allowed to thoroughly drain until the surface of the backfill is in a firm and unyielding condition prior to commencement of any subsequent improvements. The Engineer may require the Contractor, at the contractor's expense, to provide a sump and pump to remove any accumulated water.

5) The Contractor shall make its own determination that jetting will not result in damage and any resulting damage shall be repaired at the Contractor's expense.

18-5.4 Compaction Requirements — Except as specified otherwise, trench backfill shall be densified to the following minimum relative compaction:

1) 90 percent Relative Compaction:

a) Between the pipe zone and the upper 3 feet (0.9m), measured from the pavement surface (or finish grade where there is no pavement) within native material.

b) Outside the traveled way, shoulders and other paved areas (or areas to receive pavement).

c) Under sidewalks.

2) 95 percent Relative Compaction:

a) In the upper 3 feet (0.9m), measured from the pavement surface (or finish grade where there is no pavement), within the existing or future traveled way, shoulders, and other paved areas (or areas to receive pavement).

b) Within engineered fill.

c) Where lateral support is required for existing or proposed structures.

18-5.5 Imported Backfill — If the Contractor is permitted to import material from a source outside the project limits for use as backfill, said materials shall be clean soil, free from organic material, trash, debris, rubbish, or other objectionable substances.

Whenever the specifications or plans permit the use of imported material for backfill, the Contractor shall deliver, not less than 10 days prior to intended use, a sample of the material to the Engineer. The sample shall have a minimum dry weight of 100 pounds (45 kg) and shall be clearly identified as to source, including street address and community of origin. The Engineer will determine the suitability, the minimum relative compaction to be attained, and the placement method.

Should the imported material not be substantially the same as the approved sample, it shall not be used for backfill and shall be removed from the Work site at the Contractor's expense.

The densification method for imported material authorized by the Engineer will be dependent upon its composition, the composition of the in-place soil at the point of placement, and the relative compaction to be obtained.

Testing of import material shall be at the Contractor's expense.

18-5.6 Transported Backfill — The Contractor may transport or back=haul

material to be used as backfill material from any portion or line of a project to any other portion or line of the same project, or from any project being constructed under one contract to any other project being constructed under that same contract. Such transported material shall be clean soil, free from organic material, trash, debris, rubbish, or other objectionable substances except that broken portland cement concrete or bituminous type paving may be recycled as backfill as specified.

18-5.7 Compaction Tests

Laboratory Maximum Density — The following method shall be used for compaction tests unless otherwise specified;

Compaction tests will be performed in accordance with ASTM D 1557 method "C" modified to use a 4-inch (100mm) diameter mold. If the material contains more than 10 percent of particles which are retained on a 3/4-inch (19mm) sieve, use ASTM D 1557 method "D" modified to use a 40 inch (100mm) diameter mold.

The Engineer may modify ASTM D 1557 at his option to calculate relative compaction based on adjusted laboratory maximum wet density calculated as follows:

$$DA = \frac{100\ Dm}{100 \pm Wa}$$

Da = Adjusted laboratory maximum wet density

Dm = Maximum wet density per ASTM D 1557

± Wa = Percent change in moisture content from field moisture to laboratory optimum moisture. Use minus when field moisture content is higher than laboratory optimum moisture content. Use plus when field moisture content is lower than laboratory optimum moisture content.

Field Density — Field density of soil shall be determined by any method, approved by the Engineer, which will accurately and consistently determine the density and moisture content of the soil.

18-5.8 Relative Compaction — The words Relative Compaction (Relative Density) shall mean the ratio of the field dry or wet density to the laboratory maximum dry or adjusted wet density, respectively, expressed as a percentage.

18-5.9 Sand Equivalent Test — This test is intended to serve as a field test to indicate the presence or absence of plastic fine material. The test shall be run in accordance with Calif. Test 217 or ASTM D 2419. When testing material containing asphalt, this test method shall be modified by drying the sample at a

temperature not exceeding 100°F (38°C).

18-5.10 Permeability Test — Permeability tests for granular soils will be performed in accordance with ASTM D 2434, using samples compacted to the specified field density.

18-6 Testing Pipelines

18-6.1 General — All leakage tests shall be completed and approved prior to placing of final asphalt surfacing or concrete surface improvements.

When leakage or infiltration exceeds the amount allowed by the specifications, the Contractor at its expense shall locate the leaks and make the necessary repairs or replacements in accordance with the Specifications to reduce the leakage or infiltration to the specified limits. Any individually detectable leaks shall be repaired, regardless of the results of the tests. Leakage tests shall be made on completed pipelines as follows:

1) Storm Drains — Not required unless called for on Plans or in Specifications.

2) Gravity Sanitary Sewers [24 inches (600mm) or less in diameter where difference in elevation between inverts of adjacent manholes is 10 feet (3m) or less] — Water exfiltration test or water infiltration test as directed. The Engineer may allow substitution of an air pressure test for the water exfiltration test.

3) Gravity Sewers [24 inches (600mm) or less in diameter where difference in elevation between inverts of adjacent manholes if greater than 10 feet (3m) — Air pressure test or water infiltration test as directed.

4) Gravity Sewers [greater than 24 inches (600mm) in diameter] — Air pressure test or water infiltration test as directed.

5) Pressure Sewers (force mains) — Water pressure test at 120 percent of maximum operating pressure.

18-6.2 Water Exfiltration Test — Each section of sewer shall be tested between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers. The pipe and manhole shall be filled with water to a point 4 feet (1.2m) above the invert of the sewer at the center of the upper manhole; or if groundwater is present, 4 feet (1.2m) above the average adjacent groundwater level.

If, in the opinion of the Engineer, excessive groundwater is encountered in the

construction of a section of the sewer, the exfiltration test for leakage shall not be used.

The allowable leakage will be computed by the formulae:

$E = 0.0001\ LD\sqrt{H}$ for mortared joints.
$E = 0.00002\ LD\sqrt{H}$ for all other joints.

Where:

L is length of sewer and house connections tested, in feet.
E is the allowable leakage in gallons per minute of sewer tested.
D is the difference in elevation between the water surface in the upper manhole and the invert of the pipe at the lower manhole; or if groundwater is present above the invert of the pipe in the lower manhole, the difference in elevation between the water surface in the upper manhole and the groundwater at the lower manhole.

The contractor shall, at its expense, furnish all water, materials and labor for making the required test. All tests shall be made in the presence of the Engineer.

18-6.3 Water Infiltration Test — The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water, and pumping of groundwater shall be discontinued for at least 3 days, after which the section shall be tested for infiltration.

The infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed by the formula in Subsection 18-6.2 where H is the difference in the elevation between the groundwater surface and the invert of the sewer at the downstream manhole.

Unless otherwise specified, infiltration will be measured by the Engineer using measuring devices furnished by the City.

18-6.4 Air Pressure Test — The Contractor shall furnish all materials, equipment and labor for making an air test. Air test equipment shall be approved by the Engineer unless otherwise provided on the plans or in the Specifications.

The Contractor may conduct an initial air test of the sewer mainline after densification of the backfill but prior to installation of the house connection sewers. Such tests will be considered to be for the Contractor's convenience and need not be performed in the presence of the Engineer.

Each section of sewer shall be tested between successive manholes by plugging and bracing all openings in the sewer mainline and the upper ends of all lower

lateral sewers. Prior to any air pressure testing, all pipe plugs shall be checked with a soap solution to detect any air leakage. If any leaks are found, the air pressure shall be released, the leaks eliminated, and the test procedure started over again. The Contractor has the option of wetting the interior of the pipe prior to the test.

The final leakage test of the sewer mainline and lower lateral sewers, shall be conducted in the presence of the Engineer in the following manner:

Air shall be introduced into the pipeline until 3.09 psi (20kPa) gage pressure has been reached, at which time the flow of air shall be reduced and the internal air pressure shall be maintained between 2.5 and 3.5 psi (17 and 24kPa) gage pressure for at least 2 minutes to allow the air temperature to come to equilibrium with the temperature of the pipe walls. Pressure in the pipeline shall be constantly monitored by a gage and hose arrangement separate from hose used to introduce air into the line. Pressure in the pipeline shall not be allowed to exceed 5 psi (34kPa) gage pressure.

After the temperature has stabilized and no air leaks at the plugs have been found, the air pressure shall be permitted to drop and, when the internal pressure has reached 2.5 psi (17kPa) gage pressure, a stopwatch or sweep-second-hand watch shall be used to determine the time lapse required for the air pressure to drop to 1.5 psi (10kPa) gage pressure.

If the time lapse (in seconds) required for the air pressure to decrease from 2.5 to 1.5 psi (17 to 10kPa) gage pressure exceeds that shown in the following table, the pipe shall be presumed to be within acceptance limits for leakage.

If the time lapse is less than that shown in the table, the Contractor shall make the necessary corrections to reduce the leakage to acceptance limits.

T	=	time in seconds for pressure to drop from 2.5 to 1.5 psi (17 to 10kPa) gage pressure.
D	=	inside diameter of pipe in inches (mm).

LOW PRESSURE AIR TEST FOR SEWERS

Time (T) in Seconds

Main Line				4" (100mm) House Connection					Main Line				6" (150mm) House Connection				
Dia.		Length		House Connection Length					Dia.		Length		House Connection Length				
In.	(mm)	ft.	(m)	0 ft. (0m)	100 ft. (30m)	200 ft. (60m)	300 ft. (90m)	400 ft. (120m)	In.	(mm)	ft.	(m)	0 ft. (0m)	100 ft. (30m)	200 ft. (60m)	300 ft. (90m)	400 ft. (120m)
		0	(0)	0	20	40	50	70			0	(0)	0	40	80	100	1(
		50	(15)	40	50	70	90	80			50	(15)	40	70	110	110	11
		100	(30)	70	90	100	100	90			100	(30)	70	110	120	110	11
	))	150	(45)	110	120	110	100	100	8	(200)	150	(45)	110	120	120	120	11
		200	(60)	140	120	110	110	100			200	(60)	140	130	120	120	12
		300	(90)	140	130	120	110	110			300	(90)	140	130	120	120	12
		400	(120)	140	130	120	120	110			400	(120)	140	130	130	120	12
		50	(15)	50	70	90	100	90			50	(15)	50	90	120	120	11
		100	(30)	110	130	120	110	110			100	(30)	110	140	130	130	12
	50)	200	(60)	170	150	140	130	120	10	(250)	200	(60)	170	150	140	140	13
		300	(90)	170	160	150	140	130			300	(90)	170	160	150	140	14
		400	(120)	170	160	150	150	140			400	(120)	170	160	150	150	14
		50	(15)	80	100	110	110	110			50	(15)	80	120	140	130	12
		100	(30)	160	170	150	140	130			100	(30)	160	170	150	140	14
	)0).	200	(60)	200	180	170	160	150	12	(300)	200	(60)	200	180	170	160	15
		300	(90)	200	190	180	170	160			300	(90)	200	190	180	170	16
		400	(120)	200	190	180	180	170			400	(120)	200	190	180	180	17
		50	(15)	120	140	160	140	130			50	(15)	120	160	160	150	14
		100	(30)	250	220	190	170	160			100	(30)	250	210	190	170	16
	75)	200	(60)	260	230	220	200	190	15	(375)	200	(60)	260	230	210	200	19
		300	(90)	260	240	230	220	210			300	(90)	260	240	220	210	20
		400	(120)	260	240	230	220	220			400	(120)	260	240	230	220	21
		50	(15)	180	200	190	170	150			50	(15)	180	220	190	170	16
		100	(30)	310	260	230	210	190			100	(30)	310	260	220	200	19
	50)	200	(60)	310	280	260	250	230	18	(450)	200	(60)	310	280	260	240	22
		300	(90)	310	290	280	260	250			300	(90)	310	290	270	260	24
		400	(120)	310	290	280	270	260			400	(120)	310	290	280	270	26
		50	(15)	240	260	230	200	180			50	(15)	240	260	220	200	18
		100	(30)	360	310	280	250	230			100	(30)	360	300	260	240	22
	25)	200	(60)	360	330	310	290	280	21	(525)	200	(60)	360	330	300	280	26
		300	(90)	360	340	320	310	300			300	(90)	360	330	320	300	29
		400	(120)	360	340	330	320	310			400	(120)	360	340	330	310	30
		50	(15)	320	320	270	240	210			50	(15)	320	310	260	220	20
		100	(30)	410	360	320	290	270			100	(30)	410	350	310	280	26
	00)	200	(60)	410	380	360	340	320	24	(600)	200	(60)	410	370	350	320	31
		300	(90)	410	390	370	360	350			300	(90)	410	380	360	350	33
		400	(120)	410	390	380	370	360			400	(120)	410	390	370	360	35
		50	(15)	400	370	310	280	250			50	(15)	400	350	290	260	23
		100	(30)	460	410	370	340	310			100	(30)	460	390	350	320	29
	75)	200	(60)	460	430	410	390	370	27	(675)	200	(60)	460	420	390	370	35
		300	(90)	460	440	420	410	390			300	(90)	460	430	410	390	38
		400	(120)	460	450	430	420	410			400	(120)	460	440	420	410	39
		50	(15)	490	420	360	310	280			50	(15)	480	390	330	290	26
		100	(30)	510	460	420	380	360			100	(30)	510	440	390	360	33
	50)	200	(60)	510	480	460	440	420	30	(750)	200	(60)	510	470	440	420	39
		300	(90)	510	490	470	460	440			300	(90)	510	480	460	440	42
		400	(120)	510	500	480	470	460			400	(120)	510	490	470	460	44
		50	(15)	560	460	400	350	320			50	(15)	560	440	370	320	29
		100	(30)	560	510	460	430	400			100	(30)	560	490	440	400	37
	25)	200	(60)	560	530	510	490	460	33	(825)	200	(60)	560	520	490	460	44
		300	(90)	560	540	520	510	490			300	(90)	560	530	510	490	47
		400	(120)	560	550	530	520	510			400	(120)	560	540	520	510	49
		50	(15)	610	510	440	390	360			50	(15)	610	480	410	360	32
		100	(30)	610	560	510	480	440			100	(30)	610	540	480	440	41
	00)	200	(60)	610	580	560	530	510	36	(900)	200	(60)	610	570	540	510	48
		300	(90)	610	600	580	560	540			300	(90)	610	590	560	540	52
		400	(120)	610	600	580	570	560			400	(120)	610	590	570	560	54
		50	(15)	660	560	490	440	390			50	(15)	660	530	540	390	35
		100	(30)	660	610	560	520	490			100	(30)	660	590	530	480	45
	975)	200	(60)	660	630	610	580	560	39	(975)	200	(60)	660	620	590	560	53
		300	(90)	660	640	620	610	590			300	(90)	660	640	610	590	57
		400	(120)	660	650	630	620	610			400	(120)	660	640	620	610	59
		50	(15)	710	610	540	480	430			50	(15)	710	580	490	430	39
		100	(30)	710	660	610	570	540			100	(30)	710	640	580	530	49
	(1050)	200	(60)	710	680	660	630	610	42	(1050)	200	(60)	710	670	640	610	58
		300	(90)	710	690	680	660	640			300	(90)	710	690	660	640	62
		400	(120)	710	700	680	670	660			400	(120)	710	690	670	650	64

18-6.5 Water Pressure Test — Preparatory to testing, the section of the pipeline to be tested shall be filled with water and placed under a slight pressure for at least 48 hours. The pipeline shall then be brought up to the test pressure specified and maintained on the section under test for a period of not less than 4 hours.

Accurate means shall be provided for measuring the quantity of water required to maintain full pressure on the line for the test period, which volume shall not exceed:

$$L = \frac{CN\,D\sqrt{P}}{1850}$$

Where:

L	=	Maximum allowable leakage in gallons per hour for section of pipeline tested.
N	=	Number of joints in length tests.
D	=	Diameter of pipe in inches.
P	=	Test pressure in psi.
C	=	1.0 for reinforced concrete pressure pipe with rubber joints, cylinder type.
C	=	3.0 for reinforced concrete pressure pipe with rubber joints, non-cylinder type.
C	=	0.50 for cast iron pipe with mechanical or rubber gasket joints and asbestos-cement pipe.
C	=	1.0 for other type of cast iron joints (caulked) and other types of pipe.

No leakage is allowed for welded steel pipe with welded joints.

18-6.6 Mandrel Test of ABS and PVC Pipe — Following the placement and densification of backfill and prior to the placing of final pavement, all mainline pipe shall be cleaned and then mandrelled to measure for obstructions (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel, with a circular cross section having a diameter of at least 95 percent of the specified average inside diameter, shall be pulled through the pipe by hand. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe.

All material, equipment and labor to perform the test shall be provided by the Contractor at no cost to the City.

18-6.7 Field Inspection for RTR and RPM Pipe Deflections — Installed pipe shall be inspected during construction to ensure that vertical deflections do not exceed

5 percent of the nominal ID. After the pipe had been joined and backfilled, inspection shall be as follows:

The first section of the pipeline that has been installed shall be inspected to ensure that the Contractor's installation procedures result in acceptable vertical deflections. Additional sections shall be inspected to ensure that the specified maximum deflection is not exceeded. If excessive deflections are encountered, the affected pipes shall be re-installed properly. For pipelines with ID's less than 24 inches (600mm), a mandrel shall be used to check deflections. For pipelines 24 inches (600mm) or greater, a method approved by the Engineer shall be used to test vertical deflections, provided the accuracy of the test procedure is ± 1/16 of an inch (2mm).

18-7 Manholes, Cleanouts and Appurtenances

18-7.1 General — These specifications apply to manholes, cleanouts and appurtenance materials.

The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer. Such inspection may be made at the place of manufacture, or on the job site after delivery, or at both places, and the materials shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Materials rejected after delivery to the job site shall be marked for identification and shall be removed from the job site at once. All materials which have been damaged after delivery, and prior to project acceptance by the Agency, shall be rejected, even if installed. The Engineer's judgement shall be final on the condition of the material. Contractor may attempt to make acceptable repairs on installed material(s), if the Engineer so agrees; however, Engineer's judgment on the acceptability of the repairs will be final, and if not satisfactory, the material shall be removed and replaced with satisfactory material entirely at the Contractor's expense. The Engineer may accept a certification indicating compliance with the specifications in lieu of inspection.

18-7.2 Manholes

18-7.2.1 Precast Manhole Sections — Precast manhole sections, where not otherwise modified in the Plans, shall conform to ASTM C478 and meet the following requirements:

1) The wall thickness shall not be less than 5 inches for 48-inch diameter barrel sections and 6 inches for 60-inch diameter barrel sections.

2) All sections shall be fully cured and shall not be shipped nor subjected to loading until the design compressive strength has ben reached.

3) Precast base sections shall have the base slab integral with the sidewalls. Precast base sections shall be used only if the invert plan and alignment of the sewer connections in the base exactly match the field measured angles between the connecting sewers.

18-7.2.2 Manhole Bases — Materials used in cast-in-place concrete manhole bases shall be in accordance with the applicable requirements of Section 17. At the option of the Contractor and with the approval of the Engineer, precast base sections with integral floor conforming to ATM C 478 may be used.

18-7.2.3 Manhole Extensions — Concrete grade rings for extensions shall be a maximum of 6 inches thick.

In general, manhole extensions will be used on all manholes in roads or streets or in other locations where a subsequent change in existing grade may be likely. Extensions will be limited to a maximum height of 12 inches.

18-7.2.4 Jointing Manhole Sections — Male and female joints of manhole sections shall be sealed with either a round rubber "O"-ring gasket or a preformed flexible joint sealant. The "O"-ring shall conform to ASTM C-443. The preforming flexible joint sealant shall conform with Federal Specification SS-S-00210, and be Kent Seal No. 2 as manufactured by Hamilton-Kent, Ram-Nek as manufactured by K.T. Snyder Company, or equal. The size of the preformed joint sealant shall be as recommended by the manufacturer of the precast manhole sections.

18-7.2.5 Placing Precast Manhole Sections — Precast manhole sections shall be carefully inspected prior to installation. Sections with chips or cracks in the tongue shall not be used. Ends of precast manhole sections shall be cleared of foreign materials.

The precast sections shall be installed in a manner that will result in a watertight joint. Rubber "O"-Ring gaskets or preformed flexible joint sealant shall be installed in strict conformance with the manufacturer's recommendations. Only pipe primer furnished by the gasket manufacturer will be approved. IF leaks appear in the manholes, the inside joint shall be caulked with non-shrink epoxy mortar to the satisfaction of the Engineer.

18-7.2.6 Manhole Channels — Manhole channels shall be constructed as shown on the Plans and with smooth transitions to ensure an unobstructed flow through manhole. All sharp edges or rough sections which tend to obstruct flow shall be removed. Where a full section of pipe is laid through a manhole, a neatly cut half pipe shall be laid to form the channel. The exposed edge of the pipe shall be completely covered with mortar. All mortar surfaces shall be troweled smooth. Breaking out the top half section after installation is not acceptable.

18-7.2.7 Flexible Joints — Flexible joints shall be provided not more than two feet form manhole walls. Pipes entering manholes shall be laid on firmly compacted base rock or bedding material as specified.

18-7.2.8 Covers — Castings shall conform to ASTM A 48, Class 35. The bearing surfaces of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking. The frames and covers shall be asphalt coated. Frames and covers shall be installed on top of manholes to positively prevent all infiltration of surface or groundwater into manholes. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown on the Plans. Set frames so tops of covers are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed. Provide a concrete manhole collar as shown on the Plans. Manhole covers shall be stamped with "Storm Drain" or "Sewer" as appropriate.

18-7.2.9 Manhole Over Existing Sewers — Manholes shall be constructed over existing operating sewer lines at locations shown. Excavation shall be as specified hereinbefore.

Flow through existing sewer lines shall be maintained at all times and shall be controlled. New concrete and mortar work shall be protected for a period of one day after concrete has been placed.

The new base shall be constructed under and around the existing sewer as specified herein.

The top half of the existing pipe shall be neatly removed within the new manhole, the edges covered with mortar, and troweled smooth.

18-7.2.10 Connection to Existing Manholes — Sewers shall be connected to existing manholes. Provide all diversion facilities and perform all work necessary to maintain sewage flow in existing sewers during connection to the manhole such that overflows or backup into house laterals do not occur. Break through existing manhole bases and grout as necessary to provide smooth flow into and through existing manholes. The connection

procedure shall be as follows:

1) Break through an opening approximately 6 inches in diameter greater than the outside diameter of the pipe.

2) Roughen the surface of the pipe to be encased in the wall by sandblasting or other means. Plastic pipes shall be provided with a waterstop gasket.

3) Coat the surface of the existing wall edge and the area of the pipe to be encased with an epoxy bonding agent such as Sikadur Hi-Mod Epoxy Adhesive, as manufactured by the Sika Chemical Corporation, Concessive 1001-LPL, as manufactured by Adhesive Engineering Co., or equal. The grout must be placed while the bonding agent is still tacky.

4) Fill the space between the pipe and the existing wall with a non-shrink, non-metallic grout as manufactured by Master Builders, U.S. Grout Corp. (5 Star), or equal. The grout shall have 0.00 percent shrinkage when tested according to the requirements of ASTM C-827 and Fed. Spec. CRD-C 621.

5) The pipe shall be shored in place so that there is not possibility of movement during and after the grouting operation. The shoring shall not be removed until the grout has attained a compressive strength of 3,000 psi or higher.

<u>18-7.2.11 Vacuum Testing</u> — All project manholes shall be vacuum tested. Vacuum test procedures and requirements shall be as follows:

1) After completion of the manhole barrels but prior to backfilling and grade ring installation, all openings in the manhole are sealed with plugs and a rubber ring "donut" type plug inserted inside the opening of the cone.

2) A small vacuum pump is attached to a hose connected to the plug and 4 psi of vacuum applied.

3) The vacuum is permitted to stabilize at 3.5 psi for one minute, then the test is begun.

4) The manhole must maintain vacuum such that no greater than 0.5 psi of vacuum is lost during the specified test period.

5) The specified test period is as follows:

Manhole Depth (Ft.)	Test Period (Min.)
0-5	4.5
5-10	5.5
10-15	6.0
Greater than 15	6.5

6) Manholes that fail the test shall be patched as required and re-tested.

7) A vacuum regulator shall be provided on the vacuum pump such that no greater than 10 psi can be applied to the manhole during the test. All manholes that do not meet the leakage test, or are unsatisfactory from visual inspection shall be repaired to the satisfaction of the Engineer.

18-7.2.12 Hydrostatic Testing — At the option of the Contractor and with the approval of the Engineer, hydrostatic testing may be substituted for vacuum testing. The test shall consist of plugging all inlets and outlets and filling the manhole near the top with water. Leakage in each manhole shall not exceed 0.1 gallon per hour per foot of head above the invert. All manholes that do not meet the leakage test, or are unsatisfactory from visual inspection, shall be repaired to the satisfaction of the Engineer.

18-7.3 Sewer Cleanouts

18-7.3.1 General — Cleanout construction shall be as shown on the Plans. The cleanout shall be the same material as the mainline sewer.

18-7.3.2 Pipe and Fittings — Pipe fittings, including material for drop connections at the manhole, shall be the type and dimensions as shown on the Plans or as specified in the Special Provisions for the Project.

18-7.3.3 Cleanout Frames and Covers — Cleanouts shall be as shown on the plans or the Standard Details and shall be the same type of material as approved for use in main sewer or house connection sewer construction. Castings shall conform to ASTM A48, Class 30B. The bearing surfaces of the frames and covers shall be machined and the cover shall eat firmly into the frame without rocking. The frames and covers shall be asphalt coated.

18-8 Sewer Lateral Rehabilitation

18-8.1 General — Construction shall conform to the following subsections and modifications of the Public Works Specifications:

Active lower lateral sewers, as indicated on the contract drawings, shall be replaced, sliplined, or otherwise rehabilitated. Lateral work shall include installation of a two-way cleanout between the sidewalk and the curb.

18-8.2 Abandoned House Connection Sewers — The Contractor shall be responsible for determining if a house connection sewer is abandoned. An abandoned house connection sewer shall be defined as a house connection sewer that does not connect to a house sewer (upper lateral). Abandoned house connection sewers shall be disconnected from the sewer main and the sewer main connection fitting shall be replaced with a straight piece of pipe similar to the existing sewer and approved fittings to make a watertight and airtight replacement. The abandoned house connection sewer shall be removed completely at lest 2 feet from the sewer main and the removed pipe shall be disposed of by the Contractor. The remaining house connection sewer shall be plugged with the Class C grout.

18-8.3 Initial Lateral Inspection — The initial work of the lateral rehabilitation program shall include televising the entire building lateral (upper and lower) and pulling a sizing pig through the lateral. The results of the initial work shall be provided to the Engineer who will determine if the lateral will be:

1) Replaced.
2) Sliplined.
3) Combination of replacement and sliplining.
4) No rehabilitation required. As a minimum, two-way cleanouts near the property line will be installed if not present.

The Engineer reserves all rights and will make the final determination of the rehabilitation method of the lateral. Payment for lateral rehabilitation shall be based on the unit prices provided for lateral inspection, lateral replacement, lateral sliplining, and installation of two-way cleanouts and standard cleanouts.

18-8.4 Television Inspection

18-8.4.1 General — Video recordings shall be made of the television inspections and one copy each shall be submitted to the Engineer. One copy of the printed inspection log shall also be submitted to the Engineer.

Television equipment shall include a color television camera, television monitor, cables, power source, lights and other equipment. The television camera shall be specifically designed and constructed for operation in

connection with sewer inspection. The camera shall be operative in 100 percent humidity conditions. Lighting for the camera shall minimize reflective glare. Lighting and camera quality shall be suitable to provide a clear, in-focus picture of the entire inside periphery of the sewer pipe for all conditions encountered during the work. Focal distance shall be adjustable through a range of from 6 inches to infinity. The remote reading footage counter shall be accurate to two-tenths of a foot over the length of the particular section being inspected and shall be mounted over the television monitor. The camera, television monitor and other components of the video system shall be capable of producing a minimum 350 line resolution color video picture. The camera shall be mounted on skids suitably sized for each pipe diameter to be investigated.

18-8.4.2 Installation — The camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition but in no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pas through the entire manhole section, the Contractor shall reset up his equipment in a manner so that the inspection can be performed from the new manhole. If, again, the camera fails to pass through the entire section, the Contractor shall, with Engineer's approval, remove the obstruction by excavation and proceed with the television inspection. The Engineer shall determine based on the method of rehabilitation identified for the sewer reach, how and if the exposed line shall be fixed.

18-8.4.3 Documentation of the Television Results

1) Television inspection logs shall be typed or printed location reports acceptable to the Engineer. One copy shall be maintained on-site by the Contractor throughout the project. Printed location reports shall clearly show the location, in relation to adjacent manholes, of each source of infiltration discovered. In addition, other data of significance including the locations of buildings, suspected sump pump flows and house service connections, joints, unusual conditions, roots, storm sewer connections, collapsed sections, presence of scale and corrosion and other discernible features shall be recorded and a copy of such records shall be submitted to both the agency and the Engineer. Voice recordings on the videotapes shall make brief and informative comments on the sewer conditions.

2) The measurement of distance to defects is critical in confirming the locations of areas to be excavated shown on the Plans. The Contractor shall use the following procedure in performing the television inspections:

a. A marker or flag shall be attached to the top of the camera yoke.

b. The measurements recorded in the log shall be zeroed in alignment with the marker rather than the camera itself, as is the usual practice.

3) Color videotape recordings of the internal sewer inspection shall be made by the Contractor. One copy of the videotape in a format approved by the City shall be submitted. The tab to prevent accidental erasure shall be removed from the cassette before submittal.

Videotape recording playback shall be the same speed that it was recorded. Slow motion or stop motion playback features may be supplied at the option of the Contractor. Title to the tape will remain with the Agency. The Contractor shall have all videotapes and necessary playback equipment readily accessible for on-site review by the Engineer during the project.

Tapes shall include the following information:

a. Data view:

- Report No.
- Date of TV inspection
- Upstream and downstream manhole numbers
- Current distance along reach (tape counter footage)
- Printed labels on tape container and tape cartridge with location information, date, format information, and other descriptive information

b. Audio:

- Date of TV inspection
- Verbal confirmation of upstream and downstream manhole numbers
- Verbal description and location of each defect
- Verbal description and location of each service connection

18-8.4.5 Payment — Payment for preconstruction video-inspection of reaches which have been previously video-inspected is included in the unit cost for the rehabilitation method performed. Payment for preconstruction video-inspection of reaches not previously televised will be based on the unit bid price per linear foot of sewer. Payment for post-construction video-inspection of reaches is included in the unit cost for the rehabilitation method performed.

18-8.5 Determination of Suitability of Sliplining — A sizing pig shall be pulled through the existing sewer to ensure that there are no obstructions. The minimum size of pipe for sliplining shall be three inch inside diameter.

The sizing pig shall comprise a pulling head made of steel, attached to a piece of pipe of the same size and material as the liner. A flexible pulling head is not acceptable. A cable shall be attached to the tail of the pig to allow withdrawal if necessary.

If the size pig is scored to a depth equal to or greater than 10 percent of the liner thickness, insertion of the liner shall not be permitted.

18-8.6 Lateral Replacement

Lateral Materials — Lateral materials shall be Polyvinyl Chloride Pipe (PVC) SDR 21 in accordance with ASTM D2241; or Polyethylene Pipe (PE) SDR 21 in accordance with Section 18.3.6 of the Standard Specifications or Vitrified Clay Pipe (VCP), extra strength, bell and spigot rubber gasket joint, in accordance with ASTM C700.

Laterals shall be 4 inch minimum diameter or shall match the size of the existing lateral, whichever is larger.

After replacement, the laterals shall be reconnected to the main sewer line and connected to new cleanouts. Connections to new cleanouts shall be made with mechanical joints or as otherwise directed by the Engineer

Construction of laterals shall conform to Section 18 of the Standard Specifications. Maximum deflection with one fitting shall not exceed 22-1/2 degrees. Long-radius bends shall be used for changes in direction except as otherwise allowed by the Engineer.

The Engineer shall determine the line and grade of replacement laterals. Replacement laterals shall be constructed with a minimum number of changes in grade and direction as possible, regardless of the alignment of the existing lateral. Unless otherwise directed, Contractor shall lay the pipe on a uniform grade between the sewer main and the upstream end of the lateral. Minimum slope

shall be 1/4 inch per foot unless otherwise permitted by the Engineer.

18-8.7 Sliplining

18-8.7.1 General — The installation of the polyethylene solid wall sewer pipe liner shall conform to this Standard Specification and to ASTM Specifications F585, D2657, and D2321.

18-8.7.2 Liner Handling — The liner shall be handled with care to minimize the possibility of it being cut, kinked, gouged or otherwise damaged. Damage will be assessed in accordance with ASTM F585. Ropes, fabric, rollers, or rubber-protected slings and straps may be used when handling the liner. The use of cables, chains or hooks will not be permitted. Liner shall be stored on level ground or surface, free of sharp objects which could cause damage. The liner shall be pulled on rollers, or otherwise protected from damage during the pulling operation. Sections of the liner damaged, cut, or gouged shall be repaired by cutting out the section of pipe containing the damaged areas and then rejoining the liner sections as specified herein.

18-8.7.3 Liner Installation — The Contractor shall insert the liner into the pipe in accordance with ASTM F585, the manufacturer's recommendations, and the shop drawings. A thermal crayon shall be used for providing a fail-safe mechanism for the thermometer to assure proper fusion temperature.

18-8.7.4 Joining Systems

a. Butt Fusion. Sections of the liner shall be joined into continuous lengths on the job site at ground level above the trench. Joining shall be accomplished by butt fusion performed in accordance with the liner manufacturer's recommendations and pertinent sections of ASTM D2657.

Butt fusion shall be accomplished by aligning the sections to be joined in a fixture, softening the ends by heat and then joining them together under controlled pressure. All fusion must be done by personnel trained by the pipe supplier and using tools recommended by the pipe supplier and approved by the Engineer. Joints between pipe sections shall be smooth and internal fusion beads in no case shall be greater than 0.10 inch.

Two joints, selected at random by the Engineer shall be tested in compliance with ASTM D638 to assure that the tensile strength of

the joints equals or exceeds that of the material joined. The specimens to be tested shall be obtained by cutting the liner pipe at least 12 inches on each side of the field-made joint. The ends may then be rejoined and work may proceed.

b. Mechanical Joints. Where the polyethylene liner is reconnected to the sewer main stubout and to the cleanout, and where the liner must be joined in the trench as approved by the Engineer, the polyethylene pipe shall be joined together with a stainless steel full encirclement clamp.

Clamps shall be 316 stainless steel with a rubber sleeve and shall be of adequate length to protect against pull out. Minimum lengths of clamps are listed below.

Approximate Outside Diameter of the Liner Pipe (inches)	Minimum Length of Clamp (inches)
3.5	7.5
4.5	10
5.5	10

18-8.7.5 Insertion of Liner Pipe — The top of the lateral shall be exposed to the springline for the full length of the access pit prior to the removal of the crown portion. All sharp edges shall be removed from the exposed pipe opening.

18-8.7.6 Stress and Strain Relief of Polyethylene Liner Pipe — Stress and strain relief shall be provided for as part of lateral sliplining.

18-8.7.7 Sealing Entire Annular Space Between Liner and Pipe Wall — The Contractor shall grout the entire annular space between the liner and pipe wall with Class "E" mortar specified in Subsection 201-5 of the Public Works Specifications. The grout shall have a water/solids ratio of 0.35 to 0.40. The workability shall be measured by the Corps of Engineers test method C 611; and shall satisfy a range of 10 to 30 seconds.

Grouting procedure shall conform to Subsection 306-3.8 of the Public Works Specifications. The grout shall be supplied to the pump continuously and shall be placed in such a manner that it will not place any undue stresses on the polyethylene liner.

The Contractor shall utilize special procedures including pressure relief

valves on the grout pumping apparatus, as necessary, to ensure that the liner does not rise off the existing sewer invert nor is deflected out-of-round during placement and curing of the grout. The use of water to fill the liner prior to grouting is an acceptable method to prevent flotation. If the liner is not filled with water, the grout pressure at the point of injection shall not exceed 7 psi.

Grouting shall be considered complete when the quantity of grout pumped is between 90 an 120 percent of the annular space volume.

18-8.7.8 Cleanout Installation — All upper laterals that are rehabilitated and all lower laterals that are replaced shall have two-way cleanouts as shown on the Plans. Existing cleanouts shall be removed and shall be replaced with new cleanouts.

Temporary reconnection or pumping shall be done as necessary to maintain service during rehabilitation of laterals. Cleanouts shall not be installed until laterals have been rehabilitated.

If the lateral is sliplined, the clean out shall be either PVC pipe or polyethylene liner pipe as approved by the Engineer. All cleanout plumbing shall have an inside diameter within 15 percent of the liner inside diameter. Transition from house plumbing to the cleanout fitting shall be made with a ductile iron or polyethylene fabricated reducer.

Cleanouts shall be constructed as shown in the Standard Details. If the lateral is replaced, the cleanout shall be the same dimension and material as the replacement sewer pipe. All joints shall be made watertight and airtight. The Contractor shall submit to the Engineer shop drawings of all materials used in constructing cleanouts.

18-9 Control of Existing Flows

18-9.1 Sewer Flow Control — Flow in the existing sewers shall not be restricted or dammed for any period of time without the approval of the Public Works Director. All manhole connections shall be constructed while sewage is flowing in the existing pipe. All rerouting and/or bypass pumping of existing flows necessary to make the required modifications shall be made at the Contractor's expense. The Contractor must advise the Engineer of plans for diverting sewage flow and obtain Engineer's approval before starting. Engineer's approval shall not relieve Contractor of the responsibility for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.

Bypassing of untreated wastewaters to surface water or drainage courses will not be permitted. All wastewater facilities will remain in continuous and full

operation during construction.

Where temporary pumps are required to bypass any sewage across traffic lanes, the discharge lines crossing the traffic lanes shall be buried a minimum of 4 inches below the pavement surface and backfilled with temporary asphalt concrete surfacing.

18-10 Trench Resurfacing

18-10.1 Temporary Resurfacing — Unless permanent pavement is placed immediately, temporary bituminous resurfacing 2 inches (50mm) thick shall be placed and maintained at locations determined by the Engineer wherever excavation is made through pavement, sidewalk or driveways. In sidewalk areas the temporary bituminous resurfacing shall be at least 1 inch (25mm) thick; in all other areas it shall be at least 2 inches (50mm) thick. At major intersections and other critical locations, a greater thickness may be ordered. Temporary resurfacing shall be placed as soon as the condition of the backfill is suitable to receive it and shall remain in place until the condition of the backfill is suitable for permanent resurfacing.

The bituminous mixture used for temporary trench resurfacing shall conform to Class D, Fine, Type #, Asphalt Concrete, and of bitumen conforming to grade SC-800 liquid asphalt.

The mixture may be furnished from stockpiles or directly from the plan mixer and may be laid cold, at the option of the Contractor. The resurfacing shall be placed, rolled, maintained, and removed and disposed of by the Contractor.

18-10.2 Permanent Resurfacing — Unless otherwise shown on the Plan or in the Specifications, all surface improvements damaged or removed as a result of the Contractor's operations shall be reconstructed by the Contractor to the same dimensions, except for pavement thickness, and with the same type materials used in the original work. Trench resurfacing shall be 1 inch (25mm) greater in thickness than existing pavement, or 3 inches, whichever is greater.

18-11 Measurement & Payment — Pipe and conduit shall be measured along the longitudinal axis between the ends as laid and shall include the actual pipe in place and shall not include the inside dimensions of structures. House connection sewers shall be measured from the inside face of the "Y" of the main to the inside face of conduit or structure to which connection is being made.

The price per linear foot (m) for pipe and conduit in place shall be considered full compensation for all wyes, tees, bends, monolithic catch basins, and special appurtenances as shown on the Plans; the removal of interfering portions of existing sewers, storm drains, and improvements; the closing or removing of abandoned conduit

and structures; the excavations of the trench; the control of ground and surface waters; the preparation of subgrade; placing and joining pipe; backfilling the trench; permanent resurfacing; and all other work (excluding temporary resurfacing) necessary to install the pipe or conduit, complete in place.

Payment for structures such as manholes, clean outs, junction structures, lamp holes, and catch basins shall be made at the price bid for each structure and shall be full payment for each structure complete in place, including excavation, backfill, constructing inverts, furnishing and installing castings, restoration of the street surface and all other work, excluding temporary resurfacing, necessary to complete the Work.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 19

Landscape Irrigation

19-1 General

19.1.1 Scope

Furnish all labor, tools, equipment, materials, transportation, and perform all operations necessary for the proper execution and completion of all irrigation work in accordance with the Drawings and Specifications. The work shall include, but not necessarily be limited to, trenching and backfill, water and electrical points of connection, backflow preventers, controllers, sleeves, conduits, main lines, lateral lines, remote control valves, pressure reducing valves, hose bibs, quick coupler valves, gate valves, risers, heads, emitter flush valves, emitters, emitter line and tubing, testing, adjustment of heads, maintenance and providing as-built drawings.

Coordinate installation of irrigation system with layout and installation of the plant materials to insure that there will be complete and full irrigation coverage of planting in accordance with these drawings, specifications and contract documents. Irrigation system shall be installed and tested prior to installation of plant material.

The "Model Water Efficient Landscape Ordinance" by the State Departmetn of Water Resources shall apply.

19-1.2 Related Work

Section 020: Landscaping

19-1.3 Applicable Publications — The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Federal Specification (Fed. Spec.):

WW-H-001220	Head, Sprinkler, (Underground Connection)
WW-V-51F	Valve, Angle, Check and Globe, Bronze; 125-, 150-, and 200-pound, Threaded End, Flange Ends, Solder Ends, and Brazed End, for Land Use.
WW-V-54D	Valve, Gate, Bronze (125-, 150-, and 200 pound, Int Am 3 Screwed, Flanged, Solder End, for Land Use)

B. American National Standards Institute (ANSI) Publications:

B2.1-68	Pipe Threads (Except Dryseal) Specifications, Dimensions and Gauging for Taper and Straight Pipe Threads, Including Certain Special Application
B16.3-77	Malleable Iron Threaded Fittings, Class 150 and 300.

C. American Society for Testing and Materials (ASTM) Publications:

A53-81A	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A120-81	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless for Ordinary Uses.
B61-80	Steam or Valve Bronze Castings
B62-80	Composition Bronze or Ounce Metal Castings
D1785-76	(Poly Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D2241-80	(Poly Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
D2287-81	Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
D2464-76	Threaded (Poly Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
D2466-78	(Poly Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

D2467-76A	Socket-Type (Poly Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D2564-80	Solvent Cements for (Poly Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
D2774-72	Underground Installation of Thermoplastic (R1978) Pressure Piping
D2855-81	Making Solvent-Cemented Joints with (Poly Vinyl Chloride) (PVC) Pipe and Fittings.

D. American Society of Sanitary Engineering (ASSE) Publications:

1013-80	Reduced Pressure Backflow Preventers
1003-1	Pressure Reducing Valve

E. American Water Works Association (AWWA) Publications:

C506-78	Standard for Backflow Prevention Devices-Reduced Pressure Principle and Double Check Valve Types
C601-81	Standard for Disinfecting Water Mains
C800-66	Standard for Threads for Underground Service Line Fittings - with Appendix on Collected Standards for Service Line Materials.

F. International Association of Plumbing and Mechanical Officials:
Uniform Plumbing Code - 1979 (UPC)

G. National Fire Protection Association (NFPA) Publications:

NFPA 24	Standard for Outside Protection - 1977
NFPA 70	National Electrical Code - 1981

H. National Sanitation Foundation (NSF) Publications:

STD No. 14-78	Plastic Piping System Components and Related Material

I. Plastic Pipe Institute (PPI) Publication:

PPI TN8	Making Threaded Joints with Thermoplastic Pipe and Fittings (August 1973)

19-1.4 Submittals

A. The following items shall be submitted to the City for review:

1. Materials List
2. Shop Drawings
3. Manuals
4. As-built Drawings
5. Controller Charts

B. Controller Charts

1. As-built drawings shall be approved by the City before controller charts are prepared.

2. Provide one controller chart for each controller controlling this area.

3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow.

4. The chart is to be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.

5. The chart shall be a blackline or blueline ozalid print and a different color shall be used to indicate the area of coverage for each station.

6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum of 10 mils.

7. These charts shall be completed and approved prior to final inspection of the irrigation system.

19-1.5 Explanation of Drawings

A. Due to the scale of the drawings, it is not possible to indicate all off-sets, fittings, sleeves, etc. which may be required. The Contractor shall carefully

investigate the structural and finished conditions affecting all of this work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between existing and contract installation of irrigation systems, planting including existing trees and shrubs, architectural features, above and below grade utilities, hydrants, and drainage system.

The Contractor shall be responsible for modifications to the irrigation system to prevent blockage of sprinkler irrigation patterns; to prevent overspray and excessive runoff onto walkway and parking areas; and to provide full irrigation coverage to the planted areas.

Modifications shall be reviewed by the City prior to installation. All costs associated with modifications to the irrigation system and verification of utility and underground structure locations including potholing shall be considered as included in the Contract Prices paid for the various items of work and no additional compensation will be made therefor. Damage to utility lines, underground structures, etc., shall be repaired at the Contractor's expense to the satisfaction of the City.

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

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering or that will affect layout of the planting. Such obstructions or differences should be brought to the attention of the City. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

19-1.6 Equipment to be Furnished

A. Supply as a part of this contract the following tools:

1. Two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.

2. Two (2) keys for each automatic controller.

3. Two (2) keys for each controller enclosure.

4. Six (6) quick coupler keys and matching hose swivels for each type of quick coupling valve installed.

5. Two (2) keys for the hose bib.

6. The above mentioned equipment shall be turned over to the City at the conclusion of the project. Before final inspection can occur, evidence that the City has received material must be shown by the Contractor.

19-1.7 Handling of PVC Pipe and Fittings — The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

19-1.8 Verification of Site Conditions & Surveys

Contractor shall, to the satisfaction of the City, lay out the work from the plans and shall establish all bench marks, monuments, lines and levels necessary for the construction covered by this contract unless otherwise specified herein. The Contractor shall employ a qualified land surveyor registered in the State of California, to lay out the work and to verify the lines and elevations as the work progresses. All dimensions shall be checked against existing conditions and discrepancies reported immediately to the City. Contractor shall be responsible for establishment of basic layout of entire area to the satisfaction of the City prior to beginning any portion of construction. Any discrepancies arising from preliminary layout shall be resolved prior to construction. During the progress of construction, the Contractor shall provide surveying service as necessary, or upon request of the City, to assure that the construction complies with the plans and specifications.

Prior to installation, Contractor shall carefully check all grades to satisfy himself that the work may proceed.

19-2 Materials

19-2.1 General — Use only new materials of brands and types noted on the drawings, specified herein, or approved equals.

19-2.2 PVC Pressure Main Line Pipe, Fittings and Fabrication Materials

A. Pressure main line piping for sizes 1-1/2" and larger, shall be Ring-Tite PVC Class 200.

B. Ring Tite Pipe: Pipe shall be made from an NSF approved Type I, Grade I, PVC compound conforming to ASTM specification D1784. All pipe must meet requirements as set forth in Federal Specifications PS-22-70, with an appropriate standard dimension (S.D.R.).

C. Field fabrication of ring-tite fittings will not be allowed. Use molded ring-tite type fittings for PVC as manufactured by Flo Control or approved equal.

D. Pressure main line piping for sizes 2" and smaller shall be PVC Schedule 40 with solvent-weld joints.

E. Solvent Weld Pipe: Pipe shall be made from NSF approved Type I, Grade PVC compound conforming to ASTM specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70.

F. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.

G. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.

H. All PVC pipe must bear the following markings:

1. Manufacturer's name
2. Nominal pipe size
3. Schedule of class
4. Pressure rating in P.S.I.
5. NSF (National Sanitation Foundation) approval.
6. Date of extrusion

I. All fittings shall bear the manufacturer's name or trademark, material designation, size applicable I.P.S. schedule and NSF seal of approval.

19-2.3 PVC Non-Pressure Lateral Line Piping

A. Non-pressure buried lateral line piping shall be PVC Type 1120 - Class 315 for 1/2 inch and Class 200 for 3/4 inch and larger. Joints to be solvent welded.

B. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM specification D1784. All pipe must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.

C. Except as noted in 19-2.2 A and B this section, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in section 19-2.2 of this section.

19-2.4 Quick Coupling Valves

A. Quick coupling valves shall have a brass, two piece body, designed for working pressure of 150 P.S.I. operable with quick coupler. Key size and type shall be as shown on the plans.

B. Quick coupling valves shall be installed from 6″ to 12″ from nearest adjacent paved area.

19-2.5 Hose Bibs

A. Hose bibs shall be brass construction with removable key handle as indicated on plans.

19-2.6 Gate Valves

A. Gate valves 3″ and larger shall be iron body, bronze mounted, double discs, parallel seats with pin disc spreader mechanism and shall conform to the specification of the American Water Works Association.

B. Gate valves 3″ and larger shall have 2″ square operating nut, with arrow cast in metal indicating direction of opening.

C. Gate valves 3″ and larger shall have ends compatible with pipe in which they are being installed.

D. Gate valves 3″ and larger shall be similar to those manufactured by Kennedy Valve Mfg. Co., or approved equal.

E. Gate valves 2-1/2″ and smaller shall be bronze construction, screwed connections, equipped with operating wheel, and similar to those manufactured by Stockham Valve Co., or equal.

F. All gate valves shall be installed per installation detail.

19-2.7 Control Wiring

A. Connections between the automatic controllers and the electrical control valves shall be made with single strand, direct burial solid copper wire AWG-U.F., 600 volt. Install in accordance with the valve manufacturer's

specifications and wire chart. In no case shall wire size be less than #14 gauge.

B. Control wires shall have an insulating jacket with a color that is unique for each controller. The common wire shall have a white insulating jacket with a stripe of color to match the control wire it serves. The spare wire shall have an insulating jacket with a color that is different from all control or common wires.

C. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.

D. All wiring shall be run inside a conduit. Conduit for conductor wire shall be as specified by Section 19-2.13.

E. An expansion curl shall be provided within three (3) feet of each wire connection and at least every 100 feet in length. Expansion curls shall be formed by wrapping at least five turns of wire around a one inch diameter pipe, then withdrawing pipe. Expansion curl shall be of sufficient length at each splice connection at each electric control valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires.

F. All splices shall be made in a valve or splice box with 3M-DBY wire splice pack, DS-400 Dri-Splice Wire, or approved equal. Use one splice per connector sealing pack.

G. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the City.

19-2.8 Automatic Controllers

A. Automatic controllers shall be of size and type shown on the plans, Rainbird, or approved equal.

B. Final location of automatic controllers shall be approved by the City.

C. Unless otherwise noted on the plans, the 120 volt electrical power to the automatic controller location is to be furnished by a licensed electrical subcontractor and not by the irrigation subcontractor. The final electrical hook-up shall be the responsibility of the irrigation contractor.

D. Label each new control line wire at controller. See installation section of these specifications.

E. All controllers shall be equipped with a rain sensing override device.

19-2.9 Electrical Control Valves

A. All electrical control valves shall be as listed on the drawings.

B. All electrical control valves shall have a manual flow adjustment.

C. Provide and install one control valve box for each electric control valve. Box to be lockable.

D. Label control line wire at each valve. See installation section of these specifications.

19-2.10 Control Valve Boxes

A. Use 10″ round valve box with extension and bolt down cover for all gate valves and quick coupling valves, Carson Industries 910-12B or approved equal. Box to be bolt lockable.

B. Use 11 3/4″ x 17″ x 12″ rectangular box and bolt down cover for all electrical control valves, Carson Industries 1419-12B or approved equal. Box to be bolt lockable.

19-2.11 Sprinkler Heads

A. All sprinkler heads shall be Champion, approved equal, or as listed on the drawings.

B. Spray heads shall have a manual screw flow adjustment.

C. Riser units shall be fabricated in accordance with the details shown on the plans.

D. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

E. All sprinkler heads shall be brass and of the same type shall be by the same manufacturer.

19-2.12 Sleeves

A. All water lines installed under paving or through architectural features shall be installed in Class 200 PVC pipe. Size as required, unless specified otherwise on Drawings.

B. Sleeves shall extend 12″ beyond edges of pavement.

C. There shall be no ring tite couplings inside of sleeves.

D. Where length of sleeve exceeds 15' in length and where ring tite pipe is designated to be installed at sleeve location, substitute class 315 solvent weld pipe and Schedule 40 solvent weld fittings inside sleeve.

E. Coordinate sleeve and pipe locations with other trench work and paving installations prior to construction.

19-2.13 Conduit

A. All low voltage electrical wire shall be installed in schedule 40 PVC gray conduit. Size as required unless specified otherwise on the drawings. 120 volt electrical wires shall be installed in conduit in accordance with applicable codes and regulations.

B. Conduit shall extend into splice boxes, or other enclosures. Where splice box is located in paved area, provide capped stub-out conduit piece extending out from box at least 12″ into planting bed area.

C. Splice boxes which must be installed in paved areas are to be concrete valve boxes approved by the City. Boxes shall not be installed in streets, driveways, or in locations where there is vehicular traffic.

D. Coordinate conduit locations with other trench work and paving installations prior to construction.

19-2.14 Backflow Prevention Device

19-2.14.1 Reduced Pressure Type Backflow Preventer — ASSE 1013, backflow preventer shall be of the reduced pressure principle type conforming to the applicable requirements of AWWA C506. A certificate of Full Approval or a current Certificate of Approval shall be furnished for each design, size, and make of backflow preventer being provided for the project. The certificate shall be from the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval will not be acceptable in lieu of the above.

Reduced pressure type backflow preventer shall be Febco 825Y, Wilkins Model 575R, or approved equal in accordance with the Details.

The backflow preventer shall be installed in an enclosure as detailed on the plans.

19-2.14.2 Double Check Valve Assembly — Double check valve assembly shall be a Febco No. 805, Hershey No. 1 or approved equal, in accordance with the Details. Install check valve in a concrete box with lockable reinforced concrete lid.

19-2.15 Flushing End Plug

A. Provide and install one flushing end plug at the end of each lateral in the drip irrigation system shown on the plans.

B. Install flushing end plug in a Carson Box No. 910-12B.

19-2.16 Pressure Reducing Valve

A. Pressure reducing valve shall be Wilkins Model 90 - 3/4", or approved equal. Discharge pressure is to be set at 30 PSI.

19-2.17 Filter

A. Filter shall be installed on emitter manifold and shall be Irri-Delco 3/4"-39-0 filter with 155 mesh stainless steel screen and flush valve, or approved equal. Install emitter manifold assembly in a lockable box.

19-2.18 Pressure Gauge

A. Pressure gauge shall be Irrometer model 7-100 (0-100 PSI), or approved equal.

19-2.19 Emitter Riser

A. Emitter riser shall be 1/2" IPS Flexible Hose (.840 O.D.) Use only IPS Weld-on #795 solvent weld cement on this hose.

19-2.20 Emitter Assembly

A. Single Outlet Emitter: Emitter assembly shall consist of a 1/2" Sch. 80 PVC Male adapter (gray), a Salco RA 125T Adapter or approved equal, and a Salco emitter or approved equal.

B. Multiple Outlet Emitter: Emitter assembly shall consist of a 1/2" Sch. 40 PVC Male Adapter, a RA 125T, 1/2" adapter, a Salco PC6-1 Multi-Outlet Emitter, Salco Distribution Tubing #CT-125 PVC, Salco EOCV Emitter

Outlet Check Valves on Tips of Distribution Tubing and a Salco DAS-8 Emitter Access Sleeve, all products as specified or approved equal.

19-3 Preparation

19-3.1 Physical Layout

A. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.

B. Coordinate drip, bubbler and spray system with approved plant layout prior to installation of any irrigation piping.

C. All layout shall be approved by City prior to installation.

19-3.2 Water Supply

A. Sprinkler irrigation system shall be connected to water supply points of connection as indicated on the drawings.

B. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

19-3.3 Electrical Supply

A. Electrical connections for automatic controller wiring shall be made to electrical service points as indicated on the drawings.

B. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

19-4 Execution

19-4.1 General — Contractor is responsible for coordinating work with paving installations and/or removal and repair of all asphalt and/or concrete paving necessary to install the irrigation system as shown on the plans which are a part of these contract documents. Contractor shall coordinate all work within public right-of-ways with the appropriate agencies and City. Removal and repair of paving shall be completed under the direction and approval of the City and appropriate agencies and shall be installed in accordance with City/County Specifications and applicable codes.

19-4.2 Trenching – Trenching shall be in accordance with Section 18-1 of these Technical Provisions and as specified herein.

A. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.

B. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two (2) inch and larger roots occur shall be done by hand. All roots two (2) inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and heavily wrapped with burlap and kept damp, to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two (2) inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one (1) inch and larger in diameter shall be painted with two coats of Tree Seal, or equal. Trenches adjacent to trees should be closed within twenty four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with damp burlap or canvas.

C. Subgrade of all trenches shall be flush with the adjoining subgrade. The sprinkler irrigation contractor shall set in place, cap and pressure test all piping to be under paving prior to the paving work.

D. Generally, piping under existing walks is to be done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the City. No hydraulic driving will be permitted under concrete paving. When pavement removal is approved by the City, removal and replacement shall be in accordance with other applicable provisions of these Technical Provisions.

Minimum cover requirements over:

1.	Non pressure lines:	18″
2.	Pressure main lines:	24″
3.	Control wiring:	24″
4.	All pipe and conduit under asphalt roadways:	36″
5.	All pipe and conduit under concrete roadways or asphalt pedestrian or bike paths	24″

19-4.3 Backfilling — Backfilling shall conform to Section 18-2 and 18-5 of these Technical Provisions and as pecified herein.

A. The trenches shall not be backfilled until all required tests are performed.

B. A 6" layer fine granular material backfill will be initially placed on all lines. No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill. Remainder of backfill shall be excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted according to Section 18. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

C. Flooding of trenches will be permitted only with approval of the City.

D. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the City.

19-4.4 Assemblies

A. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details and plans.

B. Install NO multiple assemblies from PVC mainlines. Provide each assembly with its own outlet.

C. Install all assemblies specified herein in accordance with the respective details. In absence of details or specs pertaining to specific items required to complete work, perform such work in accordance with best standard practice and with prior approval of the City.

D. On PVC to metal connections, the Contractor shall work the metal connections first. Permatex 51 pipe joint compound or approved equal, shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded. Use no pipe joint compound on threaded connections at sprinkler inlets.

19-4.5 Line Clearance — All lines shall have a minimum clearance of six (6) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

19-4.6 Pipe

A. PVC:

1. Pipe shall be cut with a fine tooth hacksaw or approved PVC cutting tool and any burrs shall be removed. The outside surface of the pipe and the inside surface of the fittings shall be wiped with a clean cloth saturated with methyl isobutyl ketone (MIBK) to remove all dirt and moisture before the cement solution is applied. The cement solution shall be applied to the pipe and fitting socket with a brush having a width approximately three-quarters the depth of the socket. The cement solution shall be applied freely with a light wiping action to spread the cement uniformly over the surfaces. The pipe surface of fitting socket shall not be rubbed with a brush any more than is necessary to spread the cement. If the cement thickens, it shall be discarded.

2. Immediately after the cement has been applied to the surface to be joined, the pipe shall be inserted into the fitting with a twisting motion to the full depth of the fitting socket. Immediately after joining is completed, any excess cement shall be thoroughly wiped from the pipe and fitting. The joined members shall be allowed to cure for at least 5 minutes before they are handled. In cold or damp weather, the curing period shall be increased due to slower evaporation of the solvent. An additional fitting or pipe section may be added to the completed joint within 3 minutes if care is exercised in handling so that a strain is not placed on the previous joint. The male pipe threads of all threaded connections on PVC plastic pipe shall be coated with Permatex #51 pipe joint compound or a joint compound suitable for use with plastic pipe.

3. Except as shown on the plans, PVC plastic pipe placed in a trench shall be laid on level, undisturbed, or well-compacted earth and solvent-weld pipe shall be snaked from side to side in the trench at intervals of approximately 50 feet. Pipe shall be held down between joints with small mounds of earth to prevent movement. After completing the pressure tests on the pipelines and before any backfill is placed, water shall be run through the entire line until the pipe has been cooled to the supply water temperature. The trench shall be immediately backfilled, covering the pipe with soft earth to prevent damage to the pipe from rocks or clods.

4. There shall be no ring tite couplings inside of sleeves.

5. Where length of sleeve exceeds 15' in length and where ring tite

pipe is designated to be installed at sleeve location, substitute class 315 solvent weld pipe and Schedule 40 solvent weld fittings inside sleeve.

B. Thrust Blocks:

1. Thrust blocks shall be provided where necessary to resist system pressure on ring-tite gasketed pipe and fittings. Blocks shall be concrete and the size shall be based on an average soil safe bearing load of 2,000 lbs/s.f.

2. Form thrust blocks in such a manner that concrete comes in contact only with the fittings. Thrust blocks shall be between solid undisturbed soil and the fittings.

19-4.7 Remote Control Valves

A. Install where shown on drawings and details and in accordance with manufacturer's specifications. When grouped together, allow at least eighteen (18) inches between valves. Install each remote control valve in a separate valve box.

B. Provide each assembly with its own outlet; no multiple assemblies will be allowed.

C. Remote control valves shall be adjusted so the sprinkler heads operate at the pressure recommended by the head manufacturer and so a uniform distribution of water is applied by the sprinkler heads to the planting area for each individual valve system.

D. Label control line wire at each valve with a 2-1/4" X 2-3/4" polyurethane I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.

19-4.8 Quick Coupling Valves

A. Install as detailed on the drawings.

19-4.9 Hose Bib

A. Install as detailed on the drawings.

19-4.10 Valve Boxes

A. All valve boxes shall be set to finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

B. Valve boxes located near walks, curbs, and header boards, shall be installed in such a way as to align with those items, squarely if rectangular in shape, and with top surface matching plane as items listed above.

C. Install boxes 12" away from and perpendicular to adjacent improvements. At multiple valve box groups, install boxes 6" apart, measured at finish grade surface. Short side of box shall be parallel to adjacent improvement.

19-4.11 Flushing of System

A. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.

B. Sprinkler heads shall be installed only after flushing of the system has been accomplishedo the complete satisfaction of the City.

19-4.12 Automatic Controller

A. Install as per the plans and details and manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings.

B. Label each new control line wire at controller with a permanent non-fading label indicating station number of valve controlled. Attach label to control wire.

19-4.13 Low Voltage Control Wiring

A. A single common wire as previously described in these specifications, shall be installed from the controller to the control valves in series.

B. For each control valve, install separate control wires as previously described in these specifications, from the Controller to each control valve serviced by the controller.

C. A single spare wire as previously described in these specifications, shall be installed from the controller and stubbed into each valve box in series. The spare wire is not to be connected to any equipment at the time of

installation.

19-4.14 High Voltage Wiring for Automatic Controller

A. A 120 volt power source and service switch for the automatic controller shall be provided by the electrical subcontractor. The irrigation subcontractor shall install the wires from the 120 volt power service switch to the controller.

B. All electrical work shall conform to local codes, ordinances and union authorities having jurisdiction.

C. The Contractor shall provide and install the service unit and meter socket and make the connection between the power source and the controller.

D. Adequate coverage and protection of the 24 volt service wire leading from the controller shall be maintained from the bottom of the controller.

19-4.15 Testing — After the entire sprinkler system has been completely installed, a complete test of the entire installation shall be made by the Contractor in the presence of the City before final acceptance of the system by the City.

A. Testing of Service Lines:

1. After the pipe has been backfilled to 12 inches over the top, each section of the pipe to be tested shall be slowly filled with water and all air shall be expelled from the pipe. The valves controlling the admission of water into the section of pipe to be tested should be opened wide before shutting hydrants or blow-offs. After the system has been filled with water and all air expelled, all valves controlling the section to be tested shall be closed and the line be allowed to set for a period of not less than 24 hours.

2. The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than 150 lbs per square inch or the service pressure plus 50 pounds, whichever is greater for a period of four hours.

3. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test. Any cracked or defective pipe, fittings, or valves discovered during the test shall be removed and replaced with sound material and the test repeated until the system is proved satisfactory by the City.

4. For a 4 hour hydrostatic test, the allowable leakage in gallons is

equal to diameter (inches) x length (feet) x 0.00158.

5. The test water shall be left in the mains until backfilling operations are completed.

6. After backfilling is completed, and before pavement sections are installed, the test shall be run again and no section shall be allowed a leakage greater than that of the 4 hour hydrostatic test.

B. Testing Plastic Pipe:

After all new sprinkler piping and risers are in place and connected, and all necessary division work has been completed and prior to the installation of sprinkler heads, control valves shall be opened and a full head of water used to flush out the system. After the system is thoroughly flushed, risers shall be capped off and the system pressure tested. At drip system, cap tees before flexible riser is installed. Request the presence of the City in writing at least 72 hours in advance of testing. All testing shall be done in the presence of the City or the City's authorized representative. Apply a continuous static water pressure of 120 p.s.i. on main lines and 60 p.s.i. on lateral lines when welded plastic joints have cured at least 24 hours and with the risers capped as follows:

1. Test main lines and submains for 4 hours.

2. Test lateral lines for 2 hours.

3. Repair leaks resulting from tests. Pressure testing shall continue until no leakage or loss of pressure is shown over the entire prescribed test period. At the conclusion of the pressure test, the heads, flexible risers and emitters shall be installed and tested for operation in accordance with design requirements under normal operating pressure.

19-4.16 Testing of Electrical System — Prior to acceptance of the work, the Contractor shall cause the following tests to be made:

A. For continuity of each circuit.

B. For grounds in each circuit.

C. A megger test on each circuit.

D. A functional test in which it is demonstrated that each and every part of the system functions as specified or intended herein.

19-4.17 Sprinkler Heads

A. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be equivalent in all respects to those itemized.

B. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

C. Nozzles on stationary sprinklers shall be tightened after installation and sprinklers having an adjustment stem shall be adjusted on a lateral line for the proper radius, diameter and/or gallonage. They shall be set perpendicular to finish grade.

D. Trim sprinkler heads around existing utility company boxes and other obstructions.

19-4.18 Adjustment of the System

A. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent over-spray onto walks, roadways, and buildings as much as possible.

B. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments after approval by the City, prior to planting. Adjustments may also include changes in nozzle or screen sizes and degrees of arc as required. Contractor is responsible for providing full coverage of all planted areas, with no flooding or dry spots.

C. Lowering raised sprinkler heads by the Contractor shall be accomplished within ten (10) days after notification by the City.

D. The irrigation system shall also be tested at the time of final inspection for planting. If in the opinion of the City, any portion of the irrigation system is found to be defective or damaged the Contractor shall make all required repairs or replacement to meet the requirements of the irrigation specifications at no additional cost to the City. The Contractor shall make repairs within two weeks after planting final inspection.

19-5 Maintenance

A. Plant maintenance following project installation is included in the contract and it shall begin on the date the work is accepted by the Director of

Public Works as complete.

B. The plant maintenance period shall be as specified in the Special Provisions. If not specified, the minimum period shall be 180 days.

C. The irrigation system shall be maintained, repaired and adjusted as required by the Contractor during the plant maintenance period. Soil moisture at the plant root balls in each watering zone shall be checked prior to watering. The Contractor shall be responsible for adjusting watering cycles so that plants receive sufficient water to ensure vigorous growth without allowing soil to become oversaturated with water.

19-6 Measurement — The work performed under these specifications will be measured by the unit or lump sum as designated in the contract items of work.

19-7 Payment — Payment will be made at the lump sum or unit price for sprinklers, sprinkler heads, bubbler heads, quick coupling valves, backflow preventers, control valves, control assemblies, turning unions, or garden valves; and the contract prices per linear foot for the various sizes and types of pipe.

Full compensation for furnishing and installing swing joints and pipe used for risers shall be considered as included in the price paid for the contract item requiring the swing joint and riser and no additional payment will be made therefore.

When there are no separate contract items for materials necessary to complete the irrigation system, such materials shall be furnished and installed. Full compensation for this work and materials shall be considered as included in the prices paid for the various contract items of the irrigation system and no additional payment will be made therefore.

The contract prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals; and for doing all the work involved in installing the irrigation systems, complete in place, as shown on the plans, and specified in these specifications and the special conditions and as directed by the City, including any excavation, backfill, testing and water involved.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 20

Landscaping

20.1 General

20-1.1 Scope

This work shall consist of, but not necessarily limited to, furnishing all labor, materials, plant materials, tools and equipment required to grade, prepare soil, fertilize, plant, grass from seed, and otherwise complete the landscaping as shown on the approved plans, these specifications and the details.

The Contractor shall coordinate layout and installation of plant material with installation of the irrigation system to insure that there will be complete and full irrigation coverage of planting in accordance with these drawings, specifications and contract documents. Irrigation system shall be installed and tested prior to installation of plant material.

The "Model Water Efficient Landscape Ordinance" by the State Department of Water Resources shall apply.

20-1.2 Related Work

Section 18-1 — Trenching

Section 18-5 — Backfill

Section 19 — Irrigation System

20-1.3 Planting Conditions — No planting or seeding shall occur during weather conditions which will adversely affect materials or when soil is in a muddy condition. Contractor shall not plant at the end of the day, on Fridays or before holidays unless a special crew has been assigned to care for plants on next calendar day, and on weekends and holidays.

20-1.4 Preservation of Property

The planting and seeding operations shall be conducted in such a manner that no damage shall result to existing site improvements and plantings. The Contractor shall be responsible for any damage resulting from his operations, and shall repair or replace such damage at his own expense and to the satisfaction of the City. Vehicles of any kind shall not be allowed to pass over curbs, sidewalk, planting areas, etc., unless proper protection is provided.

Prior to excavating for plant pits and beds, the location of any underground utilities shall be verified and staked by the Contractor. All costs associated with verification of utility and underground structure locations including potholing shall be considered as included in the Contract Prices paid for the various items of work and no additional compensation will be made therefor. Damage to utility lines, underground structures, etc., shall be repaired at the Contractor's expense to the satisfaction of the City or owner of the utility involved.

20-1.5 Underground Obstructions — Rocks and other obstructions shall be removed to a depth necessary to permit proper planting according to drawings and specifications. If underground utilities, construction or solid rock ledges are encountered, City shall be contacted immediately for determination of extent of obstruction. Direction for selection of alternate locations shall be made by the City.

20-1.6 Protection of Existing Trees to Remain — Contractor shall erect barricades around trees to remain. They shall be constructed of wood. Place barricades minimum 5' away from trunk or at drip line if located greater than 5' from trunk. Under no circumstances shall earth, debris and materials be piled against trees or stored within drip line of trees.

20-1.7 Personnel — Planting shall be performed by personnel familiar with the procedures required of their trade and shall be supervised by a qualified planting foreman.

20-1.8 Sequence of Work — Landscaping shall not begin until all other improvements have been installed and inspected by the City. Contractor must receive approval to proceed from City prior to starting landscaping work.

20-1.9 Inspections

A. Right of inspection by the City for approval or rejection is reserved at the place of growth and/or on the project site at any time upon delivery or during the work.

B. Contractor shall notify City of inspections a minimum of 48 hours in

advance of inspection required.

20-1.10 Quality — All work shall be of the highest quality and shall be subject to the approval of the City. Any work that is deemed unacceptable by the City shall be removed by the Contractor immediately and replaced with work that is acceptable to the City. Such removal of defective work and replacement shall be at the expense of the Contractor. Defective work shall be replaced immediately.

All plant materials shall be of standard, approved first grade quality and shall be in prime condition when installed and accepted.

Any commercially processed or packaged materials shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed analysis.

20-1.11 Storage of Materials

A. Plants not installed on the day of arrival at the site shall be stored and protected as follows:

   1. Outside storage shall be shaded and protected from wind and sun.

   2. Plants shall be kept in a moist condition until planted, by watering.

B. Fertilizer and lime shall not be stored with any other landscape materials.

C. Soil sterilant shall not be stored with any other landscape materials.

D. Storage of materials shall be only in areas designated or as approved by the City.

E. The seed containers shall be stored immediately in a dry, weather and damp proof structure. Any seed which has become wet, moldy or is otherwise damaged in transit or storage will not be acceptable.

20-1.12 Submittals

A. The Contractor shall submit to the City within 14 days of notice to proceed, all descriptive data and samples for the work as required by the specifications, and offers of alternatives, if any. Such submittals shall be checked and coordinated by the Contractor with the work of other trades involved before they are submitted to the City for examination.

   Submittals shall be made by a letter of transmittal which shall contain a list of all materials submitted and identification of all deviations from the

plans and specifications contained in the submittal. The letter and all accompanying items shall be fully identified as to project name and location, Contractor's name, with ample cross-references to the contract documents, to facilitate identification of items and their location in the work.

B. Six copies of submittals shall be presented to the City.

C. Contractor shall supply the City with a list of all products, e.g. fertilizer, soil amendments, and plant materials, including name of nursery or supplier.

D. Contractor shall supply the City with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance or bearing the manufacturer's guaranteed analysis.

20-1.13 Determination of the Use of Chemicals — The City shall make the final determination of the use of chemicals on the site. Submit letters from the manufacturers on the levels of toxicity to the City for review and direction.

20-1.14 Site Safety — Contractor shall comply with all City/County, State and National regulations and requirements regarding site safety. Contractor shall assure that no unsafe conditions are allowed to remain overnight, over weekends, or unguarded during the work day. Material safety data sheets shall be kept on the job site at all times.

20-2 Materials

20-2.1 Plant Stock

A. Plant Stock and Ground Cover:

1. Plants shall be the variety, quantity and size indicated. When total quantities are shown tabulated on the drawings, they shall be considered approximate and are furnished for convenience only. Contractor is responsible for installing all of the plants shown on the planting plan and for computing the quantity of ground cover required within the area specified and planted at the specified spacing. Quality and size shall conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Nursery-grown stock only shall be used, and shall be free from insect pests and diseases.

2. All plants shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Inspection certificates required by law shall accompany each shipment of

plants, and certificates shall be delivered to the City. All plants shall be true to species and size indicated, 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 City's decision will be final.

3. Plants shall be healthy, shapely, and well-rooted. Roots shall show no evidence of having been root bound, restricted or deformed. Plant material that has just been upgraded in container size shall be rejected. Root condition of plants in containers will be inspected by the City and determined by removal of earth from the roots of not less than two plants of each species or variety from each source. All plant materials requiring inspection by the City shall be assembled and available for such inspections. In case the sample plants inspected are found to be defective, the City reserves the right to reject the entire lot or lots of plants represented by the defective samples.

4. Each plant shall be handled and packed carefully to avoid damage. All necessary precautions shall be taken to insure that the plants will arrive at the site of work in proper condition for successful growth.

5. Plants shall be transported in enclosed trucks. If trees are too large for enclosed trucks and are transported in open trucks, they shall be wrapped to prevent damage and windburn. Trees in transport or prior to shipping shall not be tipped so that the container of the adjacent plant is leaning on the trunk of the next tree. Adequate protection shall be placed between trees so that trunks are not scarred in transport and branches are not broken. All tree trunks shall be wrapped with protective covering at growing grounds prior to handling and loading. Covering shall be removed at time of plant materials inspection at job site to inspect each tree. Trunks showing signs of damage due to improper handling shall be rejected. Plant materials showing damage from transport and loading, showing signs of ill health and plants that are not true to size and species specified and in conformance to the specifications stated in these contract documents shall be rejected. Rejected materials shall be removed from the site and replaced with materials that meet the satisfaction of the City and at no additional cost to the City.

6. Substitutions will not be permitted, unless proof is submitted to the City that any plant specified is not obtainable. The City will

consider use of the nearest equivalent size or variety. Such proof shall be substantiated and submitted in writing by the Contractor within 14 days after the effective date of Notice to Proceed. The City will make appropriate deductive adjustments to the contract bid items for substitute materials; there will be no additional compensation for approved substitution.

7. Plants shall have straight trunks with the leader intact, undamaged and uncut. All old abrasions and cuts shall be completely calloused over. All plants shall be measured when their branches are in their normal position. Height of plant is measured from root crown to top of plant. Width of plant is measured at branching at the widest point. Indicated sizes shown are before pruning. Plants shall not be pruned prior to delivery.

8. Trees shall be well tapered in the trunk so that when the nursery stake is removed, the tree supports itself upright without further staking. Trees shall have a main leader. The main branches shall be spaced vertically and alternately along the trunk. Branching shall not be concentrated in one location nor shall there be severe crossing of branches. Branches shall be smaller in diameter than the trunk. Branch attachments shall be free of embedded bark. At least one half of the foliage on the branches shall be located along the lower two thirds of the trunk.

9. All plants declared unsuitable for planting as a result of inspection of materials shall be removed from the site immediately. They shall be replaced with specimens that conform to the contract documents and that are acceptable to the City. Cost of return to grower and cost of replacement of plant materials shall be borne by Contractor and at no additional cost to the City.

10. Contractor shall facilitate inspection and identification by labeling trees and bundles or containers of the same shrub, groundcover or vine with a durable waterproof label and weather resistant ink. Labels shall state the correct plant name and size as specified in the project plant list and shall be legible for 60 days after delivery to the planting site. Plant material which is not labeled shall be rejected.

11. Plant material shall be grown under similar climatic conditions to those found in project site.

12. Ground cover shall be rooted plants, grown in flats unless otherwise noted on the plans or as approved by the City.

20-2.2 Seed

A. Seed mixture shall be 98 percent pure, and noxious weed free, with a minimum of 88 percent germination. All seed shall be re-cleaned Grade A "new crop" seed, delivered in the original unopened containers, and shall bear a guaranteed analysis and dealer's label. The dealer may mix the seed provided a guaranteed statement of composition of mixture and percentages of purity and germination of each variety is attached to the sealed container. The seed shall be pretreated with a pre-emergence fungus preventative such as "Thiram", or approved equal, in accordance with manufacturer's specifications.

B. Seed shall be as specified on plans.

20-2.3 Topsoil

A. Source: On site stockpile

20-2.4 Soil Conditioner

20-2.4.1. Nitrogen Stabilized Organic Amendment

Amendment shall be nitrogen-stabilized sawdust. Source shall be derived from a combination of fir and pine or cedar wood, free from weed seed, dust, and objectionable material and containing the following physical properties:

Percent Passing	Sieve Size
95-100%	9.51mm (3/8")
90-95%	6.35mm (1/4")
85-90%	2.38mm (No. 8, 8 mesh)
15-20%	500 Micron (No. 35, 32 mesh)

Chemistry shall be:

Nitrogen Content (dry weight): 0.56% - 0.84%

Iron Content: Minimum 0.08% diluted acid soluble Fe on dry weight basis.

Soluble Salts:	Maximum 4.0 millimohos centimeter @ 25 degrees C. as determined by saturation extract method.
Ash (dry weight):	0 - 8.0%

20-2.5 Fertilizer — Fertilizer shall be a commercial inorganic fertilizer in the granular and pelleted form. Fertilizer shall be delivered to the site in containers labeled in accordance with the applicable State of California regulations, bearing the warranty of the producer for the grade furnished. It shall be uniform in composition, dry and free-flowing.

A. Planted and Seeded Areas:

Pelleted type with analysis of 6-20-20 (N-P-K) and granular type 16-6-8 (N-P-K).

B. Planting Holes:

Tablets, 21 gram size, or approved equal, with an analysis of 20-10-5 (N-P-K).

20-2.6 Herbicide

A. Submit written chemical weed control program prepared by a licensed pest control advisor for approval by the City.

B. Herbicide shall be compatible with plant materials used in this contract. Proof of such compatibility shall be included in weed program submitted.

C. Program shall specify waiting period between spraying and planting.

20-2.7 Mulch — Mulch shall be 1/4"-3/8" dia. fir bark.

20-2.8 Backfill — Backfill to be used in planting holes shall be 100% topsoil obtained from on site top soil stripped and stockpiled.

20-2.9 Tree Stakes and Ties

A. Tree stakes shall be 3" dia. x 8' straight, close grained, Lodge Pole Pine pointed at one end. Stakes shall be pointed prior to treatment with Copper Napthanate which shall penetrate stake surfaces to a minimum depth of 1/4".

B. Tree straps: corded rubber tire strips - 1″ wide by 1/4″ to 1/2″ thick by length as required. Strips shall not contain steel within or have wire tie ends.

20-2.10 Water

A. Water at will be furnished by the City at existing available sources.

20-3 Execution

20-3.1 Soil Preparation and Grading

A. ROUGH GRADE AND WATER:

Prior to any planting bed preparation or planting, grade all planting areas, fill as needed or remove surplus dirt and float areas to a smooth uniform grade. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Rough grades shall be inspected and approved by the City before any amendments and fertilizers are installed. All planting areas shall be thoroughly wetted down. Allow soil to dry so as to be workable after which thoroughly cultivate to a depth of 6 inches using a rotary hoe and allow to dry out.

B. SOIL AMENDMENTS, FERTILIZERS AND CULTIVATING:

1. Spread soil amendment and fertilizer evenly over all areas, including grass from seed areas, at the following rates:

   a. Soil Amendment - 6 cu. yds. per 1,000 sq. ft.

   b. Fertilizer - 30 lbs. per 1,000 sq. ft. of 6-20-20.

2. After approval of amendment and fertilizer applications by the City, incorporate into top 6 inches of soil by repeated rotary-hoe cultivation.

C. WATER:

At completion of soil amendment, water soil in all areas, including grass from seed, for a full 14 days. Soil to be moist to a minimum depth of 24 inches and not be allowed to dry out at any time. In locations where irrigation is by drip or bubblers, the Contractor may, at his option and expense, install a temporary irrigation system to keep soil moist. The Contractor shall be responsible for insuring that the temporary irrigation

system does not create a safety hazard.

D. SPRAY WITH CHEMICAL WEED KILLER:

1. At the end of the watering period, spray area with an approved general chemical weed killer to eliminate all plant growth and roots including broadleaf and grass seedlings. Chemical shall be part of the chemical weed control program prepared by a licensed pest control advisor and approved by the City.

2. Chemical shall not sterilize soil and shall be applied as per manufacturer's directions. Alternate weeding methods can be used upon approval of the City.

E. FINISH GRADE:

1. When weeding and soil conditioning have been completed and soil has been thoroughly water settled, all planting areas shall be finish graded for placement of plant materials and seeding operation. Grading shall be done when soil is at optimum moisture content for working.

2. Finished grades shown on plans are given in feet and decimals of feet. Slope uniformly between given spot elevations. Planting areas including seeded areas shall be true to grade within one inch when tested in any direction with a 10 foot straightedge.

3. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins. Finish grades shall be smooth, even, and on a uniform plane with no abrupt change of surface and no erosion scars. Minor adjustments of finish grades shall be made at the direction of the City if required.

4. All grades shall provide for natural runoff of water without low spots or pockets. Flow line grades shall be accurately set and shall not be less than 2 percent gradient wherever possible unless otherwise indicated.

5. Finish grade of earth in planting beds shall be 1 inch below top of adjacent pavement, curbs or headers, unless otherwise indicated on the drawings. Finish grade of earth in grass areas shall be 1/2" below top of adjacent pavement, curbs or headers.

6. Tops and toes of all slopes shall be rounded to produce a gradual

and natural-appearing transition between relatively level areas and slopes.

7. Protect all areas against compaction by equipment.

20-3.2 Tree & Shurb Planting

A. STAKE PLANT LOCATIONS:

Mark tree and shrub locations on site using stakes or similar means. Locations shall be approved by the City before plant holes are dug, and adjustments made as required.

B. WATER-TEST SELECTED PLANT HOLES:

1. Dig tree pit as per specifications below, paragraph C.

2. Tree pits to be water tested will be selected by City. Approximately one (1) location per 80 sq. ft. will be selected. If site requires more test holes, it will be specified on the drawings.

3. Fill tree pits with water. Check holes after 24 hours to determine if water has drained out. If not, bring to attention of the City.

4. Adjustment of pit size or location will be made if drainage problem exists. This will be determined by the City.

C. PLANTING HOLES:

1. Dig pits circular in outline with vertical sides as shown on the Planting Detail. Do not excavate deeper than the vertical dimension of the rootball. After pits are dug, break sides to open wall of pit for root penetration and loosen bottom of pit to a depth of 3 inches. Construct foot tamped mound in bottom of pit to support plant at proper level.

D. PLACEMENT OF PLANTS:

1. Do not handle container plants by the tops, stems, or trunks at any time. Lift all plants so that root ball is supported from the underside. Plants that do not have a satisfactory root system will be rejected.

2. Cut root ball vertically in a few places to encourage new feeder root development along perimeter of the root ball.

3. All plants shall be planted immediately after the containers are cut. Containers shall be removed immediately from the site.

4. Place plant in upright and plumb position.

5. Groundcovers shall be installed at spacings indicated on the drawings and shall be evenly spaced and staggered in rows. Place each plant in a pit so the root system lies free without doubling and so the roots are planted vertically. Firm the soil around each plant and water the area immediately to avoid drying out.

E. FERTILIZING AND BACKFILL:

1. Place fertilizer tablets in the following quantities around perimeter of plant hole:

   1 gallon plant - 1 tablet
   5 gallon plant - 3 tablets
   15 gallon plant - 5 tablets
   24" box plant - 7 tablets

2. Backfill hole with stockpiled on site topsoil. Taper backfill around sides and up to top of rootball so that sides of rootball are not exposed.

3. Construct a 3" high berm outside the excavated area, and fill the watering basin with B-1 solution. Remove berm in areas to receive grass that will be mowed after third thorough watering, and prior to grass installation.

4. Backfill shall be watered until the backfill material is moist to the full depth of the hole.

5. Excess backfill shall be disposed of at direction of the City, and shall be included in the cost of planting.

G. PRUNING:

No pruning shall be done unless specifically requested by the City and under the City's direction.

H. STAKING:

1. Install stakes as specified along sides of root ball and one foot into undisturbed ground (or deeper in accordance with the Planting

Detail). Stakes are not to go through root ball. For 24″ box trees wood cross pieces nailed to stakes shall be 30″ long. Install ties as shown on the Planting Detail.

2. Ties shall be placed as low on the trunk as possible but high enough so the tree will return to upright position after deflection.

3. To find the proper height for tie locations, hold the trunk in one hand, pull the top to one side and release. The height at which the trunk will just return to the upright position when the top is released is the height at which to attach the ties.

4. Ties are to form a loose loop around the tree trunk and stakes so that the trunk cannot work towards the support stakes. Tree ties shall be nailed securely in position in accordance with the manufacturer's recommendations and planting details.

5. Support stakes are not to exceed 6″ above the tie locations. A flexible auxiliary stake shall be attached to those trees needing extra trunk support as determined by the City.

6. One tree of each size shall be staked and approved by the City prior to continued staking.

I. PRE-EMERGENT HERBICIDE APPLICATION:

1. Pre-emergent herbicide shall be applied to all tree, shrub, ground cover and firbark areas including plant basins. Chemicals used are to be in written chemical weed control program prepared by a licensed pest control advisor and approved by the City. Apply prior to any mulching.

2. Pre-emergent shall be applied during a windless period. Areas to receive seed shall be protected from contamination by pre-emergent.

3. Any area to receive seed that is contaminated with pre-emergent shall have the soil stripped to a 6″ depth and replaced with imported topsoil to the satisfaction of the City and at no additional cost to the City.

J. MULCHING:

Install a 2″ layer of fir bark in all planted areas not planted with grass or

hydroseed. Fir bark shall be kept away from stems and trunks of plants, 4″ at groundcovers and 8″ for all other plants.

K. ADJUSTMENT OF PLANTS:

1. Plants that settle deeper than specified shall be raised to the correct level.

2. Plants that go out of plumb shall be straightened and restaked.

20-3.3 Grass from Seed

A. Installation of plants shall be approved by the City before seeding operations begin. Just prior to seeding, areas to be seeded shall be loosened by harrow or rototiller to 2″ depth, raked to remove rocks one inch or larger in size along with sticks and debris, floated level, rolled and floated again.

B. Seed shall be sown evenly using a mechanical spreader at the rate of 10 pounds of mixture over each 1,000 square feet of area. One half of the seed shall be sown in one direction, and the remaining one half sown in a direction 90 degrees to the first during a windless period. Overseed any existing undisturbed lawn at junction with disturbed area being seeded to provide even grass coverage at this point. Apply fertilizer (16-6-8) at the rate of 6 lbs./1,000 sq. ft. uniformly over seeded areas.

C. Lightly rake surface to cover seed and to mix with fertilizer and then compact with a 200 lb. roller. Soil shall be irrigated immediately and kept moist but not saturated until the seed has germinated.

D. Whenever the grass reaches a height of 3 inches, mow to 1-1/2 inches and remove all clippings. After second mowing of grass, apply second application of fertilizer. Apply fertilizer (16-6-8) at the rate of 6 lbs./1,000 sq. ft. uniformly over turf area. Apply again at the same rate 2 weeks prior to completion of maintenance.

E. Protect grass areas with temporary fencing as necessary. Fencing shall not create a hazard for pedestrian or vehicular traffic. Contractor shall obtain approval of the City for fence type and locations prior to installation. Barriers shall be maintained by the Contractor and kept in orderly condition at all times until work has been accepted by the City. Any damage to turf shall be repaired by Contractor at no expense to the City.

F. Until completion of the required maintenance period of the project, Contractor shall provide maintenance of grass area installed under this

contract by watering, weeding, seeding, mowing (includes trimming and edging), rolling and by performing any other necessary operations of maintenance including treatment for fungus diseases, insects, pests of rodents. Re-seed all bare spots at intervals of 10 days until a full stand of grass is established over the entire grass area in scope of work.

20-3.4 Clean Up

A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his work. At the completion of the work he shall remove all rubbish, tools, scaffolding, and surplus materials from the site.

B. Neatly dress and finish all planting areas.

C. Pavement shall be broom clean.

D. Rinse foliage of all plant materials within the construction area as often as necessary to keep the foliage free of dust.

20-3.5 Preliminary Inspection

A. At the completion of work, the Contractor shall request a preliminary inspection to determine the condition of planting and seeded lawn area.

1. Inspection shall be requested 48 hours in advance.

2. Present for the inspection will be: Contractor and City.

B. Construction considered ready for inspection shall conform to the following:

1. All planting shall be healthy and free of infestations.

2. All planting areas shall be free of weeds.

3. Grass areas shall show a uniform, smooth ground surface without eroded ruts or gullies, and evidence of uniform seed germination.

4. Grass shall be mowed to 1-1/2" above finish grade.

5. Stakes and ties shall be as specified in the contract documents.

6. Mulch shall be raked to uniform surface. Areas not mulched shall be raked to uniform surface.

7. All debris shall be removed from site, all pavement shall be broom clean, and foliage shall be washed clean.

8. All plants shall be installed as per the Contract Documents.

C. Approval:

1. If the installation is found satisfactory, the work shall be approved by the City in writing.

2. If the installation is found unsatisfactory, the City will submit a punch list of conditions to correct to the Contractor. The Contractor is responsible for requesting additional inspections after the conditions of the punch list have been corrected.

3. No partial approvals will be given.

20-4 Maintenance

20-4.1 Scope of Work

A. The maintenance period following project installation is included in the contract and shall begin on the date the work is accepted by the Director of Public Works.

B. Maintenance period shall be for 1 year beginning the day of the acceptance of the construction by the City, or as specified in the Special Provisions if for a longer period of time.

C. Maintenance shall include, but is not limited to all watering, weeding, fertilizing, cultivation, spraying and pruning necessary to keep the plant material in a healthy growing condition and to keep the planted areas neat and attractive in appearance throughout the maintenance period. All plants shall be watered not less than twice a week. Each watering shall be of such quantity as to provide optimum growth conditions. The Contractor shall provide the equipment and means for its proper application. At the direction of the City, any plant exhibiting weakness and the probability of dying, shall be replaced immediately by the Contractor at his expense. Replacements of plants or grass shall be made in the same manner as specified for the original planting. At the end of the maintenance period, all plant material shall be in a healthy growing condition and free of physical injury of any kind.

D. Work under this Section shall include complete responsibility for maintaining adequate protection for all areas. Any damaged areas shall

be repaired at no additional expense to the City.

E. Grass shall be mowed each time it reaches 3″ in height and with blades set to 1-1/2″ above grade. Grass shall be trimmed at the edges of curbs, paving, drains and headers. Grass areas which fail to germinate shall be reseeded at maximum 10-day intervals until a vigorous, even stand of grass is established. Seeding operation shall follow specifications for initial installation. Grass areas shall be kept free of weeds by hand pulling, or by spraying with the approved selective chemical herbicide before weeds exceed 2 inches in height. Clippings and debris shall be removed from the site.

F. Plants installed under this contract shall be properly maintained by regular watering, cultivating, weeding, re-mulching, repair of stakes, pruning, and treatment of insects and pests. During the Maintenance Period, any plants which are vandalized, damaged by herbicide, diseased, dead, or in an unhealthy condition, shall be replaced by the Contractor at his expense within two weeks after notification from the City or his authorized representative. Maintenance shall also include treatment for fungus, diseases, rodents, and insects, the requirements for approval of treatment program shall be the same as for herbicide.

G. Weed all areas at intervals of not more than (10) calendar days.

H. Rocks, clods, and debris which appear on the surface shall be removed. Heaved, settled, or eroded areas shall be restored by excavating, filling, finish grading, and rolling as required.

20-4.2 Final Inspection and Acceptance

A. Final inspection will be conducted at the end of the Maintenance Period. Notice requesting final inspection shall be submitted by the Contractor to the City at least 7 calendar days prior to the anticipated date.

B. Acceptance of the project by the City will be contingent upon proper maintenance and the establishment of vigorous plant materials. Any portion thereof which does not show vigorous growth is subject to continued maintenance at the Contractor's expense.

C. Prior to the final inspection, the Contractor shall also have performed weeding, repair or touch-up of paving, equipment, and structures, and the thorough cleaning of the site.

D. Just prior to final inspection, 16-6-8 granular form commercial fertilizer shall be applied as follows:

Plant Size	Qty. Fertilizer
Specimen	1 pint
15 gal.	1 cup
5 gal.	1/2 cup
1 gal.	1/4 cup
ground cover	10 lbs./1,000 sq. ft.

E. Mulch shall be raked away from around plant bases. Fertilizer shall be spread around plant base and worked into the top 2 inches of soil. Mulch shall then be replaced.

F. At the final inspection, the City will determine the condition of improvements and planting. Plants which are missing, vandalized, dead, or unhealthy shall be replaced by the Contractor at his expense with the same species and sizes originally specified and following these same specifications for installation. The Contractor shall make replacements within two weeks after final inspection, and maintain plants for an additional 30 calendar days.

G. The irrigation system shall also be tested at this time. See Irrigation Specifications for additional information.

H. If project improvements, corrective work, and maintenance have not been performed as specified and to the satisfaction of the City, maintenance shall continue at the Contractor's expense until such time as work has been successfully completed and accepted by the City. Should work have been performed as specified and to the City's satisfaction, the City will assume maintenance responsibilities following the final inspection. The City will send written Notice of Acceptance of project to the Contractor.

20-5 Guaranty

20-5.1 — All trees, and other plant materials shall be guaranteed to take root and grow, and thrive for a period of one year after final acceptance of work.

20-5.2 — Any trees or other plant materials that die back and lose the form and size originally specified shall be replaced, even though they have taken root and are growing after the die-back.

20-5.3 — Within 15 calendar days of written notification by the City, the Contractor shall, at his own expense remove and replace all guaranteed plant

materials which, for any reason, fail to meet requirements of guaranty. Replacements shall be made to same specifications as required for original materials and shall carry the same guaranty from the time they are replaced.

20-6 Measurement and Payment — The landscaping shall be measured and payment made at the contract lump sum or unit price and shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals and for doing all work in landscaping and planting areas and tree areas including staking as shown on the plans and as specified in these specifications and as directed by the City.

The contract price for maintenance will be paid from the ten (10) percent retention on a pro-rata basis in twelve (12) equal monthly payments within 20 days after the successful completion of each monthly maintenance period.

The provisions of Section 9, "Payments" of the General Provisions, are hereby modified as necessary to comply with these provisions.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 21

Tennis & Basketball Court Resurfacing

21-1 General

The contractor shall:

A. Submit the proposed construction schedule and recommendations regarding the extent of the refinement course needed (should it differ from the Engineer's Estimate) to the Engineer for review 7 days prior to commencing construction.

B. Maintain adequate warning signs and barricades for the safety of the public and protection of the work acceptable to the City. Contractor shall maintain pedestrian access through work area.

C. Bear all responsibility for all damages and costs of repair to existing utilities. Should any such utility be damaged during construction, all expenses of whatever nature arising from the restoration of the utility to its original service shall be borne by the contractor and no additional compensation will be allowed by the City.

D. Remove all tennis nets prior to the commencement of work and reinstall nets following completion of work to the satisfaction of the inspector.

E. Remove all fencing required to provide access for equipment, and/or adjustment for clearance as directed by the City. Any such fencing removed shall be re-erected in conformance to the standards of the trade and in a timely manner at no additional cost to the city.

F. Clean all ground occupied by the work of all rubbish, excess material, and equipment prior to start of the job and prior to final inspection of the job.

G. Exercise due care in the protection of all existing walks, fencing, landscaping and all adjacent improvements and shall repair all damages to

the satisfaction of the Engineer.

H. Not perform any part of the resurfacing project during rainfall or when rainfall is imminent and/or unless the air temperature is at 50 degree F and rising.

I. Understand and know job site relative to specifications herein specified.

21-2 Materials

21-2.1 Resurfacing System — Plexipave System as manufactured by California Products Corporation. Decoralt Color System as manufactured by Koch Asphalt Company, or approved equal.

21-2.2 Refinement Course — A mixture of plaster sand, water, and either a acrylic resurface or asphalt refinement course material and asphalt emulsion. The mixture should conform to recommendations of the resurfacing system manufacturer and be subject to the approval of the Engineer. Suggested mixtures include either of the following:

Plexipave System	
Acrylic Resurface	55 gals.
Water	20-40 gals.
Sand (40-60 mesh)	600-900 lbs.

Decoralt System	
Plaster Sand	3 gals.
Surfix TT650 or Over Kote	2 gals.
Asphalt Emulsion	1/2 gal.

Asphalt Emulsion shall conform to Federal Specification SS-A-674c and/or ASTM D977.

Plaster Sand shall be clean, free from silt or clay, and graded as follows:

Sieve Size	% Passing
#4	100
8	95-100
16	70-100
30	40-75
50	10-35
100	2-15

21-3.4 Texture Coat

Plexipave System: Plexipave filled with sand to produce a medium play surface.

SP-3 OF 6

Decoralt System: Decoralt MP (920-27) filled with sand to produce a medium play surface.

21-3.4 Finish Coat

Plexipave System: Plexichrome

Decoralt System: Decoralt MP (920-27)

21-3.5 Line Paint — Plexicolor Line Paint as manufactured by California Products Corporation or White Striping Paint manufactured by Koch Asphalt Company, or equal.

21-3.6 Colors

Tennis Courts: All tennis courts shall have a dark green playing surface with red on the exterior. The resurfacing system shall be a full depth color system, i.e. the green playing surface shall receive all three color coats of green, the red surface shall receive all three color coats of red, etc. The Contractor shall submit color samples to the Engineer for approval prior to the beginning of work.

21-3 Application

21-3.1 Refinement Course — Prior to the application of any materials, the entire area shall be water flooded and all depressions holding over 1/8″ depth of water shall be filled with refinement course mix and allowed to cure. All surface cracks and holes greater than 1/8″ in depth shall be cleaned of any loose or foreign materials and filled with refinement course mix and allowed to cure. All ridges, loose or foreign particles shall be removed from the surface.

Apply two coats by pouring from a can or wheeled container to continuous parallel lines and spreading immediately with a rubber faced squeegee. The squeegee shall be pulled on an angle from the line and spread so as to continuously roll the material toward the operator and not overflow or "spill" on its forward edge away from the operator. After each coat has dried, any ridges shall be removed with scrapers and the surface rolled with a two to four (2-4) ton

roller.

The minimum applications shall be at the rate of not less than twenty five (25) gallons per coat of undiluted refinement course material per 1,000 square feet or as recommended by the manufacturer and shall cover the existing color coat.

Upon completion of rolling, the area shall be water flooded and rechecked for depressions holding over 1/8" depth of water. Should any depressions appear, these areas should be filled with refinement course material again as outlined above. The finished surface shall be smooth, free of ridges, valleys and too marks. Approval shall be made by the Engineer prior to proceeding to the color coatings.

21-3.2 Texture Coat

Plexipave System: Over the completed refinement course or a thoroughly clean surface in areas not receiving a refinement course, apply two (2) coats of Plexipave mix in accordance with the manufacturer's direction at a rate of not less than 0.08-0.1 gallons per square yard total for the two coats. If the asphaltic surface course is not covered to a uniform, even texture, free of all porosity, a third texture coat shall be applied to attain uniformity. The first coat shall be applied lengthwise of the court and the second coat crosswise of the court. Care should be taken not to leave ridges of mix where adjoining applications overlap. Dilution rate shall not exceed 1 part water : 2 parts Plexipave.

Decoralt System: Over the completed refinement course or a thoroughly clean surface in areas not receiving a refinement course, apply two coats of DecoColor Multi-Purpose Coating 920-27 mix in accordance with the manufacturer's direction at a rate not less than 1 gallon per 100 square feet per application. If the asphaltic surface is not covered to a uniform, even texture, free of all porosity, a third coat shall be applied to attain uniformity. The first coat shall be applied to lengthwise of the court and the second coat crosswise of the court. Care should be taken not to leave ridges of mix where adjoining applications overlap.

21-3.3 Finish Coat

Plexipave System: On a clean, dry underlying surface apply one application of Plexichrome in accordance to the manufacturer's recommendation at a rate not less than 0.04 gallons of material per square yard. The application shall be made cross-wise of the court and with a wide hair type pushbroom or a rubber bladed squeegee followed by a pushbroom and shall produce a uniform color throughout. Dilution rate shall not exceed 1 part water : 1 part Plexichrome.

Decoralt System: On a clean, dry underlying surface, apply one application of DecoColor Multi-Purpose Coating 920-27 in accordance with manufacturer's

recommendation at a rate not less than 0.5 gallons of material per 100 square feet. The application shall be made cross-wise of the court and with a wide hair type pushbroom or a rubber bladed squeegee followed by a pushbroom and shall produce a uniform color throughout. Dilution rate shall not exceed 1 part water:2 part Decoralt MP (920-27).

21-3.4 Playing Lines — Two inch wide playing lines shall be accurately located, applied by brush or spray, free from any fogging or overspray. Line paint shall be white. All measurements shall conform to the United States Tennis Association dimensions. All lines shall be straight and true with no irregular edges.

21-4 Measurement — The quantities of Tennis Court Resurfacing will be measured on a square foot basis of completed and acceptable resurfacing.

21-5 Payment — The contract unit prices for Tennis Court Resurfacing shall include full compensation for furnishing all labor, materials, tools, equipment, line painting, crack filling, coloring and incidentals for completing the resurfacing, as specified, and no additional payment shall be made therefor.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 22

Tree Trimming & Stump Removal

22-1 General — As work under this contract shall be performed in accordance with these Provisions and the Standard Drawings.

A) Contractor shall notify in writing residents adjacent to the work 48 hours prior to commencing work adjacent to their property.

B) Unless arrangements are made otherwise with the property owner, access to driveways shall be maintained.

C) Contractor shall furnish water as required for the job at no cost to the City, except as provided in the contract items of work. Use of homeowner's water shall be only upon written consent of the property owner.

D) The Contractor shall have, at all times, a Certified Arborist on staff and supervising the work. The Contractor shall submit the Arborist's resume to the City with the Contract Bid Proposal.

Quantities of work are shown for estimating purposes only. The City reserves the right to increase or decrease any quantity or to eliminate any item of work. No adjustment will be made in unit prices for any such increase, decrease, or deletion regardless of the percentage of such adjustment. Final payment will be made on the basis of contract unit prices for work actually accomplished.

Trees shall be trimmed to accomplish the following: to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, which have vertical spacing from 18 to 48 inches and radial orientation so as not to overlay one another; to eliminate marrow V shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitation; to maintain a natural appearance; to balance crown with roots; all pruning cuts should be made to lateral branches or flush with the trunk. Under no circumstances should "stubbing" ever be performed.

22-2 Tree Pruning — The Contractor shall perform the following services in a professional workmanship like manner consistent with all appropriate rules of Safety.

A) Follow the shape suggested by the natural growth habits of each tree species.

B) Cut to laterals to preserve the natural form of the tree, leaving the head open enough for the branching system to show and permit dead material to be easily cleaned out and light to show through the head. Tree foliage shall not be reduced by more than 20% to 30%.

C) All limbs one inch in diameter or over shall be undercut to avoid splitting. Where there is a chance of the bark tearing at the crotch, remove large limbs with the crotch.

D) Trim to clear energized lines a minimum of two (2) feet, remove dead wood, hazardous branches, weak diseased, insect infested, broken, low or crossing limbs and all suckers, shoots and ivy. Branches with an extremely narrow angle of attachment shall be removed. Any structural weakness, decayed trunk, or branches shall be reported to the Superintendent.

E) The Contractor shall provide for proper vehicle clearance at curb, both in height of lower branches and extension of branches into the street. Height clearance at the curb shall be fourteen (14) feet from street level.

F) The Contractor shall allow adequate clearance for pedestrians to walk under the tree without concern for personal injury. Final head clearance shall be twelve (12) feet (minimum) as balance to curb pruning as possible.

G) On trees known to be diseased, pruning tools as well as cut surfaces shall be disinfected with a ten percent (10%) chlorine bleach solution or sterilant after each cut and between trees where there is danger of transmitting the disease on tools.

H) Pruning with hand pruners will be permitted. Small limbs, including suckers and water spouts, shall be cut close to the trunk or branch from which they arise.

I) Trees with dense foliage surrounding street lights shall be opened to allow light to penetrate through the head.

J) Pruning around high voltage transmission lines shall be done by a certified and qualified line clearance tree trimmer.

The Contractor should avoid any encroachment on adjacent properties and repair

and make good any damage caused to public or private property as a result of the work described in this contract. The Contractor will have an office or job site location where the person in charge of this project can be reached. The Supervisor for this project will be made known to a representative of the City of Albany so that he may be contacted immediately during working hours. In accordance with the project the Contractor will prepare a schedule for the entire project. This schedule shall be the basis for establishing the starting and completion dates of the work described in this project. It will be the responsibility of the Contractor to conform to the approved schedule and to arrange work in such a manner that it will be performed in accordance with the schedule. The Contractor will submit the final application for payment in accordance with procedures and requirements stated in the conditions of the Contract. The Contractor will take care not to damage existing surfaces and public and private property.

The Contractor will leave all portions of the work area in a safe, clean and sanitary condition satisfactory to the Director of Public Works.

22-3 Tree Stump Removal — Unless otherwise specified in the contract, special provisions or drawing, tee stump removal shall be as specified herein.

Stumps shall be removed by method approved by the City and in a manner as not to damage existing improvements.

The stump removal shall include the removal of the root ball to a depth of 24-inches below the existing curb grade or natural grade where no curbs exist, and to a minimum horizontal area of 18-inches each side of the center of the stump, or curb to sidewalk in the one direction when the planter strip os less than 36-inches wide.

After removal of the stump and root ball, the area shall be backfilled with topsoil to a minimum relative compaction of 85%.

Where existing improvements interfere with the stump and root ball removal, or when the Contractor desires to do so to facilitate his work, the improvements shall be removed and replaced in kind, at no additional expense to the City.

Removal and replacement of existing improvements by the Contractor shall be in accordance with the sections of these Standard Specifications, at no additional expense to the City.

The Contractor shall be responsible for notifying USA prior to work and the verification and protection of all existing subsurface improvements.

22-4 Measurement — Measurement shall be as indicated in the bid proposal. In general, trees shall be measured on a per each basis when listed by specific address. When tree trimming is listed in this bid proposal by "zone" or by entire "street," the measurement shall be on a lump sum basis. Such lump sum shall include all City-owned

trees within the zone s indicated on the contract drawings and all trees on a designated street (both sides). When no limit is specified for the beginning and end of work on the street specified, it shall mean city limit to city limit as that designated street.

22-5 Payment – The Contract unit or lump sum prices shall be considered as including full compensation for furnishing all labor, materials, tools, equipment and incidentals required to complete the contract items of work, including but not limited to removals, hauling, disposal costs and clean up.

CITY OF ALBANY

Standard Specifications
Technical Provisions

Section 23

Standard Specifications for Public Works Construction "Technical Provision"

For construction materials and methods of work not covered by the City's Standard Specification, Technical Provisions, the latest edition, at the time of bid advertising, of the "Standard Specifications for Public Works Construction" shall apply.