

PARK CITY
DESIGN STANDARDS
CONSTRUCTION SPECIFICATIONS
AND
STANDARD DRAWINGS



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PREPARED BY:

THE OFFICE OF THE CITY ENGINEER
PARK CITY MUNICIPAL CORPORATION
PARK CITY, UTAH 84060

Edited by: Eric Anderson
Approved by: Eric W. DeHaan, M.S., P.E.

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SECTION 700 WATER MAIN AND SERVICE LINE CONSTRUCTION

*This section has been replaced with the updated
'Water Guidelines & Service Line Flow Chart' Specs*

Please visit our webpage for the updated specs

<http://www.parkcity.org/departments/community-development/engineering-division/water-guidelines-service-line-flow-chart>

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STANDARD DRAWINGS



SECTION 100

GENERAL REQUIREMENTS

100.1 Introduction: The following Park City Construction Specifications and Standard Drawings were developed to provide standards for the physical development of subdivisions of land, construction of public works improvements within Park City, including, but not limited to, the construction and installation of roads, streets, curbs, gutters, drainage systems, and water and sewer systems. These Specifications are not intended for extraordinary circumstances; in such instances alternatives may be allowed, where justified, upon approval of the Park City Engineer.

100.2 Definitions: In the interpretation and construction of these Specifications and the Contract, or in any documents or instruments dealing with the construction operations governed by these Specifications, the following words, terms and abbreviations, or pronouns in place of them shall each be construed as defined below:

Abbreviations: Wherever the following abbreviations are used in these Specifications and in the Contract Documents, they are to be construed the same as the respective expressions represented:

A.A.N.	American Association of Nurserymen
A.A.R.	Association of American Railroads
A.A.S.H.T.O.	American Association of State Highway and Transportation Officials
A.C.I.	American Concrete Institute
A.G.A.	American Gas Association
A.G.C.	Associated General Contractors of America
A.I.A.	American Institute of Architects
A.I.S.C.	American Institute of Steel Construction
A.N.S.I.	American National Standards Institute
A.P.W.A.	American Public Works Association
A. R A.	American Railway Association
A.R.E.A.	American Railway Engineering Association
A.S.C.E.	American Society of Civil Engineers
A.S.L.A.	American Society of Landscape Architects
A.S.T.M.	American Society for Testing and Materials
A.W.P.A.	American Wood Preservers' Association
A.W.W.A.	American Water Works Association
A.W.S.	American Welding Society
F.H.W.A.	Federal Highway Administration
F.S.S.	Federal Specifications and Standards General Services Administration
I.E.E.E.	Institute of Electrical & Electronic Engineers
N.E.C.	National Electrical Code
N.E.M.A.	National Electrical Manufacturer's Association
S.B.W.R.D.	Snyderville Basin Water Reclamation District

U.D.O.T. Utah Department of Transportation
U.O.S.H.D Utah Occupational Safety and Health Division
U.S.A.S.I. United States of America Standards Institute

"Acceptable Alternate": In order to establish a basis of quality for some things in the work, certain processes, types of machinery and equipment, or kind of material may be mentioned on the Approved Plans by designating a manufacturer by name and referring to his brand or model numbers. Such mention is not intended to exclude other processes, equipment or materials that will measure up to the designated standards of that mentioned. *If the Contractor desires to use other products as equal thereto, he shall secure acceptance by the City Engineer before entering an order for such products.* Wherever in the Specifications a manufacturer's name, brand or model is mentioned, it is to be understood that the phrase "or acceptable alternate" is assumed to follow thereafter whether or not it does in fact.

Amount of Contract: For the purpose of awarding the contract and determining the amount of the bond, the total amount of the bid and the full amount of the contract price will be the summation of the products of the quantities shown in the proposal by the unit bid prices, and state sales or use tax, whenever applicable.

Approved Plans: The final construction drawings, plans, profiles, typical cross-sections, specifications and materials, and supplemental drawings, or reproductions thereof, approved by the City Engineer or District Engineer, which show the location, character, dimensions and details of work to be performed. All such documents are to be considered as a part of the plans whether attached to the Specifications or separate therefrom.

As-Built Drawings: These drawings shall be reproducible mylar drawings made by the developers' Engineer. They shall include any and all changes made to the construction plans before and during construction.

Bridge: A structure, other than a culvert, which carries traffic over a water course, highway or railroad, or railroad traffic over a highway or street.

City Engineer: The person or Consulting Engineer, including his authorized Assistant(s), who represent the Park City Municipal Corporation.

City Inspector: The authorized representative of the City or City Engineer assigned to make all necessary inspections of the work performed or being performed, or of materials furnished or being furnished by the Contractor.

City or Owner: Park City Municipal Corporation, acting through its legally constituted officials, officers, or employees, or the Developer who sponsors construction.

City Manager or designee: The appointed Park City official responsible for issuing the "notice to proceed" to the Contractors on any project involving public improvements.

Contract Bond, Performance Bond: The approved form of security furnished by the Contractor and his surety, as required in the Contract Documents. It shall be conditioned that such person or persons who enter into contract with the City shall faithfully perform and fulfill all the provisions of the Contract documents and complete the work in strict accordance with the Approved Plans and Specifications including full payment for labor and materials used in the work.

Contract Documents: The written agreement between the city or Owner and the Contractor covering the performance of the work and furnishing of labor, materials, tools, and equipment in the construction of the work. The Contract Documents shall include the Park City Specifications, Notice to Contractors, Bid Proposal, Approved Plans and Specifications, Special Conditions and Contract Bonds; also any and all supplemental agreements amending or extending the work contemplated. Supplemental agreements are written agreements covering alterations, amendments or extensions to the contract and include contract change orders.

The Contract Documents are complementary and what is called for by one shall be as binding as if called for by all. *In case of discrepancies, Specifications shall govern over Approved Plans, Supplemental Specifications shall govern over Standard Specifications, and Special Conditions shall govern over Specifications and Approved Plans.* Where appearing on Approved Plans or Drawings, dimensions denoted by actual figures shall govern over scaled dimensions. In case of any ambiguity or dispute over interpretation of the provisions of the Contract, the decision of the City Engineer shall be final.

Contractor: The Contractor is the individual or organization responsible for doing the work. The Contractor is further defined as the individual, firm, co-partnership or corporation, and his, their, or its heirs, executors, administrators, successors and assigns, or the lawful agent of any such individual firm, partnership, covenantor or corporation, or his, their, or its surety under the contract bond, constituting one of the principals to the Contract and undertaking to perform the work herein specified. Were any pronoun is used as referring to the word "Contractor" it shall mean the Contractor as defined above.

Culvert: A drainage structure which may or may not directly support traffic, extending across and beneath a highway, street, driveway or alley.

Days: Unless otherwise designated, days as used in the Specifications will be understood to mean calendar days including weekends and holidays.

Developer: The person sponsoring construction.

Director of Public Works: The appointed Park City official in direct charge of public facilities in Park City.

District: Snyderville Basin Water Reclamation District.

District Engineer: The Consulting Engineer, including authorized assistants, who represent the Snyderville Basin Water Reclamation District.

District Engineer: The authorized agent of the District or District Engineer assigned to make detailed inspections of any or all portions of the sewer system construction.

Engineer: This term shall primarily mean a Licensed Engineer or an authorized member of a licensed consulting firm or organization retained by the developer for design and construction engineering of specific projects.

This term shall also apply to the City or District Engineer in cases where requirements need to be altered to serve the best interests of the City or District.

Liquidated Damages: the amount prescribed in the Specifications to be paid the Owner, 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.

Pavement: the uppermost layer of bituminous or Portland-cement concrete material placed on the traveled way or shoulders for a riding surface, whether rigid or flexible in composition. This term is used interchangeably with *surfacing*.

Roadway or Street (Right of Way): That portion of the highway included between curbs, gutters, or ditches, intended primarily for vehicular traffic, and including all appertaining structures and other features necessary to proper drainage and protection, together with a shoulder of from 5 feet to 10 feet outside of the paved area where vehicles may park and snow may be stored from time to time.

Special Conditions or Provisions: The contract requirements peculiar to the project which are not otherwise thoroughly or satisfactorily detailed and set forth in the Standard Specifications.

Specifications: The directions and requirements of the Standard Specifications contained herein, as supplemented by such Special Conditions as may be provided, pertaining to the manner of performing the work or the quantities and quality of materials to be furnished under the Contract Documents.

Standard Drawings or Plans: The standard illustrative details which accompany these Construction Specifications.

Subcontractor: The individual, firm, partnership or corporation to whom the Contractor sublets any part of the work covered by the Contract Documents.

Subgrade: That portion of the roadbed surface which has been prepared, as specified, and upon which a layer of specified roadbed material or base, or sub-surfacing, or pavement is to be placed.

Supplemental Specifications: Supplemental specifications are those adopted subsequent to the Standard Specifications and generally involve alterations and new construction items, or substantial changes in the Standard Specifications.

Surety: The surety responsible for the bidder's acts in the execution of the contract, or which is bound with and for the Contractor to insure performance of the Contract, the payment of all obligations pertaining to the work, and the fulfillment of such other conditions as may be specified or required by law.

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

Traffic Control Devices: Fixed or portable signs, signals, street lights, barricades, guard rails, pavement markings, channelization and other equipment or materials used for the purpose of regulating, warning and guiding traffic.

Traveled Way: That portion of the roadway intended for movement of vehicles.

Work: 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 City Engineer.

Working Drawings (Shop Drawings): Stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval.

100.3 Revisions of Standards and Specifications: Technical Specifications produced by industrial or trade associations which are referred to in this document (ASTM, AASHTO, ANSI, etc.) are those Specifications as they appeared at the time this document is adopted. Subsequent revisions to those Specifications may be made from time to time, but shall not be construed as reducing the Construction Standards called for here. In the event a specific Technical Standard or Specification is revised or renumbered by the association preparing the standards, this document shall incorporate the successor provision to any of the Technical Specifications referred to herein. These Specifications may be modified or deleted by appropriate notes on Approved Drawings.

100.4 Temporary Construction Drainage: The Contractor shall be responsible for maintaining control of drainage and erosion during construction. Particular attention should be given to existing drainage patterns which run through cleared areas and over extreme slopes. These patterns should be identified to isolate problem areas where water will concentrate. Provisions shall be made to channel runoff away from new or existing improvements to prevent undermining and general site erosion. These provisions should be stabilized and should remain in place until the permanent storm drainage facilities are installed and functional.

100.5 Protection of Public and Private Utilities: The Contractor shall support and protect by timbers or otherwise, all pipes, conduits, poles, wires or other apparatus which may be in the way affected by the work, and do everything to support, sustain and protect the same, under, over, along or across said work. In case of any said pipes, conduits, poles, wires, or apparatus should be damaged they shall be repaired by the authorities having control of same, and the expense of such repairs shall be charged to the Contractor.

The Contractor shall protect all survey monuments located in the vicinity of the contract work. If the monuments are disturbed or destroyed, they will be reset by the proper authorities and the expense of such efforts shall be charged to the Contractor.

The Contractor shall further be responsible for any damage done to any street or other public property, or to any private property by reason of the breaking of any water pipes sewer or gas pipe, electric conduit, or

other utility by or through his negligence. The Contractor is responsible for locating all utilities and for notifying Blue Stakes at least 48 hours prior to commencement of construction.

Specific requirements in other sections of these Specifications or Special Provisions shall prevail over the foregoing requirements in case of conflict.

100.6 Control of Material:

100.6.01 Source of Supply and Quality Requirements: The materials used on the work shall meet all quality requirements of the Contract Documents. In order to expedite the inspection and testing of materials, the Contractor shall notify the Engineer of his proposed sources of materials prior to delivery. At the option of the Engineer, materials may be approved at the source of supply before delivery is started. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other approved sources.

100.6.01A Local Material Sources: Proposed Sources: Possible sources of local materials may be designated on the Approved Plans and described in the Special Provisions. The quality of materials in such deposits will be acceptable in general, but the Contractor shall determine for himself the amount of equipment and work required to produce a material meeting the Specifications. It shall be understood that it is not always feasible to ascertain from samples the limits for an entire deposit, and that variations shall be considered as usual and are to be expected. The Engineer may order procurement of material from any portion of a deposit and may reject portions of the deposit as unacceptable if the material fails to comply with the Specifications.

The City may acquire by option and make available to the Contractor the right to take materials from the sources designated on the Approved Plans and described under Special Conditions, together with the right to use such property as may be specified for plant site, stockpiles and hauling roads. Operations and use of property in connection with designated sources shall be subject to the detailed terms of the options granted by the City. The Contractor shall contact the property owner before entering on the property.

100.6.01B Contractor Furnished Sources: If the Contractor desires to use material from sources other than those designated or if no source is designated, he shall acquire the necessary rights to take materials from the sources and shall pay all costs related thereto, including any which may result from an increase in length of haul. All costs of exploring and developing such other sources shall be borne by the Contractor. The use of material from other than designated sources will not be permitted until representative samples taken by the Engineer have been approved and written authority is issued for the use thereof.

When material deposits are not designated in the Special Conditions, the Contractor shall provide sources of acceptable materials.

When sources of material or material deposits are not provided by the Contractor, the Contractor will assume the cost of processing samples to determine the suitability of the material. A period of 30 days shall be allowed for sampling and testing after the Engineer has been notified in writing of the location of the source or deposit.

Source of supply and control of pits shall comply with this section.

100.6.02 Samples, Tests, Cited Specifications: All materials must be inspected, tested and accepted by the Engineer before incorporation in the work. Any work in which untested and unaccepted materials are used will be performed at the Contractor's risk and may be considered as unacceptable and unauthorized work. Unless otherwise designated, tests shall be made in accordance with the most recent cited standard methods of AASHTO, ASTM, or those established by the City prior to the date of advertisement of bids. The tests will be made by and at the expense of the Contractor. *All materials are subject to inspection, test and/or rejection at any time prior to acceptance of the work.* Copies of test reports will be furnished to the City.

The Contractor shall furnish certificates of compliance for all manufactured materials obtained from vendors or producers, prior to their incorporation in the work. Such certification shall be subject to verification by field inspection or further testing by the Engineer.

References to AASHTO, ASTM, UL and other specifications shall be the most recent edition at the time of advertising the bids.

Samples shall be taken and compliance test made at the point of acceptance in accordance with the following:

100.6.02A Untreated aggregates: Samples of all untreated aggregates or soils taken from the road at the laydown machine prior to compaction, for the determination of gradation, plasticity and unit weight, if applicable.

100.6.02B Bituminous Mixtures: Samples of all bituminous mixtures shall be taken from the road at the laydown machine prior to compaction, for the determination of gradation and bituminous content. Cores may then be taken after compaction to assure pavement thickness.

100.6.02C Portland Cement Concrete: Samples of Portland Cement Concrete shall be taken from the structure immediately after discharge from the hauling unit, for the determination of slump and air content and for the fabrication of test beams and cylinders.

100.6.02D Cement Treated and Lime Treated Materials: Samples of cement treated and lime treated materials shall be taken from the road at the laydown machine prior to compaction, for the determination of gradation, moisture content, unit weight, and the fabrication of test cylinders.

100.6.02E Density Test: Test for density may be made on the road after the compaction process has been completed by one of the following methods:

1. AASHTO Designation T191
2. The Utah Department of Highways Test Procedure 8-924
3. AASHTO Nuclear Device

100.6.02F Smoothness Determinations: Smoothness determinations may be made on the road, by straightedge, chalk line or profilographs, after all compacting and processing has been completed.

100.6.02G Thickness Determinations: Thickness determinations may be made on the road, by coring or test pitting, after all compacting and processing has been completed.

100.6.02H Manufactured Materials: Manufactured materials, such as Portland Cement, Hydrated Lime, Asphaltic Materials, paint, or any other material before being incorporated into the project may be sampled at the producer's plant whenever practical. Before final acceptance, such materials shall be subject to inspection and further testing after delivery to the project as determined by the Engineer. Project samples shall be taken before the material is incorporated into any other product.

100.6.03 Plant Inspection: The Engineer may undertake the inspection of materials at the source.

In the event plant inspection is undertaken, the following conditions shall be met:

100.6.03A Contractor Cooperation: The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

100.6.03B Full Plant Entry: The Engineer shall have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials being furnished.

100.6.03C Safety Measures: Adequate safety measures shall be provided and maintained.

100.6.03D Materials Retest: It is understood that the City may retest all materials prior to incorporation into the work which have been tested and accepted at the source of supply after the same have been delivered; and may reject all materials which, when retested, do not meet the requirements of the Specifications.

100.6.04 Storage of Materials: Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the right-of-way may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. *Private property shall not be used for storage purposes without written permission of the owner or lessee and, if requested by the Engineer, copies of such written permission shall be furnished by the Contractor at his expense. All storage sites shall be restored to their original condition by the Contractor at his expense, and inspected by the City.*

100.6.05 Handling Materials: All materials shall be handled in such manner as to preserve their quality and fitness for the work. Aggregates shall be transported from the storage site to the work in tight vehicles so constructed as to prevent loss or segregation of materials after loading and measuring in order that there may be no inconsistencies in the quantities of materials intended for incorporation into the work as loaded, and the quantities as actually received at the place of operations.

100.6.06 Unacceptable Materials: All materials not conforming to the requirements of the Specifications shall be considered as unacceptable and all such material will be rejected and shall be removed

immediately from the site of the work unless otherwise instructed. No rejected material, the defects of which have been corrected, shall be used until approval has been given.

100.6.07 City-Furnished Materials: The Contractor shall furnish all materials required to complete the work, except those specified to be furnished by the City.

Material furnished by the City will be delivered or made available to the Contractor at the points specified in the Special Conditions.

100.7 Record Drawings and On-Site Contract Documents: Contractor shall maintain at the site for the Engineer one copy of all drawings, specifications, addenda, approved shop drawings, change orders and other modifications, in good condition and order, and marked to record all changes made during construction. These shall be available to the City Engineer and the Director of Public Works.

To facilitate the above, the Engineer will furnish the Contractor with one set of blue line prints of all drawings which are a part of this contract. Contractor shall maintain this set of prints in good condition in his field office. Installation of any work in locations or in a manner other than shown on the drawings shall be recorded daily by the Contractor on the drawings. The Contractor shall see that the mechanical and electrical subcontractors shall do likewise. Dimensions shall be given to permanent objects such as building columns, buildings, sidewalks, curbs and driveway and/or grids.

Whenever necessary to complete the record drawings in a neat, legible manner, the Contractor shall employ a competent draftsman, satisfactory to Engineer, to make new drawings or to indicate changes on the prints.

On or before the date of final inspection, the Contractor shall deliver the corrected and completed prints to the Engineer as a record of construction. Delivery of the prints to Engineer will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints. Delivery of the prints must be made before payment of the final retained percentage.

100.8 Explanation of Measurement and Payment: The subsections regarding measurement and payment usually located toward the end of pertinent sections shall apply to projects bid for the Park City Municipal Corporation. Private developers have the option of adopting or amending these sections for use in their Contracts or Bidding Documents. It is understood that "Measurement and Payment" subsections therefore have no bearing on work by contractors for private developers.

100.9 Payment of Costs: Whenever work is required or performed under these specifications, and Park City incurs expense in the design, inspection, or review of private designs submitted for approval, the reasonable costs for that engineering work, whether performed by private consulting engineers or by members of the City staff, will be billed to the developer and must be paid in full before final certificates of occupancy or acceptance of the work will be granted.

100.10 Winter: Winter is after October 15 at 5:00 P.M. and before April 15.

Winter conditions may put additional responsibilities, limitations, and constraints on some construction activities:

Depositing mud on City roadways is not allowed: some preventive measures must be taken. Adherence to ACI cold weather concreting standards is required unless waived by the City Engineer.

Asphalt concrete may be placed after October 15 at 5:00 P.M. and before April 15 only with written permission by the City Engineer; and the asphalt concrete will be considered temporary, to be replaced after April 15 under suitable conditions, unless otherwise approved by the City Engineer.

See other sections for specific Winter requirements.

100.11 Right-of-Way: The City Right-of-Way is City property used for roads and utilities. Generally, Park City's Right-of-Way extends back about ten feet beyond the gutter or edge of asphalt on either side. Any backfill done in the City Right-of-Way shall be spread in uncompacted lifts not exceeding eight (8) inches, and then compacted by mechanical tampers to 96% as determined by ASTM Test method D-1557. The City Engineer may give a waiver requiring only 90% compaction within the most distant five (5) feet of the Right-of-Way.

100.12 Open Trenches: The length of trench excavated for pipe or other utility placement shall be kept to a minimum *and in no case shall any open trench exceed three hundred (300) feet* unless otherwise specifically authorized by the City Engineer. Trench widths, shoring, bracing, and trenching procedures shall conform to Utah Occupational Safety and Health Rules, Regulations and General Standards.

GENERAL:

Under no circumstances shall the presence, observations or testing by the City's authorized representative be construed as approval or acceptance of the Contractor's failure or refusal to fully comply with the requirements of the project plans and specifications.



SECTION 200

GENERAL IMPROVEMENT REQUIREMENTS AND DESIGN GUIDELINES

200.1 Scope: This section defines the general requirements for all site Improvements to be built and installed within the City limits of Park City, Utah and/or improvements which may become the responsibility of Park City. In addition to these requirements, all other applicable codes and ordinances remain in effect. These requirements are intended to allow the public officials of Park City to protect the health, safety, and welfare of residents and visitors.

200.2 Construction Drawings: Complete and detailed construction plans and drawings of improvements shall be submitted to the City Engineer prior to commencing construction. This plan set may be required to contain a topographic site survey or orthotopographic mapping certified as to its level of precision by a registered Land Surveyor registered in Utah. No construction shall be started until plans have been approved by the City Engineer and, in the case of any improvements which may become the responsibility of Park City, a Notice to Proceed has been issued by the City Manager or designee.

200.3 Standards for Final Construction Drawings: The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size and style. This level of detail is not necessary at any preliminary approval stage such as Planning Commission approval unless required by the City Engineer.

200.3.01 Revisions: All revision to plans shall be noted on the plans. All major revisions shall be corrected on the plans and submitted to the City Engineer for approval prior to construction.

200.3.02 Required Information: The plans and design shall meet the standards defined in the Park City Design Standards, Construction Specifications, and Standard Drawings, and other plans and ordinances of Park City. The minimum information required on drawings for improvements is as follows:

All drawings and/or prints shall be clear ant legible and conform to good engineering and drafting room practice. Size of drawings shall be no larger than 24" x 36" (trim line).

The following items are required on drawings:

- A. North arrow (plan).
- B. Vicinity map.
- C. Scale and elevations referenced to Park City Engineer's Datum.
- D. Stationing and elevations for profile.
- E. Title block, located in lower right corner of sheet, to include:
 - 1. Name of City.
 - 2. Project title (subdivision, etc.).
 - 3. Specific type and location of work.

4. Space for approval signature of City Engineer with date.
5. Name of engineer or firm preparing drawings with license number.
6. Number all sheets.

F. Scale should generally be 1" = 50' horizontal; 1" = 5' or 10' vertical.

G. Both plan view and profiles must be shown for each side of the street and centerline. Profiles shall extend 300 feet beyond end of work. Maximum finished road slope shall be 10 percent. Minimum is 1.0 percent. Maximum cul-de-sac length is 650 feet. Minimum centerline radius of public streets shall be 80 feet.

H. Stationing and top of curb elevations with curve data must be shown for all curb returns.

I. Flow direction and type of cross drainage structures at intersections and adequate flow line elevations.

J. Benchmark location and elevation.

K. Type of curb and gutter and distance back of curb to back of curb.

L. Gradient of roadways. Cross-slope transitions must be shown in detail.

M. Storm drain pipe size, type, class and gradient.

N. Calculated amount of storm water flow at each drainage collection structure and in each curb at all intersections shall be shown on an included drainage plan for any project involving more than eight (8) residential units and for any commercial or industrial project.

O. Size and location of water mains, valves, meters and hydrants.

P. Type of water pipe. Water mains shall be metered unless they are in streets, roads, or road shoulders.

Q. Minimum cover five (5) feet over water lines; the minimum cover may be increased to seven (7) feet for dead-end lines or lines in areas to be snow-plowed. Minimum cover is 7 feet in all areas above 7,300 feet.

R. Each set of plans shall be accompanied by separate sheets of details for all pavement sections and structures which are to be constructed. A note disclosing the completion date of October 15 for all street patching and construction is desirable.

S. For subdivisions and private streets serving more than eight (8) residential units, both 400-scale and 1000-scale mapping shall be submitted to the City for the City's use in updating their master mapping corresponding to those scales.

200.3.03 Additional Information: The following is a list of information which may be required for Park City Fire District approval:

- A. Legal description of property.
- B. Location: Plot plan, existing adjacent structures.
- C. Occupancy type/load.
- D. Type of construction.
- E. Access roads: grades, widths, parking, turn-arounds, cul-de-sac.
- F. Height of building: from fire fighting grade.
- G. Alarm systems: smoke, fire, sprinkler.
- H. Water supply system: source, storage facilities, distribution system, hydrant locations on uphill side of street, if possible.
- I. Fire sprinkler information.
- J. Floor plan showing: exit signs, panic hardware, location of fire extinguishers, location of hose cabinet, any other protection devices.
- K. Information may be required as determined by the Fire District/Marshal.

200.4 Inspection: All construction work involving the installation of improvements shall be subject to inspection by the City. Certain types of construction may require continuous inspection while others may have only periodic inspections. All inspection and testing costs are paid by developer or contractor unless Park City contractually assumes this financial burden. No inspections can be made on Sunday or federal holidays.

- A. Continuous inspection is required on the following types of work:
 - 1. Laying of street surfacing.
 - 2. Placing of concrete for curb and gutter, sidewalks and other structures.
 - 3. Laying of sewer pipe, drainage pipe, water pipe, valves, hydrants and testing.

B. Periodic inspection is required on the following:

1. Street grading and gravel base.
2. Excavations for curb and gutter and sidewalks.
3. Excavations for structures.
4. Trenches for laying pipe.
5. Forms for curb and gutters, sidewalks, and structures.
6. Staking of limits of disturbance.
7. Landscaping and landscape sprinkler information.
8. Water service connections.

C. Requests for Inspection: Requests for inspection of work requiring continuous inspection shall be made to the City three (3) working days prior to commencement of the work. Periodic inspection will require a two (2) full working day (Mon.-Fri.) notification prior to the requested inspection.

200.5 Construction-Completion Inspection: An inspection shall be made by the City Engineer or his authorized representatives upon notice by developer after all construction work is completed. Any faulty or defective work shall be corrected within a period of thirty (30) days of the date of the City Engineer's Inspection Report defining the faulty or defective work.

200.6 OneYear Correction Period: If within one year after completion any work is found to be defective, the contractor or developer shall promptly, without cost to the City, either correct such defective work or remove it from the site and replace it with non-defective work. If the contractor or developer do not promptly comply, or in an emergency where delay would cause serious risk of loss, injury or damage, the City may have the defective work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be collected by the City in the manner most convenient to the City from the developer and contractor. Whatever sharing of cost may be agreed upon between the developer and contractor is strictly a private matter between the developer and the contractor.

200.7 Required Improvements: The following improvements are generally required unless waived by the City on the basis of site conditions which make these improvements unnecessary. The design of the improvements will vary depending on site conditions, and on the implementation of the Streets Master Plan, Parks and Trails Master Plan, and other similar planning documents adopted by the City that may cover the site or adjoining public properties. Unless otherwise stipulated all improvements shall be designed and built to generally-accepted engineering standards.

A. Curb and gutter, culverts, inlet boxes, and other drainage improvements reasonably necessary to provide proper drainage in accordance with good engineering practice and the Park City Master Storm Drainage Plan.

B. Detention of runoff to improve water quality and to delay and reduce peak runoff to a flow rate not exceeding the runoff rate which would have existed prior to any disturbance of the land surface.

C. Pavement designed on a site-specific basis by a registered professional civil engineer. Unless otherwise approved by the City Engineer, design traffic loading as an approximate equivalent to taking all design factors into consideration shall provide for 100 heavy trucks per day both ways (HTPDBW) for residential streets, 300 HTPDBW for collector roads, and 500 HTPDBW for arterial roads, as shown on the Park City Master Streets Plan.

D. Permanent survey control such as brass cap measurements.

E. Street lights, street signs, and traffic signs and markers. Operation and maintenance of street lights is a City responsibility only when the light is at the intersection of two City streets. Street name signs shall be in accordance with Standard Drawings 540-D and 540-E. Traffic signs and traffic markers (including but not limited to stop signs and pavement striping) shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Devices. Street lights shall be in accordance with Standard Drawings 540-A, 540-B, and 540-C.

F. Fire hydrants are required at 150-foot intervals measured along public ways or walks or drives which are to be snow-plowed. All water mains serving a hydrant shall be a minimum of eight-inch diameter. Each hydrant shall have an auxiliary gate valve located flanged to the tee on the water main.

G. A metallic tracer wire and brightly-colored utility warning tape may be required to be placed over all underground utility lines.

H. Both public and private streets shall be built in accordance with cross-sections shown in the Park City Master Streets Plan, including pavement, gutter and sidewalks. Projects which would create an unreasonable traffic impact, either for construction or for permanent access, whether by vehicles, bicycles, or pedestrians on any City street shall be required to structurally improve those streets in a manner to be determined by the City Engineer such that the street is structurally capable of carrying both the temporary and permanent increases in traffic when analyzed by generally accepted engineering methods.

I. A study of geological hazards by a geologist or soils engineer may be required to be submitted for all sites unless City Staff specifically omits the requirement. Cuts and fills on each site shall be balanced to minimize hauling.

J. Right-of-way for public streets in accordance with the Master Streets Plan may be required to be dedicated to the City for sites adjacent to streets identified in the Master Streets Plan as being in need of additional right-of-way.

K. Regulatory traffic signage may be required if a project creates any traffic impact.

L. Sidewalks and/or pedestrian trails, with wheelchair ramps at curbs or other obstacles in accordance with Park City's Park and Trails Master Plan and as required to serve the proposed project.

M. All utilities and meter locations must be shown, including water and sewer laterals, power and phone cables, gas lines, and cable TV. Whenever a proposed project will alter, extend, or abandon sanitary sewer mains, all sewer construction shall be done according to standards established by S.B.S.I.D.

N. All connections to the City water system shall be inspected and metered unless otherwise approved by the City Engineer and Public Works Director. All connections 4 inches in diameter or larger shall also be provided with a valve at the tee or property line and in other locations subject to the approval of the City Engineer and Public Works Director. All connections, piping, and appurtenances on the consumer's side of the water meter or beyond a point 5 feet outside of the public roadway are to be maintained privately, not by Park City. Any large addition to the water system, such as a new condominium project or subdivision, may also be required to install a master zone meter in order to allow Park City to monitor line losses.

N1. The Water System Connection inspection is in three phases, each phase shall be inspected by the City Engineer or the City Public Improvements Inspector:

- a. Excavation, Tapping, and Backfilling
- b. Meter Set Request
- c. Public Improvements (post-landscape)

O. Any staging area must be identified if requested by the City Engineer. Site survey information including detailed horizontal and vertical information relating to existing and future items may be required by the City Engineer.

P. A letter from each appropriate utility company approving all utilities, including but not limited to water and sewer laterals, power and phone cables, gas lines and cable TV can be required by the City Engineer prior to Park City approval. All utilities shall be placed underground unless otherwise approved by the City Engineer.

Q. Methods of temporary and permanent erosion control on construction sites and along all drainage channels, swales, or streams below construction sites. Methodology is subject to approval by an independent landscape architect and shall be in accordance with generally-accepted standards of landscape architecture. Limits of disturbance shall be shown on the plans. A landscaping and revegetation plan including irrigation sprinklers may be required.

R. Wherever possible open channels shall be preserved for all major drainages shown on the Master Storm Drainage Plan. Culverting of these channels is not allowed unless approved by the City Manager or designee. Landscaping and revegetation to stabilize soils may be required.

S. Water system improvements necessary to keep Park City's water storage and distribution system fully in accordance with recommendations from the Insurance Services Office and Utah State Board of Health regulations. Improvements required include but are not limited to: reservoirs and appurtenances, including excess capacity as need to provide efficient long-term system operation, pressure reducing stations, pump stations, valves, air release valve vaults, meter vaults, water distribution lines, telemetry, and computer modeling by Park City or the consulting engineer of the City's choice as necessary to determine the impacts of a proposed development on the City water system. The City Engineer may require manhole-size valve vaults as per Std. Dwg. 709 at any valve. A completely-detailed design of each pump house will be required; scope of review includes but is not limited to exterior design and safety issues such as kill switches, ground faulting, and panel locations (2 feet off floor minimum). Pumps and motors shall have a minimum of 75% wire-to-water efficiency unless otherwise approved by City Engineer and Public Works Director. To simplify parts inventories, water systems equipment manufacturers shall be as follows: pumps shall be manufactured by Aurora; motors by U.S. Electrical Motor; starters by Dayton; boxes and panels by Square D; chlorinators by Fischer and Porter; pump control valves by Cla-Val.

T. Bus shelters, with an estimated value of \$6,000.00 each, are required for major developments along bus routes. If a bus shelter is provided, the developer's architect is required to use logos and signage in the design of the shelter but is encouraged to incorporate project design themes and features into the design of the shelter.

U. Snow storage sites and snow storage easements adequate to serve all plowed spaces within and adjacent to the developments. Snow which could be shed from roofs shall be adequately accommodated to eliminate the possibility of snow and ice falling on access ways to buildings.

V. As-built drawings or record drawings showing the as-built location of all public improvements tied to as-built surface improvements.

W. Sewer improvements as required by the Snyderville Basin Water Reclamation District (S.B.W.R.D.), including excess capacity as agreed upon between S.B.W.R.D. and the developer. Backfill over sewer lines in City streets or on City property shall be in accordance with these Specifications.



SECTION 500

STREET CONSTRUCTION AND RELATED WORK

500.1 General: All pavement and street construction within Park City, including pavement patches, on City right-of-ways, or City owned property, and for private projects as determined by City ordinances, shall be constructed in accordance with the requirements of these Specifications. Because of the severity and sudden onset of winter in Park City, all asphalt placement and all street patching and construction shall be completed by 5:00 p.m. on October 15, unless approved otherwise by Public Works Director.

500.2 Approved Plans: Pavement and street construction shall be performed in accordance with the Contract Documents for the work, prepared under the direction of a Professional Engineer licensed in Utah and approved by the Park City Engineer. Construction shall conform to the Approved Plans, these Specifications, and the Standard Drawings included in these Specifications.

500.3 Licenses and Permits Required: All paving and street construction, including City right-of-ways shall be performed by a Contractor licensed and bonded in Utah. A permit shall be secured by the Contractor from the Building Department and approved by the City Engineer at least 48 hours before initiating construction. Park City's Inspector shall be notified by the Contractor at least 3 working days before the planned construction is to commence and also before starting whenever construction is delayed for any reason. The Chief of Police and the Park City Fire District must be notified 48 hours in advance of intended closure of any public way.

500.4 Inspection: All work shall be inspected by a City authorized Inspector who shall have the authority to halt construction. Whenever any portion of these Specifications and Contract Documents are violated, the City Manager or designee, by written notice, may order that portion of construction which is in violation of these Specifications and Contract Documents to cease until violation is corrected. A copy of the notice may be filed with the Contractor's license application for future review. If deficiencies are not corrected, performance shall be required of the Contractor's Surety.

500.5 Contractor's Site Examination: Prior to starting work, the Contractor shall visit the site to determine existing conditions, nature of materials to be encountered and all other pertinent factors concerning or affecting the work to be performed. The Contractor shall familiarize himself with utilities and other existing improvements which occur in or near the designated work areas. If the work requires the temporary removal or relocation of existing items such as street signs, fences, mail boxes, etc., the location of each item shall be accurately determined and recorded on the Contractor's field drawings. Following completion of work in the area the items shall be replaced to their original locations and condition. The Contractor shall assume full responsibility for the protection of such items during removal, replacement and/or storage.

500.6 Supervision by the Contractor: Before starting the work, the Contractor shall designate, in writing, a representative who shall have complete authority to act for him. An alternate representative may also be

designated. The representative or alternate shall be present at the work site whenever work is in progress. Any order or communication given to this representative shall be deemed delivered to the Contractor. A joint venture shall designate only one representative and alternate. In the absence of the Contractor or his designated representative, necessary directions or communications relevant to the work may be given by the City's representative to the superintendent or foreman having charge of the specific work to which the order applies. Such order(s) shall be complied with promptly and referred to the Contractor or his designated representative.

500.7 Traffic Control: The Contractor shall direct all construction activities so as to minimize obstruction of vehicular or pedestrian traffic and to prevent damage to completed work. In this regard, the Contractor shall keep the proper City Authorities continuously informed as to the location(s) of this operations. *No City street or road shall be closed to vehicular traffic without the prior permission of the City and not until after the affected emergency response authorities have been notified.*
Contact the City Engineer's office to apply for street closure authorization.

In order that the effect to both the flow of traffic and damage to the new work is minimized, the Contractor shall at all times provide approved barricades, lights, flag men and other traffic control devices approved by the City Engineer, specified on the drawings or specifications or as may be required by law. All barricades needed overnight shall have flashing amber lights.

The Contractor shall submit his traffic control plan to the City Engineer for approval, prior to the start of work. All necessary personnel and/or devices, including any additional as directed by the City Engineer, shall be provided solely at the expense of the Contractor.

500.8 Protection of Existing Improvements:

500.8.01 Surface Improvements: The Contractor shall be responsible for the protection of existing surface improvements as directed elsewhere in the various applicable sections of these Specifications and Contract Documents, and any damage resulting from his operations shall be his sole responsibility.

When required for construction approval, the limits of the disturbance area shall be fenced with a 6-foot chain link fence conforming to UDOT Specifications, or approved equal.

500.8.02 Subsurface Improvements:

500.8.02A General: Utilities of record will be shown on the Approved Plans insofar as it is possible to do so. Failure of the plans to show the existence of subsurface objects or installations shall not relieve the Contractor from his responsibility to make an independent field check nor relieve him from all liability for damages resulting from his operations unless otherwise provided in the Special Conditions or by exceptions hereinafter mentioned.

It shall be the responsibility of the Contractor to give proper written notification to the agencies that have utilities in place and to cooperate with these agencies in the protection and relocation of the various

underground installations. These agencies will give assistance in the location of various utilities, but this shall not relieve the Contractor from responsibility for any damage incurred, except in cases where the installations are not located as closely as is normally possible with normal locator equipment. In such case, the Contractor will not be liable if he has proceeded with due caution.

Where sewer services are damaged through no fault of the Contractor, they shall be repaired and payment will be made therefore in accordance with the unit contract price, or by force account as the City Engineer may determine.

500.8.02B Private Utilities: Utilities other than those owned and operated by the City are in streets pursuant to franchises or to rights claimed under the laws of the U.S.A. or the State of Utah, and therefore, the respective utility agencies are responsible for all adjustments and relocations of their facilities. These agencies will locate their facilities for the Contractor and assist him in their protection. The Contractor shall coordinate his work with that of the affected agencies and shall protect their utilities from damage to the extent possible.

The Contractor shall be liable for all damage to private utilities resulting from his operations, and shall hold the City harmless.

500.8.02C Water Mains and Appurtenances: The Contractor shall be responsible for any damage to water mains and water facilities caused by his operations, for the cost of lost water, and also for the cost of City manpower, materials, and equipment costs as determined by the Public Works Director, except under the following conditions:

1. he has not excavated below or beyond the required excavation lines and,
2. he has given proper and timely notice of his work plans, and
3. he has used reasonable care and has cooperated in minimizing the damages.

Any damage to water gates, hydrants, valve chambers, and other surface appurtenances which results from the Contractor's operation shall be his sole responsibility.

500.9 Use of Existing Streets: Off-highway earthmoving equipment, tracked equipment and haul vehicles with loads in excess of legal limits will not be allowed to travel upon, haul on or across any existing streets not being improved under or otherwise included in the Contract.

500.10 Use of Explosives: Blasting will not be permitted in any case without specific authority of the City, and then only under such restrictions as may be required by the proper authorities. Explosives shall be handled and used in strict compliance with the "Utah Occupation Safety and Health; Rules and Regulations; General Standards" of the Utah State Industrial Commission.

When the use of explosives is necessary for the execution of the work, the Contractor shall be responsible for any and all damage or injury resulting from the use of explosives.

The Contractor shall notify the Park City Police Department, the Park City Fire District, and each public utility company having structures in proximity to the site of the work of his intention to use explosives and such notice shall be given sufficiently in advance to enable companies to take such steps as they may deem necessary to protect their property from injury.

Blasting shall be completed in the vicinity of new structures before construction on such structures is undertaken. All explosives shall be stored in a secure manner and placed in compliance with local laws and ordinances and all such storage places shall be clearly marked "Danger--Explosives". No explosive shall be left in an unprotected manner along or adjacent to any existing highway or public place.

500.11 Prime and Tack Oil Application: The prime and tack oil application rate will be allowed to vary depending on air temperature, soil moisture, and soil type from the rates specified herein down to 0.05 gallons per square yard. The determination will be made by the Park City Inspector as specific conditions are verified.

500.12 Import Fill Material: The Contractor shall obtain import fill material from one source only for each classification of fill material used on each project. The material from each source must meet the specifications for the classification and be approved by the City Engineer prior to delivery on site. Submittals to the City Engineer must be made a minimum of five (5) working days prior to the intended use of the material.

500.13 City Right-Of-Way Grades Behind Gutter/Edge of Asphalt : (REFER TO STD. DWG. 800-B) When Landscaping or excavating on City property or the City Right-Of-Way, the following conditions shall apply:

1. Within the outside ten (10) feet of the City Right-Of-Way, the final physical grade elevation shall be within the limits of the areas shown between the dashed lines in Standard Drawing 800-B, Right-Of-Way Grading Section. The change in grade within the first five (5) feet behind the back of curb (BOC), or edge of asphalt (if there is no curb or gutter), shall not exceed six (6) inches plus or minus from the BOC grade elevation. The change in grade between five (5) feet and ten (10) feet behind the BOC, or edge of asphalt (if there is no curb or gutter), shall not exceed three (3) feet plus or minus from the BOC grade elevation.

2. Any landscape materials used in the outside ten (10) feet of the City Right-Of-Way: rock, timber, etc. shall physically fit within the limits of the areas shown between the dashed lines in Standard Drawing 800-B, Right-Of-Way Grading Section.

3. Approval of the City Engineer or the Director of Public Works is required prior to doing work on City Property. A permit may be required. Contact the City Engineer's Office for Permit requirements and/or Approval.



SECTION 501

EARTHWORK

501.1 General Description: Earthwork shall consist of all work required to construct or shape the earthen foundation, embankment, subgrade, etc. of any street, alley, parking lot, or other such facility in accordance with the Specifications and in reasonably close conformity with the lines, grades, and typical cross-sections shown on the Plans or as established by the Engineer. Earthwork shall consist of, but not necessarily be limited to, any or all of the following items.

- a. Clearing, Grubbing and the Removal of Obstructions.
- b. Excavation; Embankment; Subgrade Preparation and Construction; and Compaction.
- c. Materials Requirements.
- d. Subsurface Drainage.

501.2 Clearing and Grubbing:

501.2.01 Description: This item shall consist of clearing and removing all materials and artificial objects, including trees, brush, logs, stumps, roots, grass, weeds, pavements, buildings, foundations and any other objectionable materials, which are encountered within the limits of the work; designated in the Project Specifications or indicated on the Plans.

501.2.01 Methods and Details: Clearing and grubbing operations shall be carried on well in advance of the construction operations so as to permit a well-planned schedule of work.

The natural ground surface shall be cleared of all vegetable growth such as trees, logs, upturned stumps, roots of downed trees, brush, weeds, and all other objectionable material within the limits of construction.

Clearing and grubbing shall cover all areas within the limits of the construction zone or as called for in the Plans or Special Provisions. The limits of clearing and grubbing operations on sewer and water main projects are dependent to a considerable degree upon the Contractor's operations and it shall be his responsibility to determine these limits, providing he does not go beyond right-of-way or easement lines. The clearing and grubbing shall be to such width as will provide for adequate area alongside the excavation for material such as trench excavation and backfill, and area for pipe and material storage, and for any haul roads which may be necessary. In areas where driveable streets exist and where the project calls for grading and/or paving, the limits of clearing will be outlined in the Approved Plans or in the Special Conditions. When an area is to be cleared prior to landscaping, the limits of the clearing will be outlined on the Approved Plans and will be staked by the Engineer.

No payment will be made to the Contractor for clearing and grubbing outside the stated limits unless such work is authorized by the Engineer.

Within the limits of the clearing and grubbing zone, all roots one-quarter ($\frac{1}{4}$) inch in diameter (*the size of a standard pencil*) or larger, buried logs, and all other such objectionable material shall be removed down to a point three (3) feet below the existing, ground surface or final street subgrade, whichever is deeper. When

buried objects, such as boulders, foundations, underground tanks or any other natural or man-made items, are encountered, the objects shall be removed and the soil immediately underlying said items shall be over-excavated to firm ground or to a minimum of six (6) inches below the point of deepest embedment, whichever is deeper. When excessive excavation is required to facilitate removal, the excavation shall be backfilled with approved materials. The backfill shall be placed in layers not exceeding, eight (8) inches in loose depth and compacted to a minimum of ninety-six (96) percent of the laboratory maximum density as determined by ASTM Test Method D-1557 or to the minimum degree specified for subgrade preparation or any overlying, fill material, whichever is greater.

All trees to be felled shall be felled within the area to be cleared. All tree trimming directed by the Engineer or required to facilitate the Contractors operation shall be done by competent personnel and in accordance with good tree surgery practices. Trees, shrubbery, plants, and other landscaping items that are not to be removed shall be fully protected from injury by the Contractor at his expense. Where required, trees shall be removed in such a manner as not to injure adjacent standing trees, plants, or any other improvements which are to be preserved.

The Contractor shall be responsible for all damages to trees, shrubbery, plants, other landscaping and improvements when said damages are a result of his operations. In the case of damage, the Contractor shall replace the damaged item(s) in kind. Any item(s) requiring replacement or repair, including, trees and plants, shall be warranted by the Contractor for a period of one year.

No debris of any kind shall be deposited in any stream or body of water or in any street or alley or upon any private property except by written consent of the Owner. In the case that the Owner is other than the City, the City Engineer shall be provided with a copy of the written agreement.

The refuse resulting from the clearing and grubbing operations shall be hauled to a waste site provided by the Contractor and shall be disposed of in such a manner as to meet all requirements of State, County, and Municipal regulations regarding health, safety, and public welfare. When authorized by the proper authorities, the Contractor may dispose of such refuse by burning on the site of the project provided *all requirements set forth by said authorities are fully met and complied with.*

In all cases, the authority to burn shall not relieve the Contractor in any way from damages which may result from his operations. In no case shall any materials be left on the project or adjoining private properties, or be buried in embankments or trenches within the project area.

501.3 Removal of Pavements, Sidewalks and Curb and Gutter: Pavement removal shall be accomplished and compensation be made for as defined in Section 501.4 or as indicated in the Contract Documents. Where existing streets are to be excavated and are presently surfaced with asphaltic concrete, bituminous mats on earth or granular base, or Portland Cement Concrete, these surfaces shall be considered as part of the excavation unless otherwise specified in the Special Conditions. Where existing street pavement extends beyond the back of the new curb line, the Contractor will also be required to remove the pavement beyond the project limit as part of the excavation.

Asphalt pavements shall be removed to clean, straight lines with near vertical faces. Saw cutting of the edges to be joined is optional at the time of the excavation. (See SECTION 552 PAVEMENT PATCHING)

Existing Portland Cement Concrete pavements, sidewalks and curbs and gutter shall be removed to existing joints, whenever possible. If removal is terminated between existing joints, whether specified or by the Contractor's choice, an approved concrete saw shall be used to cut the concrete along the established lines. Sawing shall be done in neat, straight lines and shall be to a depth of at least one and one-half (1½) inches. The remaining thickness of the concrete member may be broken or chipped away, using particular care not to break the concrete on the back side of the sawed joint. Where the Contractor chips or breaks the concrete section behind either the newly sawed joint or an existing adjacent joint, he shall replace such damaged sections at his own expense.

501.3.01 Edge Preparations: Following the completion of any additional work, such as excavation, backfill, subgrade compaction, etc., and prior to the placement of new surfacing, including patching, the existing pavement edges shall be prepared in accordance with the details presented in Standard Drawings 552-A and 703-A, whichever is applicable. All edges shall be saw cut full depth and *the twelve (12) inches minimum distance set back from trench excavations or any other disturbed material shall be strictly adhered to.* Disturbed subgrade material or aggregate base resulting from removal of existing pavements for final edge preparation shall be recompact to a minimum of ninety-six (96) percent of the laboratory maximum density as determined by ASTM Test Method D-1557.

501.4 Excavation and Grading: (also see Sec. 500.12)

501.4.01 Description: This work shall consist of excavating, grading and compacting the roadway; side streets, alleys and driveway approaches; sidewalk areas, parking lots, etc.; and other such work as may be necessary for the completion of the cuts, embankments, slopes, roadway ditches, side street approaches, sidewalk areas, planting areas, alleys, and subsidiary work including the disposal of all surplus or unsuitable material. All work shall be performed in accordance with the alignment, grades, cross-sections and lines shown on the Construction Plans or as established by the Engineer.

This work shall include the removal and disposal of structures or any miscellaneous obstructions which are visible or are indicated on the Plans which encroach upon or otherwise obstruct the work and for which a separate bid item is not provided.

501.4.02 Classification: Roadway excavation, comprising all materials within the roadway, planting, and sidewalk areas, but excluding trench excavation and borrow pits, will be classified under headings of "Common Excavation", "Solid Rock Excavation", or "Unclassified Excavation" in accordance with the Specifications herein. Any work involving mill tailings resulting from previous mineral processing may require special handling procedures to be defined by the City Engineer.

Excavation will be classified according to the following definitions and will be indicated on the plans, in the Special Provisions or in lieu thereof defined by the City Engineer, based on his judgement of the character of the materials and the site conditions.

501.4.02A Common Excavation: "Common Excavation" shall be defined as the excavation of all materials that can be excavated, transported, placed, or stockpiled by the use of heavy ripping equipment and wheel tractor-scrappers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard or more and equipped with

attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the character of the materials and the site conditions.

501.4.02B Solid Rock Excavation: "Solid Rock Excavation" shall cover the removal and disposal of solid rock or concrete, i.e., ledge rock that requires drilling and blasting for its removal and boulders exceeding one cubic yard in a volume. Hard pan, hard clay, or glacial till will not be classified as solid rock excavation. Sandstone, siltstone, shale, or other sedimentary rocks that are soft, weathered or extensively fissured will not be classified as solid rock excavation.

501.4.02C Unclassified Excavation: "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in these Specifications shall apply.

The presence of isolated boulders or rock fragments smaller than one cubic yard in size will not in itself be sufficient cause to change the classification of the surrounding material.

501.4.03 Definitions: For the purpose of materials classification, the following definitions shall apply:

501.4.03A Heavy Ripping Equipment: Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth or multi-tooth ripping attachment mounted on a track type tractor having a power rating of 200 or more net horsepower (at the flywheel).

501.4.03B Wheel Tractor-Scraper: Wheel tractor-scraper shall be defined as a self-loading (not elevating) and unloading scraper having a struck bowl capacity of 12-20 yards.

501.4.03C Pusher Tractor: Pusher tractor shall be defined as a track type tractor having a power rating of 200 or more net horsepower (at the flywheel) equipped with appropriate attachments.

501.4.04 Site Drainage and Ditches: Where required, ditches shall be constructed as shown on the Approved Plans and shall be so graded as to conform to the natural flow of the water to inlets, catch basins, culverts, or channels. Ditches originating in cut(s) shall be located in such a manner as to bypass any part of the adjacent fill so that no damage will be caused thereto by running water. The roadbed and ditches shall be maintained in such condition that the work shall be well drained at all times, including periods of work suspension. Proper protection shall be provided to ensure that no erosion takes place.

If it is necessary in the prosecution of the work to interrupt the existing flow of irrigation water, existing surface drainage, sewers, or underdrainage, temporary facilities shall be provided until permanent drainage or irrigation work is completed. All areas where seepage or standing water exists, shall be thoroughly drained, if feasible and required, as directed by the Engineer. This work must be done in advance of any grading operations.

501.4.05 Use and Disposal of Excavated Materials: Suitable excavated material, conforming to these specifications, shall be used for construction of all required project embankments. The more suitable portions of the excavated material shall be stored on the project, as the Contractor elects, or off the project in areas approved by the City Engineer and used for backfilling of curbs and dressing up of planting areas. *The*

different materials shall not be mixed during storage or during backfilling unless specifically authorized by the City Engineer. The cost of this shall be considered as incidental to the excavation. Excavated material in excess of that needed to complete all embankments and for backfilling curbs and dressing planting areas shall be removed as directed by the Engineer. Any remaining excess or unsuitable materials shall be disposed of by the Contractor at his own expense.

The Contractor shall not waste any excavated material until he is certain there is sufficient material to complete all necessary project embankment and planting. If any undue amount is wasted, the Contractor shall secure and furnish approved borrow material at his own expense.

The Engineer may designate as unsuitable those materials that cannot be properly compacted in embankment. All such unsuitable material shall be disposed of as directed.

The street, alley, or other such project facility shall be maintained in such condition that it will be well-drained at all times. Where the Engineer deems any subgrade material to be unsatisfactory due to "soft spots" excavation below subgrade will be required to such depths as may be directed. If the excavated material is unsatisfactory for the specified use on the project solely because of high moisture content, the Contractor may be directed by the Engineer to either process the material to reduce the moisture content to an optimum condition, or to remove the material and replace it with suitable backfill material.

Where excavation to subgrade exposes an unsuitable subgrade material, the Engineer may require the Contractor to remove the unsuitable material to the extent necessary to provide a firm, stable foundation. If any excavated material is found to be unsatisfactory of the specified or intended use on the project solely because of high moisture content, the Contractor may be directed by the Engineer to process the material to reduce the moisture content so that the material can be utilized within the project in the intended manner.

501.4.06 Side Street, Alley and Driveway Approaches: Approaches to the project shall be excavated to the limits indicated on the Approved Plans or to such limits as the Engineer may direct. This excavation shall be made in conjunction with the street excavation and in such manner as to provide safe access for local and emergency traffic at all times.

Where the Engineer deems subgrade material to be unsatisfactory, excavation below grade will be required to such depths as he may direct. Excavation below grade shall be of the same classification as that above it, provided it is removed in the same operation as the normal excavation. Where the Contractor has completed the excavation and is required to move back to remove unsuitable material, or where the additional depth requires special equipment or procedures because of the presence of shallow utilities or other unforeseen conditions, the work shall be performed as directed and additional payment will be authorized with a "Change Order" at the bid contract unit price. No materials shall be wasted without permission of the Engineer. Excavation operations shall be conducted so that material outside of the limits of slopes will not be disturbed, unless otherwise directed.

If the excavation below grade is required because of negligence on the part of the Contractor, the necessary excavation below grade and the backfilling required to restore the surface satisfactorily shall be at the Contractor's expense.

501.4.07 Planting and Sidewalk Areas: The class of excavation as specified shall include all excavations of planting and sidewalk areas and shall extend to the lateral and terminal limits shown on the construction plans. Planting areas shall be defined as those areas existing between the roadway surface and property line, exclusive of the areas occupied by other improvements such as sidewalks. Excavation on planting strips in developed areas, shall be made and be terminated to blend neatly with the existing contours. Planting strips shall be filled with topsoil comparable to existing topsoil and shall conform to the plan grade.

501.4.08 Embankment Cut Slopes: Following the clearing and grubbing operation, the construction of cut slopes will be performed to neat and clean lines in accordance with the cut stakes, showing depth of cut and slope planes as staked. Shoulders of slopes shall be cleared and formed at the highest point and the slopes brought down to the finished subgrade elevations as staked. Loose soil and rocks will be removed from cut slopes during this excavation. Over-excavation of cut slopes shall be replaced with suitable mechanically compacted materials in accordance with requirements of the City Engineer.

The maximum allowable slope on cuts or fill embankments shall be 2:1 unless justified by specific site tests conducted by a Soils Engineer and approved by the City Engineer. Any changes in the sideslope shall be smoothly graded to avoid abrupt transitions. UBC Chapter 70 and Park City Erosion Control Guidelines shall be strictly adhered to.

Rock excavations will follow uniform slopes and planes as close as reasonably possible.

501.4.09 Fill Slopes and Embankments: All fill being placed on fill embankments will be placed in level, horizontal, uniform layers of sufficient width to allow thru-passage for working construction equipment. All fill slopes or embankments being constructed on hillside slopes shall be horizontally benched into hillside natural ground prior to initial placement of material.

Unless otherwise shown on the approved plans, the width of each bench cut or terrace shall be the width of the machine being used to bench. Each bench shall be cut to a minimum of two (2) feet and a maximum of four (4) feet vertically, and the excavated material shall be mixed and compacted with the fill material being placed on the embankment. ***Unless otherwise shown on the Approved Plans, the fill slopes resulting from the roadway or drainage channel construction shall be graded no steeper than two (2) horizontal to one (1) vertical, or (2:1).***

501.4.10 Slides: Side slopes in cuts and on embankments shall be constructed as staked or established by the Engineer. In the case that a slope finished to the lines as staked or established by the Engineer shall slide back of the established slope onto the roadway prism, or out of an embankment before final acceptance of the work, such slide material shall be removed by the Contractor from the roadway, or be replaced in the embankment by him, at the unit contract price for the class of excavation involved, and the slopes shall be refinished as directed by the Engineer.

Rock cut slopes shall be scaled of all loose rocks and fragments, and left in a neat, safe and workmanlike condition.

In the event the slide material cannot be measured accurately, or if the slide material will require a different type of equipment than that available on the project, payment may be made on a force account basis when so authorized by the Engineer.

Materials to replace embankment slides shall be obtained from sources approved by the Engineer. Slope undercut at the base or destroyed in a manner by an act of the Contractor shall be re-sloped by him parallel to the damaged slope, or as established by the Engineer.

501.4.11 Overbreak: In all materials encountered in the performance of the contract, overbreak is any portion of any such materials which is excavated, displaced or loosened outside and beyond the slope, lines, or grades as staked or established, with the exception of such material which occurs as slides as described hereinbefore, regardless of whether any such overbreak is due to blasting, to the inherent character of any formation encountered, or to any other cause. All overbreak as so defined shall be removed by the Contractor at his own expense and shall be disposed of by the Contractor in the same manner as provided for the surplus materials but at his own expense and without any allowance for haul.

Whenever it is agreed to in writing and in advance between the Contractor and the City Engineer, overbreak may be used in forming any embankment as planned to replace borrow, which otherwise would have to be provided for. In this event, payment will be made for the volume of common borrow or solid rock borrow, as the case may be, which the overbreak replaces at the respective contract price per cubic yard for such borrow with the additional allowance for haul, if any, of such available borrow; provided, however, that no allowance will be made for overbreak which is placed in the embankments as planned in lieu of available material coming from within the neat lines of the roadway prism.

501.4.12 Subgrade: The subgrade will be considered as the earthen surface or area of any new or existing street, alley, driveway, sidewalk, curb and gutter, parking lot, or other public facility upon which additional materials are to be placed, or which are to be constructed or prepared for future placement thereon of other materials in accordance with these Specifications, the Plans, or the Special Provisions, and which will be staked for lines and grades by the Engineer.

In advance of setting line and grade stakes, the subgrade area shall be cleared of brush, weeds, vegetation, grass, debris, etc., all of which shall be satisfactorily disposed of. All depressions or ruts which contain water shall be properly graded to drain. The subgrade shall be excavated and bladed to remove all uneven areas and to secure subgrade surface materials true to the required line and grade. The subgrade material shall then be scarified to a depth of twelve (12) inches, moisture conditioned to the optimum value and compacted by approved equipment to the specified density.

Grade and line throughout the various stages of constructing the subgrade, shall be secured from the reference stakes. The subgrade shall be maintained in the finished condition until the first course of surfacing is placed upon it.

All underground work contemplated in the area of the subgrade shall be completed and properly backfilled before subgrade work is started. This is intended to include work under the Contract, work to be performed by the Owner or work to be performed by others.

All soft, pumping, or yielding spots shall be entirely removed and the so-excavated space refilled with suitable material and thoroughly compacted. If such areas are caused by negligence of the Contractor in his operations, the removal, replacement, and compaction shall be done by the Contractor at his own expense.

501.4.12A Unsuitable Foundation Excavation: When shown in the Contract Documents, unstable natural ground shall be excavated prior to preparation for placement of embankment over the area. The unstable material may consist of peat, muck, swampy or unsuitable materials, including buried roots and stumps. The material shall be excavated by the Contractor as directed by the Engineer to give the constructed embankment full bearing on firm ground. To obtain this result, the Contractor shall displace the overburden of unsuitable materials by such methods as the Engineer may approve. The overburden material outside of the new embankment shall be leveled off and blended in as directed by the City Engineer, and left in a neat condition.

When no unit contract price is provided in the Contract Documents for "Unsuitable Foundation Excavation", such work may be ordered by the Engineer, and shall be accomplished as extra work and payment will be negotiated.

When embankments are constructed across wet or swampy ground which will not support the weight of heavy hauling and spreading equipment, the Contractor will be required to choose such methods of embankment construction and to use such hauling and spreading equipment as will least disturb the soft formation. When soft foundations are encountered, the lower part of the fill may be constructed by dumping and spreading successive vehicle loads of approved materials in a uniformly distributed layer of thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified in the Contract Documents.

It is not the policy of the City to allow an increase in the planned depth of embankment material over soft, wet, or swampy ground for the sole purpose of providing support for heavy hauling and spreading equipment, unless the Contractor proves to the satisfaction of the Engineer that the planned depth is inadequate to support lighter vehicles. If it proves necessary for the Contractor to use smaller hauling vehicles or different methods of embankment construction than he had originally contemplated in order to comply with the foregoing, such shall not be the basis for a claim for extra compensation. The unit contract price for the various pay items involved shall be full compensation for all labor, materials and equipment necessary to perform the work as outlined herein.

501.4.13 Subgrade Compaction: After the required excavations have been completed and approved by the Engineer, the exposed surfaces shall be scarified to a depth of approximately eight (8) to twelve (12) inches. The materials shall be machine processed to provide a uniform, homogeneous mixture and moisture conditioned to within ± 2 percent of the materials optimum moisture as determined by ASTM Test Method D-1557. The upper eight (8) to twelve (12) inches of the subgrade shall then be graded, shaped to designated lines and compacted to a minimum of ninety-six (96) percent of the laboratory maximum dry density as determined by the test method specified above.

In the case, where the Approved Plans or Special Conditions specify that asphalt concrete surfacing, including Full-Depth Asphalt, or Portland Cement Concrete paving is to be placed directly on prepared subgrade without the use of an aggregate base course section, then the upper eight (8) inches of the subgrade shall be further

compacted to a minimum of one-hundred (100) percent of the laboratory maximum dry density as determined by ASTM Test Method D-1557.

Compaction of embankment material which contains excessive moisture shall not be started until the moisture content is reduced to the maximum amount specified heretofore. All costs and expenses involved in drying embankment materials shall be considered incidental to the various unit contract prices, unless a bid item or items for "Aeration Equipment" are included in the Contract.

501.4.14 Subgrade Stabilization: Where indicated on the Plans, in the Special Provisions or where directed by the Engineer the exposed subgrade to receive fill shall be stabilized, in lieu of compaction, by the following methods:

501.4.14A Clearing, Grubbing and Excavation: The subgrade areas shall be cleared, grubbed and excavate to the limits indicated on the drawings or as directed by the Engineer as specified in these specifications. Every effort shall be made by the Contractor to minimize over-excavations not required or directed and to minimize disturbance to the exposed subgrade.

501.4.14B Equipment: The Contractor shall select clearing and excavation equipment specifically chosen to minimize disturbance of the exposed subgrade including construction traffic. The Contractor's equipment shall be subject to the approval of the Engineer. Generally, the equipment shall be limited to track-mounted backhoe type excavators, equipped with tracks of sufficient area to support the machine on the material.

501.4.14C Subgrade Preparation: The Contractor shall take whatever steps necessary to control surface water run-off and groundwater at the site. Under no circumstances shall water from these sources be allowed to pond on or run across completed excavations. De-watering measures or run-off control facilities, if required, shall be fully completed and operational prior to the start of clearing and excavation.

501.4.14D Subgrade Stabilization Fabrics: Following the approved completion of excavations an approved geotextile fabric shall be properly installed over the exposed subgrade. The fabric shall meet the following minimum requirements:

Mullen Burst Strength	600 lb. min.
Puncture Strength	130 lb. min.
Equivalent Opening Size (EOS)	Max No. 20-U.S. Std.Sieve
Grab Strength	300 lb. min.
Modulus of Elongation at 10 percent	140 lb. min.

501.4.14E Installation: The fabric shall be installed in strict accordance with the manufacturer's recommendations and the following additional requirements:

1. The fabric shall be lapped along the sides a minimum of 30 inches; and a minimum of 36 inches at the ends of the rolls.
2. Only truck traffic to place cover or fill materials shall be allowed directly on the fabric. Dumping of aggregates shall be limited to end dumps and no turning of the trucks will be allowed on the fabric.

3. Dumping traffic shall be maintained at an absolute minimum and drivers shall be instructed to stagger their tire tracks to minimize subgrade and fabric disturbance. Minimum lap requirements shall be strictly maintained.

4. Aggregate base or select granular fill materials shall be placed full depth up to a maximum of sixteen (16) inches in uncompacted thickness. Following compaction, subsequent lifts shall be placed as required and shall not exceed twelve (12) inches in uncompacted thickness. Lifts near the maximum thickness shall be placed to minimize construction traffic.

501.4.14F Compaction: Each lift of fill overlying the fabric shall be compacted individually to a minimum of ninety-six (96) percent of the laboratory maximum as determined by ASTM Test Method D-1557.

If required to facilitate compaction, only the minimum amounts of water shall be added to the material to provide efficient compaction. In no case, shall the fill material be placed or compacted at a moisture content exceeding the optimum as determined by the test method specified above.

Compaction to the specified degree shall be accomplished utilizing steel drum rollers, preferably static. If the Contractor utilizes vibratory compaction methods, the procedure shall be closely monitored to assure that the procedure does not enhance moisture infiltration from the subgrade or further deteriorate the condition of the subgrade or fill materials, i.e., pumping etc. Should detrimental conditions begin to appear, the use of vibratory equipment shall be immediately discontinued.

All of the Contractor's fabric stabilization operations beginning with review of the cleared, grubbed and excavated subgrade and continuing through final placement, grading and compaction of any and all fill material shall be continuously observed and/or tested for compliance with these specifications as provided for in Section 500.4.

501.4.15 Embankment Construction: No embankment material shall be placed until the foundation has been approved by the Engineer.

Embankment construction shall be divided into two classes, rock embankments and earth embankments. Rock embankments shall be all, or any part, of an embankment in which the material contains 10 percent or more by volume of gravel or stone four (4) inches or greater in diameter. Embankments of all other material shall be considered as earth embankments.

501.4.15A Rock Embankment Construction: Rock embankments shall be constructed in layers not exceeding twelve (12) inches in depth, except in the case that the average size of the fragment exceeds twelve (12) inches, the layers may be as deep as required to allow their placement, subject to approval by the City Engineer. Occasional fragments exceeding the average size shall be disposed of instead of being incorporated in the embankment.

Each layer shall be consolidated by routing the loaded and unloaded hauling equipment or through the use of rollers. Where sufficient fines exist in the materials to facilitate efficient compaction the roadway shall be compacted to a minimum ninety-six (96) percent of the laboratory maximum density as determined by ASTM

Test Method D-1557 or other applicable test methods indicated on the Approved Plans, in the Special Provisions or as directed by the Engineer.

The material shall be placed carefully so that the larger pieces of rock or boulders are well distributed. The intervening spaces and interstices shall be filled with the smaller stone and earth as may be available so as to form a dense, well compacted embankment. Each layer shall be compacted as specified in the Contract Documents.

In making rock embankments, the Contractor will be required to bring the fills to within twelve (12) inches below grade, as designed by the Engineer, and to construct the remainder from suitable fine materials placed in layers, graded and compacted in accordance with the requirements specified for earth embankments. The finer materials from rock excavations shall be saved as far as is practical for use in topping out rock fill and backfilling over the subgrade excavation in rock cuts.

Across low swampy ground, the lower part of the embankment may be constructed by end-dumping granular material to form a uniform layer or thickness not greater than that necessary to support the hauling equipment. The remainder of the embankment shall be constructed in layers as specified.

501.4.15B Earth Embankment Construction: Earth embankment shall be constructed in compacted layers of uniform thickness and moisture. The layers shall be carried up full width from the bottom of the embankment to avoid widening the edges after the center has been brought to grade.

Earth embankment shall be compacted with modern, efficient, compacting units satisfactory to the Engineer. The compacting units may be of any type, provided they are capable of compacting each lift of the material to the specified density. The use of hauling equipment to obtain partial compaction will be allowed, but the Contractor will be required to compact the full width and depth of each layer of material to the required density. The right is reserved for the Engineer to direct the use of any particular compacting unit discontinued if it is not capable of compacting the material to the required density in a reasonable time.

Embankments normally shall be constructed in successive horizontal layers not exceeding eight (8) inches in loose thickness. If approved by the Engineer, successive horizontal layers up to a maximum depth of twelve (12) inches may be placed, provided the required density is obtainable throughout the full width and depth of each layer.

Each layer of the material shall be mechanically processed, moisture conditioned to within two (2) percent of optimum moisture and then be compacted to a minimum of ninety-six (96) percent of the laboratory maximum density as determined by ASTM Test Method D-1557.

At all locations that are inaccessible to a roller, the embankment shall be brought up in horizontal layers and compacted as specified above with mechanical tampers. The horizontal layers shall not exceed six (6) inches in loose thickness.

501.4.15C Embankment and Structures, Trestle and Bridge Ends: The work of filling around structures and the ends of trestles and bridges and the constructing of incidental embankments shall be undertaken and completed as soon as possible after each structure is completed, or when directed by the Engineer.

In filling around the structure, trestle or bridge ends, the Contractor shall bring the fill up equally on all sides of the bracing and the columns of the bridge to prevent distortion of the bents and columns. This method shall also be used in bringing up the fill on both sides of the bulkheads as shown on the Approved Plans, or as directed by the Engineer. The embankments shall be constructed under the bridge to the height and dimensions as shown on the Approved Plans, or directed by the Engineer. Fill shall not be placed against green concrete and wedging action against walls shall be prevented by stepping or serrating the sides of excavation. All drainage openings or seep holes in the masonry or concrete shall be backfilled one foot in each direction from the opening with coarse concrete aggregate. This concrete aggregate shall be furnished and placed without additional compensation to the Contractor.

The embankment and backfill at both ends of all rigid frame concrete structures which do not have provisions of expansion shall be brought up and compacted simultaneously to prevent lateral displacement of the structure due to unbalanced earth loading. The strength requirements for the closing placement of concrete for frame structures must be met and approved by the City Engineer or the placement shall have been completed at least seven days before backfilling.

The type of fill material to be used for backfill shall be specified on the drawings or in the Special Provisions. All backfill material shall be processed, moisture conditioned, placed and compacted in accordance with and to the degree specified for earth embankment construction in subsection 501.4.15B of these specifications.

All cost in connection with the above work shall be considered as incidental to the construction of the improvement and shall be included in the unit contract prices of the various pay item of work involved.

501.4.16 Compaction Control Testing: Optimum moisture content and maximum dry density shall be determined for each soil, aggregate or fill material type encountered and/or used. A minimum of one moisture-density relationship (Proctor) test shall be performed on a representative sample of each material type. The test shall be performed in accordance with ASTM Test Method D-1557 unless otherwise specified or directed by the City Engineer.

501.4.16A Field Density Testing: Field density testing to check the degree of compaction being attained shall be performed in accordance with AASHTO Test Methods T-238 and T-239 or ASTM D-1556. The frequency of density testing shall be sufficient to assure that all of the compacted subgrade or embankment fills have been compacted to the minimum degree specified. The City Engineer shall reserve the option of increasing or decreasing the frequency of field testing as conditions warrant.

501.4.17 Inadequate Compaction: When the results of field density tests indicate that less than the specified minimum degree of Compaction is being accomplished, the affected area(s) shall be subjected to additional compactive efforts.

If conditions warrant, or if directed by the Engineer, the affected areas shall be scarified, mechanically reprocessed and remixed, moisture conditioned and recompacted to the minimum degree specified.

The Contractor may, at his option or at the Engineer's direction, remove the material from the affected area(s) and replace the material with other acceptable materials, approved by the Engineer, and compacted to the degree specified .

In any case, the Contractor shall bear all costs associated with any additional work required to bring the material into minimum conformance with the specified degree of compaction and moisture conditioning.

501.4.18 Revegetation: All exposed cut and fill areas shall be revegetated in accordance with the requirements stipulated on the Approved Plan or specified in the Special Conditions.

501.4.19 Snow Removal: Whenever the surface of a cut or the site of an embankment is covered with snow sufficiently deep to impair the utility of the work, the snow must be removed and deposited beyond the slope stakes at the Contractor's own expense. Work of this nature shall be at least one hundred (100) feet in advance of the excavation or subgrade preparation operations.

501.4.20 Measurement: Excavation will be measured by the cubic yard in its original position by cross-sectioning by the Engineer. Pay quantities will be computed to the neat lines of the cross-sections as staked.

Stripping of quarries and pits will be measured by the cubic yard in its original position by cross-sectioning.

Unsuitable foundation excavation will be measured by the cubic yard in its original position by cross-sectioning.

501.4.21 Payment: Payment will be made for such of the following bid items as are included and shown in the Contract Documents:

1. "Common Excavation", per cubic yard
2. "Unsuitable Foundation Excavation", per cubic yard

The unit contract prices for such types and classes of excavation and borrow listed above shall be full compensation for excavating, loading, placing or otherwise disposing of the material as shown on the Approved Plans, as specified herein or as directed by the Engineer and shall include the removal and disposal, the wasting or stockpiling of forest debris or any top soil, organic matter, or other deleterious matter from the surface of a cut or fill, as specified or as may be directed by the Engineer.



SECTION 503

SUBGRADE, BORROW AND IMPORTED FILL MATERIALS

503.1 General: This section specifies minimum physical characteristics and guidelines for soil/rock combination materials to be used in the construction of prepared subgrade, embankments, roadway fills, backfill and for any other portions of the work previously specified in Section 501 - EARTHWORK.

503.2 Description: The work shall consist of providing materials as herein defined and specified, whether obtained from within or outside of the right-of-way, for use in the construction of prepared subgrade, embankments, roadway fills, backfill or for any applicable or specified portions of the work. Where a specified type of material is required the material type(s) and designated placement limits shall be indicated on the Approved Plans, in the Special Conditions as directed by the Engineer.

503.2.01 Subgrade: Subgrade as previously defined Section 501.4.12, shall consist of existing near surface or cut surface soil and/or soil rock combinations.

The materials to be prepared as compacted subgrade shall be free of vegetation, debris and other deleterious materials. During processing, moisture conditioning, compaction and overlying fill placement operations, the subgrade material shall be completely free of frozen particles and materials.

When the project grading requirements result in the upper twelve (12) inches of prepared roadbed, upon which aggregate base or other surfacing materials are to be placed, being comprised of subgrade material as described herein and in Section 503.3.12, then the subgrade material shall further conform to all of the minimum requirements specified in Section 503.2.02.

503.2.02 Common Fill (Borrow): Common Fill (borrow) shall consist of soils and/or soil-rock combinations completely free of vegetation, debris or other deleterious materials. During processing, moisture conditioning, placement and compaction, the materials shall be maintained completely free of frozen particles and materials.

Common Fill shall contain no rocks over six (6) inches in greatest dimension and not more than thirty (30) percent of the material shall be retained on the 3/4 inch sieve when tested in accordance with AASHTO Test Method T-27. In addition, when the project grading requirements result in the upper twenty-four (24) inches of prepared roadbed, upon which aggregate base or other surfacing materials are to be placed, being comprised of Common Fill (borrow) materials shall conform to the following minimum requirements.

1. That portion of the total material passing the number 200 sieve shall not exceed thirty-five (35) percent, when tested in accordance with AASHTO Test Method T-27.
2. The Plasticity Index (P.I.) of that portion of the total material passing the number 40 sieve shall not exceed (10), when tested in accordance with AASHTO Test Methods T-89 and T-90.
3. The California Bearing Ration Value (CBR) of the material shall be a minimum of twenty (20) when tested in accordance with ASTM Test method D-1883.

503.2.03 Select Fill (Granular Borrow and Backfill): Select Fill materials shall consist of soil and/or soil-aggregate mixtures completely free of vegetation, debris and other deleterious materials. During processing, moisture conditioning, placement and compaction, the materials shall be maintained free of frozen particles and materials. In addition, Select Fill materials shall further conform to the following minimum requirements.

1. The materials shall contain no rocks or particles over three (3) inches in greatest dimension, not more than thirty (30) percent of the materials shall be retained on the 3/4 inch sieve and that portion of the material passing the number 200 sieve shall not exceed twenty-five (25) percent, when tested in accordance with AASHTO Test Method T-27.
2. The Plasticity Index (P.I.) of that portion of the total material passing the number 40 sieve shall not exceed six (6), when tested in accordance with AASHTO Test Methods T-89 and T-90.
3. The California Bearing Ratio Value (CBR) of the material shall be a minimum of twenty (20) when tested in accordance with ASTM Test Method D-1883.

503.3 Construction Methods: The Contractor shall notify the Engineer sufficiently in advance of opening any borrow areas so that cross-section evaluations may be taken and the material tested, if necessary, before being used. Clearing of vegetation and stripping of unsatisfactory material from the pit or blending of materials when required, shall be performed by the Contractor at his expense. When there is a choice in quality of materials in the borrow source, the best material, when directed, shall be placed in the top portion of the embankment or fill.

Fill material shall not be placed until after the roadway excavation has been completed and approved by the Engineer. If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume.

503.4 Revegetation: All borrow and stockpile areas shall be revegetated in accordance with the requirements stipulated on the Approved Plans or specified in the Special Conditions.

503.5 Method of Measurement and Payment:

Also see Sec. 500.12



SECTION 505

CONSTRUCTION WATER

505.1 Description:

505.1.01 Water for Streets: Water for compacting embankment, constructing subgrade, placement of screened gravel and crushing surfacing, and for laying dust caused from grading operations or public travel, if ordered by the Engineer, shall be applied in optimum amounts and placed as designated by the Engineer. Payment will be considered as incidental to the construction of the improvement and the costs thereof shall be included by the Contractor in the unit contract price of the pay items of the Contract.

505.2 Source of Water and General Requirements:

505.2.01 Water Supply: The Contractor shall make arrangements for and provide all necessary water at his own expense, unless otherwise provided in the Special Conditions.

If the Contractor purchases water from Park City at a fire hydrant on or near the project, all arrangements shall be made by him at his own expense and payment be made the utility on basis of the actual quantity of water metered. The Director of Public Works must authorize the opening of any City hydrants. All water usage will be metered. Application for service shall be made to the Finance office located in the City Offices.

505.2.02 Requirements and Responsibility: The Contractor shall use only those hydrants designated by the agency in charge of water distribution and in strict accordance with its requirements for hydrant use.

The Contractor shall secure permission from and comply with all requirements of the water utility before obtaining water from the fire hydrants. The Engineer or his authorized representative shall also be notified by the Contractor of such permission as soon as granted.

The Contractor shall use hydrant wrenches only to open hydrants. He shall also make certain that the hydrant valve is open "full," since "cracking" the valve causes damage to the valve. An approved auxiliary valve shall be provided on the outlet line for control purposes. Fire hydrant valves must be closed slowly and completely to avoid a surge on the system, which creates undue pressure on the water lines. The Contractor shall carefully note the importance of following these directions.

If one of the Contractor's employees shall knowingly or unknowingly damage any hydrant valve system, the Contractor will be responsible for all resulting costs and damages. He shall immediately notify the water utility so that the damage can be repaired as quickly as possible.

Upon completing the use of the hydrants, the Contractor shall notify the Department of Public Works, so that the hydrants may be then inspected for possible damage. Any damage resulting from the use

of the hydrants by the Contractor will be repaired by the water agency and the cost thereof shall, if necessary, be borne by the Contractor.

The Contractor shall furnish all connectors, wrenches, valves, and small tools that may be necessary to meet the requirements of the water distribution agency pertaining to hydrant use.

Violation of these requirements will result in fines and will lay the Contractor liable for damage suits because of malfunctioning of damaged fire hydrants, in the event of fire.

505.3 Construction Details:

505.3.01 General: Where hauled water is required, the tank truck and/or trailer shall meet all safety and licensing regulations and shall be provided with a pump of such size and capacity as to provide for a discharge equivalent to that required for hydrant settling water. Adjustable spray heads, front or rear, and spray bar shall provide uniform and controlled application of water without ponding or washing.

An approved pressure pipeline hose nozzle or sprinkling system may be used for applying water in embankment construction or to moisten material before excavation.

The Contractor shall provide sufficient equipment to apply water as directed. Insufficient or inadequate watering equipment shall be cause for closing down those operations affected by such until the Contractor makes proper remedy of the deficiency.

505.4 Payment: Water, which is required and used to secure adequate compaction of the subgrade and in sprinkling the subgrade for maintenance purposes shall not be a pay item, unless ordered by the Engineer.



SECTION 506

EXCAVATION FOR STRUCTURES

506.1 Description: The provisions of this section of the Specifications concern the removal or excavation of all materials of whatsoever nature that is necessary for the construction of footings, bases, or any other foundation work required to support pump stations, headwalls, water tanks, transmission towers, and similar structures.

This Section also includes the construction and subsequent removal of all shoring, cribs, cofferdams or caissons; the pumping which may be necessary for the execution of the work, and the placement and compaction of all necessary backfill.

It is not intended that excavation for culverts, sewers, and water mains and their appurtenances, manholes, inlets, and catch basins, conduits, and miscellaneous work covered elsewhere in these Specifications or in the Special Conditions shall be considered as structure excavation.

506.1.01 Classification: Structure excavation will not be further classified into solid rock excavation or common excavation, nor into wet or dry excavation. Structure excavation shall include the necessary grubbing of structure sites which otherwise would not be grubbed, the excavation of any and all formations encountered inside the limits which define structure excavation, and the removal and disposal of all debris, including submerged or buried timber, and all pumping that may be necessary for draining and dewatering the excavation. It shall also include the furnishing of all equipment necessary for the performance of this work, the placement of all necessary backfill inside the limits which define structure excavation, as hereinafter specified, and the disposal of excavated material that is not required for backfill.

506.2 Construction Details:

506.2.01 Preservation of Channel: When foundations or substructures are to be constructed in or adjacent to running streams, no excavation shall be done outside of cribs, cofferdams, caissons or sheet piling, nor shall the natural stream bed adjacent to the structure be disturbed without the written permission of the City Engineer. Care shall be taken to minimize damage to vegetation and to minimize siltation in the stream. Excavation work shall not be done during periods of high snowmelt. If any open pit excavation or dredging is permitted at the site of the structure before the placement of cribs or cofferdams, the Contractor shall, after the foundations are in place, backfill such excavations to the original surface of the stream bed with material satisfactory to the City Engineer. The backfilling material shall be of such quality and shall be placed in such a manner that it will offer the same resistance to scour as the material removed.

506.2.02 Excavation in Open Pits: When footings can be placed in the dry without the use of cofferdams and when cofferdams are not necessary for the preservation of conditions affecting the safety of the completed structure, the Engineer may permit the excavation of open pits without shoring, cofferdams or cribs. Such pits shall be constructed with side slopes sufficiently flat to prevent sliding or caving. The Contractor shall assume full responsibility for the prevention of any such slides adjacent to any such excavation, and in the event of any

such slide, the Contractor shall remove the additional material brought down by the slide at his own expense.

In case the material disturbed by a slide lies within an area upon which a portion of the structure is to be constructed, the Contractor shall excavate the disturbed material and backfill the excavated area to the original ground line with material satisfactory to the Engineer. This material shall be placed and compacted in the manner specified elsewhere herein. All costs in connection with excavating, backfilling, compacting, and restoring such a slide area to its original position and condition shall be borne by the Contractor.

When water is encountered, ample provision shall be made for draining or pumping, and the excavation shall be accomplished by such means as will prevent stirring up or softening the bottom. Foundation material unduly disturbed or softened by the use of equipment in the bottom of the pit or by inadequate handling of water shall be removed by the Contractor at his own expense. Such material removed shall be replaced, at the Contractor's own expense, with satisfactory material.

506.2.03 Depth of Footings: Foundation for all structures shall be excavated to the depth and lines indicated on the Approved Plans. The Engineer may require the Contractor to excavate below the elevations shown on the Approved Plans, or may order him to stop above the elevations shown, depending upon where suitable foundation material is encountered .

506.2.04 Preparation for Placing Foundations: In solid rock or other hard material, the excavation shall be carried at least 6" to 12" into the rock or hard material to form a key for the concrete footing, or to such additional depth as shown on the Approved Plans or directed by the Engineer. The bottom of the pit shall be cleaned of all loose material and cut to a firm surface, either level, stepped or serrated. When concrete is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation and the final removal of all loose or soft material shall be made just before the concrete is placed.

506.2.05 Shoring, Cribs, and Cofferdams: Except as provided in Section 506.2.02, all excavations shall be shored, braced, or protected by cofferdams in accordance with approved methods. No excavation or dredging shall be done before shoring, crib, or cofferdams are placed, except with the written permission of the City Engineer. If permission is given, it shall not relieve the Contractor of his obligation to anchor or otherwise hold the crib or cofferdam in place and secure it against tipping or displacement. Unless otherwise ordered, all cofferdams, sheeting and bracing shall be removed after serving their purpose.

506.2.06 Inspection: The Contractor shall notify the City Engineer before starting any excavation. From time to time during the progress of excavation, the City Engineer will examine at his discretion the character of material taken out.

506.2.07 Disposal of Excavated Material: The material obtained from structural excavation shall be used as the Engineer may require, either in construction embankments, or for backfilling over and around the structures after they are complete. When the material is unsuitable or not required for either of these purposes it shall be disposed of in a satisfactory manner.

506.2.08 Backfilling: All material used for backfill shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, wood or other extraneous matter. The backfilling of openings made for structures shall be considered as a necessary part of the excavation, although the Engineer may require that the material for use in making a backfilling be obtained from a source entirely apart from the structure, in which case compensation will be on a force account or agreed price basis unless otherwise specified by the Contract Documents or the Engineer. Except as may be otherwise specified hereinafter, spaces excavated and not occupied by abutments, piers, or other permanent structures shall be backfilled up to the surface of the surrounding ground, with a sufficient allowance for settlement and, in general, the top surface of the backfill shall be neatly graded.

Backfill in existing street areas or in areas that must support roadway embankment or which is a part of any roadway embankment, shall be placed in horizontal layers not more than eight (8) inches thick, and each layer shall be tamped and compacted to 96% of the maximum density as measured by ASTM D-1557 Method of Compaction.

The use of mechanical tampers may be required for compacting backfill for certain items as shown in the individual specifications for such items, and as may be required in the Special Conditions or on the Approved Plans where greater density than that specified above is to be obtained.

Special precautions shall be taken to prevent any wedging action against abutments and wing walls. If the excavation has sloping sides, the slope shall be broken up by stepping or serrating to prevent wedge action before the backfill is placed. Fill placed around culverts, piers, and other underground utilities shall be deposited on both sides to approximately the same elevation at the same time.

The Engineer may order the backfill around piers and in front of abutments and wings to be of stone or lean concrete if the excavation has been in hard material exposed to erosion. Backfill of this nature will be paid for by force account unless otherwise provided for in the proposal. If the material used in making the backfill is too dry to permit proper compaction, the Engineer may require the addition of sufficient water to allow satisfactory compaction. Compensation for the use of water for this purpose shall be included in the contract prices for "Structure Excavation." If the material is too wet to permit proper compaction the Engineer may require a more suitable material to be substituted. Additional payment from such material will be made by change order or force account as authorized by the Engineer, prior to substitution.

506.3 Measurement: The materials excavated will be measured in their original position by volume in cubic yards. The quantity measured for payment will include only the material excavated from within the limits herein after defined, regardless of whether the excavation is made within a cofferdam enclosure or in an open pit. Any additional excavation outside of these limits shall be considered as having been made for the Contractor's benefit and all costs in connection with such excavation shall be at expense of the Contractor.

The horizontal limits for measuring the structure excavation for payment shall be for material removed up to but not beyond one foot outside the vertical planes of the footings, as shown on the Approved Plans.

The bottom limits for measuring the excavation for footings shall be the elevation of the bottom of the footing, as shown on the Approved Plans or as otherwise established by the Engineer. In pile foundations, the material resulting from the swell due to driving piles will not be included in the measured quantity.

The upper limit for measuring excavation shall be the top surface of the ground, or the bed of the stream as it exists at the time the excavation is started. When the contract designates the removal of certain materials in advance of excavation for structures and for which there is a designated pay item in the same contract, or in a separate contract, the upper limit shall be the completed subgrade of the designated grading section, as shown on the Approved Plans.

No measurement will be made of the materials involved in shoring, cribs, cofferdams and caissons.

Compaction costs shall be included by the Contractor in other pay items.

506.4 Payment: Excavation for structures will be paid for under such of the following bid items as are included and shown in any particular contract:

1. "Structure Excavation," per cubic yard.
2. "Shoring and Cribs or Extra Excavation," lump sum.



SECTION 510

UNTREATED AGGREGATE BASE COURSE

510.1 Description: This work shall consist of furnishing and placing one (1) or more courses of aggregate base material, as specified herein, on prepared surfaces in accordance with these specifications and in conformance with the line, grades, thickness and any other dimensions shown on the Approved Plans or as directed by the Engineer.

510.2 Source: It is anticipated that aggregate base materials will be obtained from existing commercial or Contractor owned pits. Should the Contractor choose or the project documents require the development of a new source, the Contractor shall be responsible for providing the source and for securing all the necessary zoning variances and permits which may be required, including those required for dust collection systems, wet-wash systems and truck traffic for haul access.

All work involved in clearing and stripping any aggregate source, including the handling of any unsuitable material encountered, shall be performed by the Contractor, and no additional compensation will be allowed for this work. In case the material deposit contains sand or other material, in excess of the specification gradation requirements or of an unacceptable quality, such excess or undesirable material shall be removed and disposed of prior to crushing.

In any case, each proposed aggregate source shall be tested in accordance with test method specified herein, and the results submitted to the City Engineer at least 48 hours prior to bringing any material on-site.

510.3 Mineral Aggregate Requirements: The mineral aggregate shall conform to the following requirements:

1. On that portion of the aggregate passing the No. 40 sieve, the liquid limit shall not exceed twenty-five (25), and the material shall be non-plastic, when tested in accordance with AASHTO Test Methods T-89 and T-90.
2. The aggregate shall have a percentage of wear not exceeding fifty (50), when tested in accordance with AASHTO Test Method T-96.
3. The aggregate shall be of uniform density and quality, and shall have a rodded weight of not less than 75 lbs. per cubic foot, when tested in accordance with AASHTO Test Method T-19. The material shall have a fracture face equal to 75%, on one or more sides.
4. The material shall have a California Bearing Ratio Value (CBR) of eighty (80) minimum when tested in accordance with ASTM Test method D-1883.

5. The dry material aggregate shall be uniformly graded within the following gradation limits, when tested in accordance with AASHTO Test Method T-27. The source of all materials must be approved in advance to importing by the City Engineer.

The total amount of material passing the No. 200 sieve shall be determined by washing in water in accordance with AASHTO Test Method T-11.

TABLE 510.3.01 AGGREGATE BASE GRADING REQUIREMENT:

Percent Passing by Dry Weight

<u>SIEVE SIZE</u>	<u>1" MAX SIZE PERCENT PASSING</u>	<u>WIDE BAND PERCENT PASSING</u>
1"	100	100
3/4"	95	90-100
1/2"	85	78-90
3/8"	74	67-81
No. 4	55	48-62
No. 16	30	24-36
No. 50	20	15-25
No. 200	8	5-11

510.3.01A Acceptance of Material: Acceptance of the on site delivered aggregate base material shall be based on periodic samples taken by the City Inspector by random selection.

If the result of any individual test indicates that the material does not comply with any of the requirements specified herein, then a second sample shall be obtained immediately from the same location to check the results obtained. In any case, the results of tests indicating nonconformance shall be immediately reported to the City Engineer, who shall solely have the option of accepting or rejecting the subject material. The City Engineer shall have the authority to direct the additional samples be obtained for testing at any time before, during or after placement. *Any rejected materials shall be removed from the site immediately.*

A minimum of two samples shall be obtained from the work area for each five (5) days of placement. The samples shall be tested for conformance of gradation and plasticity index. The City Engineer shall direct the frequency, if any, of testing to confirm CBR values of the material.

The City Engineer shall also have the authority to increase or decrease the frequency of sampling and testing, as conditions may warrant.

510.4 Placement: The foundation material, upon which aggregate base is to be placed, shall be cleaned of all loose and deleterious materials; shall be free of excess surface moisture and/or frozen materials; shall meet

the compaction, moisture and grading requirements outlined in Section 501 and shall have been approved by the City Engineer prior to the placement of aggregate base.

The Contractor shall provide a homogeneous mixture of unsegregated and uniformly dispersed aggregate base materials as placed in position for compacting. Unless otherwise specified, the material shall be mixed and spread by one (1) or a combination of the three (3) following methods:

1. Stationary Plant Method: The aggregate and water shall be mixed in an approved mixer. Water shall be added during the mixing operation in an amount necessary to facilitate compaction. After mixing, the base material shall be placed on the roadbed by means of an approved aggregate spreader.
2. Traveling Plant Method: After the material for each layer of base course has been placed through an aggregate spreader or windrow sizing device, the base shall be uniformly mixed by a traveling mixing plant. During the mixing, water shall be added in an amount necessary to facilitate compaction.
3. Road Mix Method: After material for each layer of base course has been placed, the materials shall be mixed by motor graders or other approved equipment until the mixture is uniform throughout. During the mixing, water shall be added in an amount necessary to facilitate compaction.

The aggregate base shall be deposited on the roadbed at a uniform quantity per linear foot which shall provide the required compacted thickness within the tolerances specified herein.

Where the required thickness is 0.50 feet or less, the base material may be spread and compacted in one (1) layer. Where the required thickness is more than 0.50 feet, the base material shall be spread and compacted in two (2) or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 0.50 feet. Each layer shall be spread and compacted in a similar manner. When vibrating or other approved types of special compacting equipment are used, the compaction depth of a single layer of the base course may be increased to 0.80 feet upon approval of the Engineer.

510.5 Compaction and Shaping: After each layer has been spread, as specified herein, it shall be compacted to the full width of placement. The number and type of compaction equipment shall be the Contractor's choice, as long as the selected equipment is adequate to produce the compacted and finished product as specified. Rolling shall commence along the edge of the area to be compacted and the rolling pattern shall gradually advance toward the center of the area. The rolling pattern shall be along lines parallel to the centerline of the roadbed or other areas being constructed.

Unless otherwise specified on the project drawing or in the Special Provisions, each individual layer of the aggregate base shall be compacted to a minimum of ninety-six (96) percent of the laboratory maximum dry density as determined in accordance with ASTM Test Method D-1557. During compaction the moisture content shall be maintained at such a degree as to provide efficient densification of the aggregate base, provided that in no case shall the moisture content exceed three (3) percent over optimum as determined by the test method specified above.

510.6 Field Density Testing: Field density testing to check the degree of compaction being attained shall be performed in accordance with AASHTO Test Methods T-238 and T-239 or ASTM D-1556. The frequency of density testing shall be sufficient to assure that all of the compacted aggregate base has been compacted to the minimum degree specified. The City Engineer shall reserve the option of increasing or decreasing the frequency of field testing, as conditions warrant.

510.6.01 Inadequate Compaction: When the results of field density tests indicate that less than the specified minimum degree of compaction is being accomplished, the affected area(s) shall be subjected to additional compactive efforts.

If conditions warrant, or if directed by the Engineer, the affected areas shall be scarified, mechanically reprocessed and remixed, moisture conditioned and recompacted to the minimum degree specified.

The Contractor shall bear all costs associated with any additional work required to bring the material into minimum conformance with the specified degree of compaction and moisture conditioning.

510.7 Finishing: The base shall be finished to a smooth uniform line and made with surface deviations not exceeding 0.5 inch, plus or minus in 10 feet. The determination of compliance with smoothness shall be made with a straight-edge, chalk-line, or profilograph.

The thickness of the base shall be reasonably close to that shown in the Contract Documents or as designated by the Engineer. Acceptance of the finished base with respect to thickness shall be on the basis of test areas selected by the City Engineer, not to exceed 50,000 square feet in size. Depth analyses shall be made by test holes located in a random pattern with not less than four (4) test holes in each test area. Test area shall be accepted when seventy-five (75) percent of the test holes are not deficient more than 0.5 inch of the designated thickness, and when no individual test hole shows a deficient thickness or more than 1.0 inch.

Test areas that are not acceptable shall be brought into compliance by the addition or removal of base material. Added material shall be blended with the in-place base and recompacted to the required density. Excess material shall be removed at the Contractor's expense, and shall be deducted from the pay quantities. If the City Engineer permits an excess thickness of base to remain in place, the amount of material in excess of the tolerances specified will not be included in the pay quantity.

The finished aggregate shall be maintained to line and grade, and at the specified density until covered by an additional course of base or surface course. Any base that becomes soft, washboarded or distorted under public or construction traffic shall be scarified, watered, remixed and recompacted to a firm, smooth surface at the Contractor's expense.

510.8 Method of Measurement: Untreated base course shall be measured by the cubic yards in place.

510.9 Basis of Payment: The accepted quantities of this item shall be paid for at the contract unit price. For "Untreated Base Course", the price shall include all work required to complete this item, including water added during mixing.

Any feature covered during the base course placement process that requires raising to a final grade must be raised to the proper grade within seven (7) days of being covered. These features include but are not limited to: manhole covers, valve box covers, and monument covers. Under no circumstances can the access to utilities be delayed more than seven (7) days unless otherwise approved by the City Engineer.

(Also refer to Sec. 500.12)



SECTION 520

ASPHALT MATERIALS

520.1 Description

520.1.01 Asphalt Material: Asphalt of the grade specified shall fully comply with all of the requirements hereinafter set forth for each respective grade.

The particular grade or grades of asphalt to be used on any project will be those called for in the Contract Documents.

Each shipment of bituminous materials shall be uniform in appearance and consistency, and shall show no foaming when heated to the specified loading temperature. Shipments contaminated with other asphalt types or grades than specified shall be rejected.

520.1.02 Bill of Lading: The vendor of the bituminous material shall prepare a bill of lading for each shipment or material showing the following information:

1. Type and grade of material
2. Whether additives have been used and, if so, the type and amount
3. Destination
4. Consignee's name
5. Date of shipment
6. Railroad car or truck identification
7. Project number for which shipped
8. Loading temperature
9. Net weight (or net gallons corrected to 60°F., when requested)
10. Specific gravity
11. Bill of lading number
12. Source of bituminous material (manufacturer)

The vendor's bill of lading shall be prepared in triplicate, one copy to accompany the shipment to be delivered to the project, one copy to be mailed to the City Engineer, and one copy to be mailed to the designated testing laboratory.

520.1.03 Asphalt Cements: Penetration grades of asphalt cement prepared from petroleum shall conform to the requirements of Utah State Road Standard designation AC-10 or AC-20 when available, except that minimum flash point for all grades shall be 350°F.

520.1.04 Catalytically-Blown Asphalt: Shall be prepared only by the catalytic-blowing treatment of petroleum asphalt. The asphalt shall be homogeneous, free from water and shall not foam when heated to 347°F.

Asphaltic materials for which ferric chloride or other compounds of iron have been used as catalysts in the blowing operation will not be acceptable. Catalytically-blown asphalt shall meet the requirements of the State of Utah Standard Specifications for Road and Bridge Construction.

520.1.05 Asphalt Emulsions: Emulsified asphalt shall conform to the requirements of ASTM of ISSA Specifications, for type SS1h, CSS1h or QUICK SETTING, MIXED GRADE EMULSION.

520.1.06 Slow Curing Cut Back Asphalt (SC): Shall conform to the requirements of AASHTO M-141.

520.1.07 Medium Curing Cut Back Asphalt (MC): Shall conform to the requirements of AASHTO M-82.

520.1.08 Rapid Curing Cut Back Asphalt (RC): Shall conform to the requirements of AASHTO M-81, except that RC 4000 shall conform to the requirements shown in the State of Utah Standard Specifications for Road and Bridge Construction.

520.1.09 Deep Penetration Liquid Asphalt: The requirements of deep penetration liquid asphalt shall meet the State of Utah Standard Specifications for Road and Bridge Construction.

520.1.10 Road Tars: Shall be derived from gas-house, coke-oven, or water gas tars and shall conform to the requirements of AASHTO M-52.

520.1.11 Unauthorized Grades: The use of grades of asphalt other than those called for on the Approved Plans or in the Special Conditions will not be allowed. Any work which proves to be defective because of the use of unauthorized grades of asphalt shall be repaired or removed at the expense of the Contractor, if ordered by the City Engineer.



SECTION 521

PLANT MIX BITUMINOUS PAVEMENT

521.1 Description: This work shall consist of providing and placing one (1) or more courses of Asphalt Concrete Paving on prepared subgrade, aggregate base or on existing asphalt surfacing as indicated on the Plans, in the Special Provisions or as directed by the Engineer.

Each course shall be constructed, as specified herein, to the depth, typical section(s) or elevation required on the Plans or otherwise directed by the Engineer. Each individual course shall be placed, compacted and otherwise finished as specified and shall be subject to the approval of the Engineer.

Any feature covered by asphalt during the asphalt paving process that requires adjusting to a final grade must be raised to the proper grade within seven (7) days of being covered with the asphalt. These features include but are not limited to: manhole covers, valve box covers, and monument covers. Under no circumstances can the access to the utilities be delayed more than seven (7) days after asphaltting unless otherwise approved by the City Engineer.

521.2 Materials: Asphalt concrete mixes shall be composed of mineral aggregates and bituminous asphalt cement materials mixed in a central mixing plant.

521.2.01 Bituminous Asphalt Materials: Unless otherwise specified on the Plans or the Special Provisions, the asphalt cement shall be Viscosity Grade AC-10 meeting all requirements of AASHTO M-226 and Section 520 of these Standard Specifications.

The asphalt cement grade may be changed one step, up or down, by the Engineer at no change in the unit bid price.

521.2.02 Mineral Aggregates: It is anticipated that aggregate materials will be obtained from existing commercial or Contractor owned pits. Should the Contractor choose or the project documents require the development of a new source, then the Contractor shall be responsible for providing the source and for securing all the necessary zoning variances and permits which may be required, including those required for dust collection systems, wet-wash systems and truck traffic haul access.

All work involved in clearing and stripping any aggregate source, including the handling of any unsuitable material encountered, shall be performed by the Contractor, and no additional compensation will be allowed for this work. In case the material deposit contains sand or other material, in excess of the specification gradation requirements or of an unacceptable quality, such excess or undesirable material shall be removed and disposed of prior to crushing.

In any case, each proposed aggregate source shall be tested in accordance with test methods specified herein, and the results submitted to the City Engineer for approval.

Mineral aggregates shall consist of crushed stone, crushed gravel, or crushed slag. That portion of the materials retained on the No. 4 sieve shall constitute Coarse Aggregate and that portion of the materials passing No. 4 and retained on the No. 200 sieve shall constitute Fine Aggregates. Materials passing the No. 200 sieve are designated as Mineral Fillers.

When tested in accordance with AASHTO Test method T-104, the aggregates, both coarse and fine, shall have a weighted loss not exceeding twelve (12) percent, except that the maximum allowable percentage of loss shall be increased to sixteen (16) percent of asphalt treated base course materials when so identified on the plans.

The weight of minus 200 mesh material retained in the aggregate, as determined by the difference in percent passing a No. 200 sieve by washing and dry sieving without washing shall not exceed six (6) percent total sample weight.

521.2.02A Coarse Aggregate: Coarse aggregates, as defined above, shall consist of clean, hard, tough, durable and sound particles free from vegetable matter, deleterious substances or any adherent materials that would restrict thorough coating with asphalt cement. In addition, the coarse aggregate shall conform to the following minimum requirements:

1. The aggregate shall not contain more than five (5) percent by weight, of flat or elongated pieces. A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle as one having a ratio of length to width greater than five (5).
2. The aggregate shall contain at least fifty (50) percent by weight of crushed pieces having two or more fractured faces and sixty-five (65) percent having at least one (1) fractured face. The area of each face shall be equal to at least seventy-five (75) percent of the smallest midsectional area of the piece. When two (2) fractured faces are contiguous, the angle between the planes of fractures shall be at least thirty (30) degrees to count as two (2) fractured faces. Fractured faces shall be obtained by artificial crushing.
3. When tested in accordance with AASHTO Test Method T-96, the coarse aggregate shall have a percentage of wear not exceeding forty (40) percent, except that the maximum allowable percentage shall be increased to fifty (50) percent for asphalt treated base course materials.
4. The aggregate shall be of uniform density and quality and shall be a dry rodded weight of not less than seventy-five (75) lbs. per cubic foot when tested in accordance with AASHTO Test Method T-19.

521.2.02B Fine Aggregates: Fine aggregates, as defined herein, shall consist of clean, sound durable, angular particles, either manufactured by crushing or naturally existing. The aggregate particles shall be completely free from organic, clay balls or other deleterious matter. In addition the fine aggregates shall conform to the following minimum requirements:

1. When tested in accordance with AASHTO Test methods T-89 and T-90 that portion of the aggregates passing the No. 40 sieve shall have a liquid limit not exceeding twenty-five (25) and shall be non-plastic.

521.2.03 Mineral Filler: If mineral filler, in addition to that naturally present in the aggregates is required, the specified or designated material shall conform to the requirements contained in ASTM D-242. Mineral filler shall include Hydrated Lime or hydraulic cements required to increase the Index of Retained Strength characteristics of the asphalt concrete mixtures.

521.2.04 Paving Fabrics: When indicated on the Plans, in the Special Provisions or as directed by the Engineer, paving fabrics shall be furnished and placed to the lines or limits indicated. The fabric and placement shall conform to the minimum requirements specified herein or as otherwise indicated on the Plans or as directed by the Engineer.

521.2.04A Fabric Type: Paving fabrics shall consist of woven or non-woven polypropylene and/or polyester materials meeting the following minimum requirements:

TABLE 521.2.04B Minimum Physical Requirements

<u>Property</u>	<u>Value</u>
Weight, oz./s.y.	3.5-8.0
Grab Tensile Strength, lb.	90 lb. minimum
Grab Elongation at break, %	55% minimum
Asphalt Retention, gal/s.y.	0.20 minimum

521.2.04C Certificate of Compliance: Subsequent to the fabric material being delivered to the project site and prior to any placement, the Contractor shall submit to the Engineer, Manufacturer's Certificates of Compliance for each lot or partial lot representing material to be incorporated into the project.

In addition, each roll of fabric delivered to the project shall be clearly tagged indicating the lot or control number, date of manufacture, fabric type and identification, width and length of fabric rolls and sufficient information to determine the net weight of the fabric contained on each roll.

521.3 Mix Designs and Submittals: *At least ten (10) days prior to the start or asphalt concrete placement, the Contractor shall submit mix designs for each type of asphalt concrete mix to be used to the City Engineer for review and approval.* The design(s) shall be formulated by an independent testing laboratory, approved by the City Engineer, and shall have been completed prior to submittal, unless otherwise approved by the City Engineer. The costs of the mix design(s) shall be considered incidental to the work, and all costs of the mix design(s) shall be borne by the Contractor.

The mix designs shall be based on representative aggregate, mineral filler and asphalt cement samples from the source(s) to be used during production. The mix design(s) shall be performed in accordance with the applicable methods contained in the Asphalt Institute Manual MS-2. The design submittals shall include the following minimum information:

1. The results of laboratory quality tests performed on the proposed aggregates and mineral filler materials as indicated in Section 521.2.03.

2. The specific gravity and absorption of each aggregate fraction, as defined in Section 521.2, as determined by AASHTO Test Methods T-84 and T-85.
3. The gradation of each individual aggregate fraction, as defined in Section 521.2, as determined by AASHTO Test Methods T-27 and T-11.
4. The proposed combined aggregate grading, job mix grading tolerances and combined aggregate specific gravity used in the formulation of the design .
5. The specific gravity, grade and producer of the asphalt cement used in the formulation of the design.
6. The recommended asphalt cement content of the proposed mixture supported by the test properties for the recommended content. The submittal shall also include the test property curves indicated in Figure III-4 of the Asphalt Institute Manual MS-2.
7. The results of Index of Retained Strength Tests (Immersion-Compression) as determined in accordance with AASHTO Test Methods T-165 and T-167.
8. The laboratory mixing temperatures and the recommended production mixing and lay-down temperatures for the mixture. Minimum lay-down temperature shall not be less than 250 degrees F.

521.4 Asphalt Mixture Composition: Unless otherwise approved by the City Engineer, all asphalt concrete and/or all asphalt concrete mix designs shall be formulated to conform to the minimum requirements specified herein.

521.4.01 Combined Aggregate Gradings: The combined job mix aggregate gradation shall establish a single, target percentage of aggregate passing each required sieve size. The gradation shall conform to the appropriate grading band, as specified, in Table 521.4.01A. After the combined grading is established, asphalt mixtures for the project shall conform to the established gradation within the tolerances indicated in Table 521.4.01B.

continued . . .

TABLE 521.4.01A Master Gradation Limits

Percent Passing by Dry Weight of Aggregate

<u>Sieve Size</u>	<u>1¼" Max.*</u>	<u>¾" max.</u>	<u>½" max.</u>
1¼"	100		
1"	86-98		
¾"	68-93	100	
½"	57-81	79-99	100
¼"	49-69	68-88	79-99
No. 4	34-54	48-78	58-79
No. 8	22-42	33-53	39-59
No. 16	13-33	20-40	26-46
No. 30	8-24	14-30	19-35
No. 50	6-18	9-21	12-24
No. 100	4-12	6-16	7-17
No. 200	3-9	3-9	3-9

* ASPHALT TREATED BASE COURSE

TABLE 521.4.01B Job Mix Gradation Tolerances

<u>Aggregates</u>	<u>Tolerances plus or minus</u>
Retained on No. 4 and larger sieves	± 7 percent
Passing No. 4 and retained on No. 200	± 4 percent
Passing the No. 200 sieve	± 2 percent

521.4.02 Asphalt Cement Content: The asphalt cement content of the mixture shall be established by the approved mix design. During production and placement the asphalt cement content shall not vary by more than ± 0.30 percent without the approval of the City Engineer.

521.4.03 Physical Test Properties: The mineral aggregates when combined with the determined percentage of asphalt cement shall conform to the following test properties:

continued . . .

TABLE 521.4.03 Test Properties

<u>Property</u>	<u>Value</u>
Number of blows/side:	50
Stability, pounds:	1750*
Flow, 0.01 inch:	10-18
Percent air voids:	2-5
Percent voids in mineral aggregate; VMA	
1¼" max. size aggregate:	13 minimum
¾" max. size aggregate:	15 minimum
½" max. size aggregate:	16 minimum

*The stability of the design mix shall not exceed 3000 pounds unless approved by the City Engineer.

521.4.03B Index of Retained Strength: When tested in accordance with AASHTO Test Methods T-165 and T-167, the asphalt concrete mixture shall have an Index of Retained Strength value of not less than seventy (70). If the test value is less than seventy (70), the design mix shall be rejected or a minimum of one (1) percent hydrated lime shall be added to the mixture, as required, to produce an Index of Retained Strength of not less than seventy (70). In no case, shall the unconfined compressive strength of the Group 2 (wet compression) samples be less than 150 psi. Unless otherwise approved by the Engineer, anti-strip additives shall not be substituted for hydrated lime, and then only if laboratory test results indicate that the approved additive will result in a retained strength complying with the requirements specified herein.

The Index of Retained Strength value shall be used to evaluate the acceptability of the aggregates and proposed mix designs and shall not be used as a project control requirement, unless otherwise directed in the Special Provisions or by the City Engineer.

521.5 Acceptance of Delivered Material: Acceptance of the asphalt concrete material shall be based on periodic samples taken from the roadway by random selection.

If the result of any individual test indicates that the material does not comply with any of the requirements specified herein, then a second sample shall be obtained immediately from the same location to check the results obtained. *In any case, the results of tests indicating non-conformance shall be immediately reported to the City Engineer, who shall solely have the option of accepting or rejecting the subject material.*

A minimum of three (3) samples shall be obtained from the work area for each five (5) days of placement. The samples shall be tested for conformance with the requirements contained herein, and otherwise established by the mix design. The City Engineer shall have the authority to increase or decrease the frequency of sampling and testing, as conditions may warrant.

521.6 Preparation of Roadway:

521.6.01 Untreated Roadway Surfaces: Where asphalt concrete, as described herein, is to be placed directly upon compacted subgrade or aggregate base, the subgrade or aggregate base shall be prepared in accordance with the requirements specified in Sections 501.4, 503 or 510, whichever is applicable.

The prepared surfaces shall be maintained in the same condition as prepared until the asphalt concrete is placed.

521.6.01A Prime Coat: Unless otherwise indicated on the Plans, in the Special Provisions or deleted by the City Engineer, all prepared subgrade or aggregate base upon which asphalt concrete is to be placed shall receive a prime coat. The prime coat shall conform to the material requirements and application procedures set forth in Section 522, except for the following modifications:

1. The prime coat shall be asphalt emulsion type CSS-1h unless otherwise specified in the Contract Documents or as directed by the City Engineer.
2. The prime coat shall be uniformly applied at a rate of 0.25 gal/sq. yd. unless otherwise specified in the Contract Documents or directed by the Engineer.

521.6.02 Overlays: Where asphalt concrete is to be placed as an overlap, the existing paved surfacing shall be thoroughly cleaned with power brooms, blowers, hand brooms or otherwise as directed by the Engineer.

All flushing or bleeding asphalt patches, accumulations of grease or oils and any other objectionable matter shall be entirely removed from the existing pavement. Excess asphalt and premolded joint filler material shall be removed to the satisfaction of the City Engineer.

Potholes, depressions, cracks as indicated, and other surface irregularities shall be patched by specified or otherwise approved methods satisfactory to the Engineer.

521.6.02A Tack Coat: Unless otherwise indicated in the Plans, in the Special Provisions or deleted by the City Engineer, all prepared existing paved surfaces upon which an asphalt concrete overlap is to be placed shall receive a tack coat. The tack coat shall conform to the material requirements and application procedures set forth in Section 523, except for the following modifications:

1. The tack coat shall be asphalt emulsion type CSS-1h unless otherwise specified in the Contract Documents or directed by the Engineer.
2. The tack coat shall be uniformly applied at a rate of 0.15 gal/sq. yd. unless otherwise specified in the Contract Documents or directed by the Engineer.
3. Where paving fabrics are specified for use, the prepared surface shall be tacked in accordance with Section 521.6.04B.

521.6.03 Paint Binder for Vertical Surfaces: Vertical faces of cut asphalt, cut concrete, manholes, etc. shall be sprayed, painted or otherwise coated with a uniform coating of emulsified asphalt binder type CRS-1 or CRS-2. The material shall be applied at the rate of 0.10 gal/sq.yd. of surface area covered or as otherwise directed by the Engineer.

521.6.04 Paving Fabrics: Where indicated on the Plans, in the Special Provisions or directed by the Engineer, paving fabrics conforming to the minimum requirements contained in Section 521.2.04 shall be placed in strict accordance with the Special Provisions, and manufacturer's recommendations except as modified below:

521.6.04A Preparation: Roadway preparation shall be completed in accordance with Section 521.6.02 or as otherwise specified.

521.6.04B Fabric Sealant: A fabric sealant coat shall be applied immediately prior to application of the fabric. The sealant coat shall be asphalt cement grade AC-10 applied at the rate of 0.25 gal/sq. yd. If for any reason the sealed fabric is not covered with the overlap in the same day as the fabric and sealant were placed, then the Engineer shall have the option of directing that an additional tack coat of AC-10 be applied, at an application rate to be determined by the Engineer.

521.6.04C Fabric Installation: The Contractor shall provide only qualified, experienced personnel, adequately equipped, to place the fabric materials. If, in the opinion of the Engineer, the assigned personnel are not adequately trained or experienced, then the Contractor shall provide manufacturer-trained representative to supervise or provide placement of the fabric.

The paving fabric shall be stretched, aligned and placed entirely on the tack coat with a minimum of wrinkles and folds. Hand and mechanical brooming shall be effected to maximize the fabric contact with the tacked roadway surface. If folds in excess of one-half ($\frac{1}{2}$) inch occur, the fabric shall be slit to remove the fold or wrinkle then overlapped in the direction of the paving.

All cutting or slitting of paving fabric shall be effected by a method approved by the Engineer. When cutting or slitting is employed, the Engineer will determine the additional amount of tack coat to be applied, to assure adhesion of the double fabric layer.

If manual placement methods are used, the fabric shall be unrolled, stretched, aligned and placed in increments not exceeding thirty (30) feet.

The fabric shall be rolled when required to seat the fabric to prevent movement and assure fabric saturation. Care shall be taken to avoid tracking plant mix bituminous pavement material onto fabric and to avoid distorting the fabric during rolling.

No vehicle shall be allowed on the fabric, except rolling equipment (if fabric seating is necessary), equipment needed to spread the of plant mix bituminous pavement material on top of the fabric, paving equipment and cross traffic. Prior approval by the Engineer shall be received before cross traffic is permitted.

Paving operations shall follow placement of the paving fabric within an hour or within $\frac{1}{4}$ mile whichever is less.

521.7 Preparation of Asphalt Concrete Mixtures: The mineral aggregate shall be dried prior to mixing. Drying shall be accomplished in a suitable dryer and shall continue until the average moisture content is not more than one (1) percent by weight. Moisture determinations shall be made on samples taken from the dryer discharge. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid contamination of the aggregate by soot or fuel oil.

521.7.01 Mixing: The mineral aggregate and bituminous binding shall be mixed at a central mixing plant. The shortest mixing time consistent with satisfactory coating of the aggregate shall be used as approved by the Engineer. The mineral aggregate shall be considered satisfactorily coated with bitumen when all of the particles passing on the No. 4 sieve are coated and ninety-six (96) percent of the particles retained on the No. 4 sieve are coated as determined visually by the Engineer. The required mixing time, as determined above, shall be used until change is approved by the Engineer.

If a dryer-drum mixing process is used, the dryer-drum mixing system shall be equipped to provide positive control of the cold aggregate feed and automatically regulate the feed gate and permit instant correction of variations in load. The cold feed shall be automatically coupled with the bitumen flow to maintain the required proportions. The system shall be equipped with automatic burner controls and shall provide for temperature sensing of the bituminous mixture at discharge. The mixing system shall be equipped with an adequate and approved surge bin capable of discharging in a manner as to prevent segregation of the mix. Dumping on the ground and reloading of the bituminous mix shall not be permitted. A mixing time consistent with satisfactory coating of the aggregate shall be used. The mineral aggregate shall be considered satisfactorily coated with bitumen when all of the particles passing the No. 4 sieve and ninety-eight (98) percent of the particles retained on the No. 4 sieve are coated as determined by the Engineer. The moisture content of the bituminous mixture shall not exceed one (1) percent by weight.

521.8 Mix Temperature Control: The viscosity of the asphalt as it is being used in the pug mill shall be between one hundred and fifty (150) and three hundred (300) centistoke, determined in accordance with ASTM Test Method D-2170. In no case shall the pug mill mixing temperature be less than two hundred and seventy-five (275) degrees F.

The Contractor shall advise the City Engineer in writing of the source of the asphalt to be used, who will then approve the mixing temperature limits for the asphalt, aggregate, mixing and lay down.

In the event a dryer-drum mixing process is used, the temperature of the bituminous mixture at discharge from the mixer shall not be less than two hundred and sixty (260) degrees F nor more than three hundred (300) degrees

The temperature of the asphalt concrete discharged from the mixing plant shall not vary more than twenty (20) degrees F for successive batches.

Minimum lay down temperatures of two hundred and fifty (250) degrees F shall be strictly adhered to. Any asphalt concrete delivered to the project at a lesser temperature shall be subject to rejection by the Engineer.

Final rolling and compaction to the minimum degree specified shall be completed before the mat temperature drops below one hundred and eighty (180) degrees F, when measured one-half (½) inch below the surface or mat.

If the source of asphalt cement is changed during the course of the work, notice shall be given in writing to the City Engineer. A new mix design shall be made, and new temperature limits will be specified before asphalt from the new source is used. In no case shall the asphalt from two different sources be intermixed.

521.9 Hauling: The beds of trucks used to haul asphalt concrete may be coated with a light film of distillate or light oil before loading. Amounts of oil that form visible pools in the truck bed shall be removed prior to loading. When the haul time from the mixing plant to the job site exceeds two (2) hours; when the atmospheric temperature is below fifty (50) degrees F, or when rain is falling along the haul route, asphalt concrete shall be covered with tarpaulins during transport. The tarpaulins shall completely cover the load and be firmly secured. Asphalt concrete shall be delivered to the site of the work without segregation of the ingredients and within the temperature range specified in Section 521.8.

521.10 Placement and Spreading:

521.10.01 General: Each individual course of asphalt concrete pavement shall be spread on the approved, prepared surface by means of mechanical, self-propelled bituminous paving machines. The paving machines shall be capable of placing a mat at least twelve (12) feet in width, without segregation or tearing of the mat.

521.10.01A Lift Thickness: The asphalt concrete for each individual course shall be placed to the loose depths required to result in the compacted thickness specified on the Plans, or in the Special Provisions.

Where the specified total compacted thickness of the asphalt paving exceeds two and one-half (2½) inches, then the asphalt shall be placed in two (2) courses. In no case shall an individual course be placed in such a manner that will result in a compacted thickness exceeding two and one-half (2½) inches.

521.10.02 Equipment: Bituminous pavers shall be self-contained, power-propelled units with an activated screed or strike-off assembly, heated if necessary, and shall be capable of spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness and grade. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mix material in widths shown on the plans.

The paver shall be capable of operating at forward speeds consistent with satisfactory laying of the mixture.

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line or surface through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

The controls shall be capable of working in conjunction with any of the following attachments:

- A. Ski-type device of not less than 30 feet (9.14 m) in length or as directed by the Engineer.
- B. Taut stringline (wire) set to grade.
- C. Short ski or shoe.

The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded by mechanical elevator, into the paving machine. No asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than two hundred and fifty (250) feet in front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped shall be picked up and loaded into the paving machine.

To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to ensure continuous operation. The Contractor shall provide and schedule enough smooth metal-bedded haul trucks, with covers as needed, to ensure orderly and continuous paving operations. When in the opinion of the City Engineer, excessive seams occur due to the stopping and starting of the paving equipment, the Contractor shall at his own expense correct the problems, by removal and replacement of the pavement to the satisfaction of the City Engineer. The corrective action is to occur within seven (7) days of the notification of the Contractor by the City Engineer.

The paver control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end independently, including any screed attachments used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.

When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of the alignment.

Areas which are inaccessible to the spreading machine may be paved by other methods, as approved by the Engineer. When ordered by the Engineer, motor patrol graders or approved types of truck-attached spreaders shall be used to pave inaccessible or irregularly shaped areas. Hand raking shall be kept to a minimum.

521.10.03 Joints: The longitudinal joints in any upper course shall be offset from any longitudinal joint in the course immediately underlying by a minimum of twelve (12) inches.

Transverse joints in any upper course shall be offset from any transverse joint in the course immediately underlining by a minimum of two (2) feet. Transverse joints in adjacent lanes of the same course shall be offset by a minimum of ten (10) feet.

Where new paving joins or abuts with existing pavement surfaces, the edge of the existing surfaces shall be cut vertical and painted with tack coat as specified in Section 521.6.03.

Joints between successive days placements shall be made by placing a bulkhead of other approved material which when removed will provide a vertical faced joint. The joint shall be full width and depth. The joint surface from previously placed mix shall be painted with tack coat as specified in Section 521.6.03.

521.10.04 Weather and Seasonal Limitations: Asphalt concrete paving shall be placed only between April 15, and October 15; when the surface temperature, upon which asphalt concrete is to be placed, is at least fifty (50) degrees F and/or when the wind chill factor has not fallen below thirty (30) degrees F, unless otherwise authorized by the City Engineer.

In no case shall asphalt concrete be placed during rain or when the surface to be paved has free or standing moisture evident. Paving may be halted by the Engineer during any adverse weather condition which, in his opinion, may adversely affect the quality of paving.

Asphalt concrete placed after October 15, and before April 15, shall only be permitted by written authorization from the City Engineer and then only when conditions established by a proper review indicate that such placements are in the best interest of the City and the public. If the asphalt is placed it will be considered temporary, to be replaced under suitable conditions unless otherwise approved by the City Engineer.

521.10.05 Miscellaneous Details: The amount of asphalt concrete placed in one day shall not exceed that which can be compacted, in accordance with Section 521.11, in the day.

Construction of one course upon the previously placed course shall not be allowed until the underlying course has completely cooled. Tack coats between subsequent lifts shall be in accordance with Section 521.6.02A except that the application rate shall be 0.10 gal/sq. yd.

No traffic other than that necessary for construction purposes shall be allowed on any course of paving until the course has completely cooled. In no case shall traffic be used in an attempt to attain compaction.

521.11 Compaction: As each individual course is placed and spread, as specified in Section 521.10, it shall be thoroughly and uniformly compacted to a minimum of ninety-seven (97) percent of the laboratory maximum as determined in accordance with ASTM Test Method D-1559. Averaging is not allowed.

521.11.01 Construction Details: Compaction rolling shall start at the lower edge and progress longitudinally toward the centerline or higher point. Under no circumstances shall the center of the mat be rolled before the lower portions have been rolled. Each pass of the roller shall overlap the proceeding pass by at least one-half ($\frac{1}{2}$) the width of the roller.

Steel drum-rollers, either static or vibratory, shall be used to accomplish the initial break-down rolling. For subsequent intermediate and finish rolling, steel drum-rollers shall be supplemented with pneumatic-tired rollers. All rollers shall conform to the minimum requirements contained in Section 521.11.02.

During the first days placement, a specific rolling pattern for the specific rolling equipment being used shall be established by the Contractor and approved by the Engineer. The pattern shall not be modified without the approval of the Engineer. If the rolling pattern fails to achieve the specified degree of compaction and/or surface, it shall be modified to the satisfaction of the Engineer.

The number of rollers sufficient to attain the specified degree of compaction shall be furnished by the Contractor. *The Contractor's refusal, inability or failure to provide adequate rolling equipment, in the opinion of the Engineer, shall be sufficient cause for suspension of the work.* Should work be suspended for this reason, the Contractor shall take immediate action to provide the additional equipment required. All costs associated with or resulting from such suspensions, including wasted or rejected materials, damaged work and lost time shall be borne by the Contractor.

All asphalt concrete placed in a single day shall be compacted to the minimum degree specified in that same day. In no case shall the Contractor delay completing compaction for any reason within his control. Should compaction efforts be terminated by weather conditions, the City Engineer will review field density test results and other pertinent data in order to determine the suitability of the asphalt concrete. Should the review result in a determination that the material is inadequate or unsuitable and that the Contractor proceeded with placement without adequate consideration of impending weather conditions, then the City Engineer may order the subject asphalt concrete removed and replaced at the expense of the Contractor.

The surface of each course after compaction shall be smooth and true to established section and grade. Any mixture which shows an excess or deficiency of asphalt, or uneven distribution of asphalt due to insufficient mixing, or which becomes loose, broken, raveled, mixed with dirt, or is in any way defective, shall be removed and replaced with fresh hot mixture at the Contractor's expense, and be immediately compacted to conform with the surrounding area. *Areas of one square foot or more showing an excess or deficiency of asphalt shall be removed and replaced.*

At forms, curbs, headers, walls or other places not accessible to rollers, the asphalt concrete shall be thoroughly compacted to the degree specified with mechanical tampers, hot hand tampers, vibratory plates or other equipment approved by the Engineer.

521.11.02 Rollers: All rollers shall be in good condition, and the reversing mechanism so maintained that the roller is capable of changing directions smoothly. The roller shall be kept in continuous motion while on the hot mat in such a manner that all parts of the pavement receive equal compression. Reversing should not be done until the roller has completely stopped. Rollers shall be operated by competent and experienced personnel.

The number and weight of the rollers shall be sufficient to compact the asphalt concrete to the minimum degree specified while the mix is still in a workable condition and as otherwise specified herein.

Unless otherwise approved by the Engineer rollers shall not be operated at a speed exceeding three (3) m.p.h. during breakdown or intermediate rolling. Roller speeds during finish rolling shall be maintained at a safe level which provides the specified surface and compaction.

521.11.03 Field Density Testing: Field density testing to check the degree of compaction being attained shall be performed in accordance with ASTM Test Method D-2950 or by coring. The frequency of density testing shall be sufficient to assure that all of the asphalt concrete has been compacted to the minimum degree specified. The City Engineer shall reserve the option of increasing or decreasing the frequency of field testing, as conditions warrant.

521.11.04 Inadequate Compaction: When the results of field density tests indicate that less than the specified minimum degree of compaction is being accomplished, the affected area(s) shall be subjected to additional compactive efforts as long as such additional effort is completed within the temperature limits contained in Section 521.8 and within the time limits contained in Section 521.10.05.

In any case, the results of density tests indicating non-conformance shall be immediately reported to the City Engineer, who shall solely have the option of accepting or rejecting the subject material. Should the asphalt concrete be determined to be unsuitable, the Contractor shall bear all costs associated with removal, disposal and replacement. All remedial work required shall be performed in accordance with these Specifications.

The City Engineer shall have the authority to increase or decrease the frequency of sampling and/or testing, as conditions may warrant.

521.12 Finishing: The asphalt concrete shall be finished to a smooth uniform line and grade deviations not exceeding one-eighth (1/8) inch, plus or minus, in ten (10) feet. The determination of compliance with smoothness may be made with a straight-edge, chalk line, high-low detector, or profilograph at the option of the Engineer. Surface ridges and irregularities shall be eliminated by rolling or other approved methods. The use of any equipment that leaves defects in the finished surface which cannot be eliminated, shall be discontinued.

When tested longitudinally, parallel to the surface, the surface shall not vary more than the following:

<u>Length of Section</u>	<u>Leveling or First Course</u>	<u>Second or Surface Course</u>
10 feet	1/4 inch	1/8 inch
25 feet	3/8 inch	1/4 inch
50 feet	1/2 inch	3/8 inch

Any variation from specified tolerance shall be corrected, at the expense of the Contractor, in a manner satisfactory to the Engineer.

The average thickness of the completed surface course shall be reasonably close to that shown on the typical sections. Acceptance of the completed surface course with respect to thickness shall be on the basis of test areas selected by the Engineer, not to exceed fifty thousand (50,000) square feet in size. Depth analyses may be made by cores located in a random pattern, with not less than four (4) cores in each test area. The test area shall be accepted when seventy-five (75) percent of the cores are not more than one-half (1/2) inch greater nor one-fourth (1/4) inch less than the specified thickness and when no core show a deficient thickness of more than one-half (1/2) inch.

Test areas that are not acceptable because of deficient thickness shall be brought into compliance by removal and replacement or by placing additional surface course as directed by the Engineer.

Test areas that are not acceptable because of excess thickness shall be corrected as directed by the Engineer. Removal of portions of the surface course, if required, shall be at the Contractor's expense, and the amount of material removed shall be deducted from pay quantities. If the Engineer permits an excess thickness of surface course to remain in place, the amount of material in excess of the tolerances specified will not be included in the pay quantities.

The thickness tolerances established above shall not apply to those areas where additional thickness is required for leveling an existing surface.

521.12.01 Shoulders: Shoulders where indicated shall be finished to the lines, grades and cross-sections shown in the Approved Plans or Special Conditions and in conformance with these Specifications, unless otherwise directed by the Engineer.

521.13 Method of Measurement: Asphalt Concrete shall be measured by the specified thickness, per square yard in place, unless otherwise specified in the Special Conditions.

521.13.01 Paving Fabric Measurements: Paving fabrics shall be measured by and paid for at the contract unit bid price per square yard of material complete and in place. Fabric sealant tack coat shall be considered incidental.

521.14 Basis of Payment for Asphalt Concrete: The accepted quantities of this item shall be paid for at the contract unit price per square yard for "Asphalt Concrete" which price shall be full compensation for all work necessary to complete this item.



SECTION 522

BITUMINOUS PRIME COAT

522.1 General: This item shall consist of an application of liquid or emulsified asphalt to a prepared subgrade or untreated base course preparatory to placing a bituminous base or surface course. The prime coat shall be applied in conformity with the Approved Plans and these Specifications or as designated by the City Engineer.

522.2 Bituminous Material: Bituminous material shall be MC 70 and shall conform to the requirements of Section 520.

The grade may be changed one step by the City Engineer without a charge in the unit price.

522.3 Blotter Material: Blotter material, when required, shall consist of granular material that meets the following gradation requirements, then tested in accordance with AASHTO T-27.

<u>Sieve Size</u>	<u>Percentage Passing Sieves</u>
No. 4	90-100
No. 10	25-80
No. 200	0-15

522.4 Surface Preparation: If the surface to be primed contains an appreciable amount of loose material or is excessively dusty, it shall be wetted, bladed and rolled as approved by the Engineer, to make the surface satisfactorily tight. Priming shall not be started until all free surface moisture has disappeared.

522.5 Application of Bituminous Material: The bituminous material shall be sprayed over the prepared surface by means of a pressure distributor. The rate of application shall be approved by the Engineer.

The temperature range of the bituminous material at the time of application shall be such that the viscosity will be between 50 and 130 centistokes, as determined in accordance with ASTM D-2170. The exact temperature range shall be approved by the Engineer.

Where a surface is overprimed, resulting in a film of free liquid asphalt, it shall be blotted by spreading a light, uniform layer of blotter material applied at a rate approved by the Engineer.

Blotter material shall be applied by means of an approved mechanical spreader, capable of depositing a uniform layer of blotter material applied at a rate approved by the Engineer.

An underprimed surface shall immediately receive another application of bituminous material.

522.6 Protection of Structures: During the application of bituminous material, all structures shall be protected from being spattered or marred by covering with building paper or other suitable materials. If spattering or marring should occur, the condition shall be corrected at the expense of the Contractor.

Bituminous material shall not be discharged into borrow pits or gutters.

522.7 Opening to Traffic and Maintenance: *If a roadway has been open to traffic at any time, its closure for application of prime coat must be coordinated with the Public Improvements Inspector of the City Engineer's Office, 48 hours in advance.* After the prime coat has been applied, it shall be left undisturbed for at least 4 hours.

If after this time the surface is tacky or tends to pick up under traffic, the excess bituminous material shall be blotted with blotter material, before the surface is opened to any kind of traffic.

The Contractor shall maintain the primed surface until the next course is placed. Maintenance shall include spreading any necessary additional blotter material, replacing and restoring all portions of prime coat that have been destroyed, and patching any breaks in the primed surface. Any primed area that has become fouled by traffic, or otherwise, shall be cleaned before the next course is placed.

Under no circumstances should traffic be permitted to travel over freshly primed surface. If detours cannot be provided, the Contractor shall restrict his operation to a width that will permit it at least one-way traffic over the remaining portion of the roadbed. If one-way traffic is provided, the traffic shall be controlled by flagging or pilot car operation.

522.8 Weather and Limitations: Prime coat and tack coat shall be applied only when the air temperature in the shade is above 50°F and the roadbed temperature is above 50°F. Prime coat and tack coat shall not be applied during rain, fog, or other adverse weather conditions. See also Subsection 500.11.

The temperature restrictions may only be waived upon written authorization by the City Engineer.

522.9 Payment: There shall be no separate payment for bituminous prime coat. It shall be included in the costs of "Bituminous Surface Course," unless otherwise stated in the Bid Schedule.



SECTION 523

BITUMINOUS TACK COAT

523.1 General: This item shall consist of an application of liquid asphalt or emulsified asphalt to an existing surface applied in conformity with the Approved Plans and these Specifications or as directed by the City Engineer.

523.2 Materials: Bituminous material shall be SS1 or RC 70 and shall conform to the requirements of Section 520.

523.3 Application of Bituminous Material: Prior to applying the material, the surface to be treated shall be swept or flushed free of dust or other foreign material. The material shall then be sprayed over the prepared surface by means of a pressure distributor at the rate approved by the Engineer.

The temperature range of the bituminous material at the time of application shall be such that the viscosity will be between 50 and 100 centistokes, as determined in accordance with ASTM Designation D-2170. The exact temperature range shall be approved by the Engineer.

523.4 Protection of Structures: Structures shall be protected as provided in Subsection 522.6.

523.5 Opening to Traffic: Under no circumstances shall traffic be permitted to travel over the tacked surface until the bituminous material has cured so as to not be picked up by traffic. If detours cannot be provided, the Contractor shall restrict his operation to a width that will permit at least one-way traffic over the remaining portion of road. If one-way traffic is provided the traffic shall be controlled by flagging or pilot car operation.

523.6 Weather Limitations: The application of tack coat shall be subject to the conditions outlined in Subsections 522.8 and 500.11.

523.7 Payment: There shall be no separate payment for bituminous tack coat. It shall be included in the costs of bituminous surface course, unless otherwise stated in the Bid Schedule.



SECTION 524

BITUMINOUS SEAL COAT

524.1 General: This item shall consist of applying, a coat of liquid asphalt to an existing surface course. When required, an application of cover material shall follow the bituminous application. The seal coat shall be applied in conformity with the Approved Plans and these Specifications or as directed by the Engineer.

524.2 Bituminous Material: The bituminous material shall be RC 70, conforming to the requirements of Section 520.

524.3 Cover Material: Cover material shall consist of clean, hard, tough, durable, and sound fragments of broken stone, crushed gravel, or crushed slag conforming to the following requirements:

- a. The dry mineral aggregate shall be uniformly graded with one of the gradation limits specified below, as is called for in the bid proposal, when tested in accordance with AASHTO T-27.

<u>Sieve Size</u>	<u>Percentage Passing Sieves</u>	
	<u>Type A</u>	<u>Type B</u>
1/2 inch	100	-
3/8 inch	90-100	-
No. 4	10-25	100
No. 8	0-10	85-100
No. 16	0-6	10-25
No. 50	0-4	0-5
No. 200	0-2	0-2

Acceptance of cover material with respect to gradation shall be based on the average gradation of 5 samples taken from a test lot of 500 tons. The samples shall be obtained from the stockpile prior to use. A test lot shall be accepted when the average gradation of the 5 samples is within the specified gradation band and when the number of individual samples in each test lot outside the gradation band does not exceed 2 and when they are not outside the band by more than 2 percentage points on any one sieve.

The total amount of material passing the No. 200 sieve shall be determined by washing with water in accordance with AASHTO T-11.

- b. That portion of the aggregate retained on the No. 4 sieve shall have not less than 90 percent, by weight, of particles with at least two mechanically fractured, or clean angular faces, when tested in accordance with the Utah State Department of Transportation Test Procedure 8-929.

- c. The aggregate shall have a percentage of wear not exceeding 30, when tested in accordance with AASHTO T-96.

d. The crushed mineral aggregate shall have a weighted percent of loss not exceeding 10 percent by weight, when subjected to five cycles of sodium sulfate and tested in accordance with AASHTO T-104.

e. The aggregate shall be of such nature that when the particles are thoroughly coated with the bituminous material specified for the project, not less than 90 percent of the coating shall be retained, when tested in accordance with Utah State Department of Transportation Test Procedure 8-945 .

524.4 Construction Methods:

524.4.01 Bituminous Additive: Bituminous additive may be used to improve the coatibility of the aggregate. The amount and type of additive to be used shall be approved by the Engineer.

524.4.02 Surface Preparation: Seal coat operations shall not be started until the surface to be sealed has been thoroughly compacted by traffic. In no event shall seal coat be placed on newly constructed bituminous surfaces within 7 days after such surfaces are laid.

Prior to placing the seal coat, the existing surface shall be cleaned of all dirt, sand, dust, or other objectionable material.

524.4.03 Application: The material shall be sprayed over the prepared surface by means of a pressure distributor. The material shall be applied in such a manner that an inspection of the spread can be made and any defects corrected before the cover material is applied. The rate of application shall be approved by the Engineer. Application of bituminous material shall not be more than 1000 feet in advance of the placing of cover material.

Joints between applications shall be made by starting and stopping the distributor on building paper. Valve action shall be instantaneous, both in starting and cut-off. The distributor shall attain the proper application speed at the time the spray bar is opened.

The temperature range of the bituminous material at the time of application shall be such that the viscosity will be between 50 and 100 centistokes, as determined in accordance with ASTM D -2170. The exact temperature range shall be approved by the Engineer.

524.4.04 Spreading, and Compacting of Cover Material: The cover material shall be spread immediately after applying the bituminous material by means of an approved spreader, which can be adjusted to uniformly spread the required amount of aggregate. Provisions shall be made so that the larger particles will be deposited first. The rate of cover material application, in pounds per square yard, shall be approved by the Engineer. Immediately after spreading, the cover material shall be hand broomed, if necessary, to distribute the aggregate uniformly over the surface.

After the cover material has been satisfactorily spread, the surface shall be rolled in a longitudinal direction. Rolling, performed with pneumatic tire rollers, shall adequately seal the cover material and shall consist of at least two complete coverage. Rolling shall be completed the same day the bituminous material and cover material are applied .

After rolling, but not earlier than the next day, any loose material shall be redistributed over the surface. At the end of four days, any loose material shall be removed in such a manner that the material set in the bituminous binder will not be dislodged.

524.4.05 Protection of Structures: Structures shall be protected as provided in subsection 522.6.

524.4.06 Opening to Traffic: On completion of final rolling, traffic shall be permitted to travel over the seal coat. Traffic shall be controlled as directed by flagging and pilot car operation.

504.4.07 Weather Limitations: Seal coat shall be applied only when the air temperature in the shade and the roadbed temperatures are above 50°F. Seal coat shall not be applied during rain, fog, or other adverse weather conditions.

The temperature restrictions may only be waived upon written authorization from the Engineer.

524.4.08 Supplemental Cover Material: Cover material shall be stockpiled at the designated places in such quantities as contained in the bid proposal or as the Engineer may direct. Prior to stockpiling, the selected sites shall be cleared and leveled.

524.5 Payment: There shall be no separate payment for bituminous seal coat. It shall be included in the costs of "Bituminous Surface Course", unless otherwise stated in the Bid Schedule. Cover material shall be paid for by the unit price per square foot, when applicable.



SECTION 525

PLANT MIX BITUMINOUS SEAL COAT

525.1 Description: This item shall consist of a mixture of mineral aggregate and bituminous binder, mixed at a central mixing plant, spread and compacted on a prepared surface in reasonably close conformance with the lines, grades and dimensions shown on the Approved Plans and typical sections and in accordance with these Specifications.

525.2 Materials:

525.2.01 Bituminous Material: Bituminous material shall be of the type called for in the Bid Proposal and shall conform to the requirements of Section 520. The grade specified in the Proposal may be changed one step by the Engineer at no change in the unit bid price. The percentage of bituminous material used shall be approved by the Engineer.

525.2.02 Mineral Aggregate:

a. The dry mineral aggregate shall meet one of the gradations shown below when tested in accordance with AASHTO Designation T-30. The gradation to be used shall be designated in the Proposal.

At least ten working days prior to producing plant mix bituminous seal coat, the Contractor shall submit in writing a job-mix gradation to the Engineer for his approval. The job-mix gradation shall have definite single values for the percentage of aggregate passing each specified sieve based on the dry weight of the aggregate. The job-mix gradation shall meet the ideal gradation with the tolerances shown below:

<u>Type A:</u>		
<u>Sieve Size</u>	<u>Ideal Gradation (Percent Passing)</u>	<u>Ideal Gradation Tolerance</u>
½ inch	100	0
3/8 inch	97	+2
No. 4	40	+4
No. 8	17	+3
No. 16	12	+2
No. 50	8	+2
No. 200	3	+1

continued . . .

<u>Type B</u>		
<u>Sieve Size</u>	<u>Ideal Gradation (Percent Passing)</u>	<u>Ideal Gradation Tolerance</u>
½ inch	100	0
3/8 inch	97	±2
No. 4	40	±4
No. 8	17	±3
No. 16	21	±3
No. 50	13	±2
No. 200	4	±1

The total amount of material passing the No. 200 Sieve shall be determined by washing with water in accordance with AASHTO T-11.

Changes in the job-mix gradation may be made prior to a day's production, subject to approval by the Engineer who, before use, will make any necessary adjustments in the amount of bituminous material to be used. The request for changes shall be in writing and shall give the Engineer sufficient notice to review and approve this mix design. For major changes in the job-mix gradation, at least two working days notice shall be required.

Acceptance of the aggregate with respect to gradation shall be based on the average of the deviations from the job-mix gradation of the samples taken from a lot. A lot shall equal the number of tons of bituminous mix placed each production day. When the daily production exceeds 2,500 tons, a minimum of 5 samples shall be required. When it is between 1,500 and 2,500 tons, a Minimum of 4 samples shall be required. When it is less than 1,500 tons, a minimum of 3 samples shall be required. In the event the minimum number of samples required can not be obtained, the test lot may be evaluated on the basis of fewer samples. The samples shall be taken on a random basis for the bituminous mix after it has been discharged into hauling units. In addition, the samples shall be distributed as uniformly as possible in time throughout the test lot so as to be representative of the Material being produced during the entire production day. A lot will be accepted when the average gradation of the 5 samples is within the specified gradation band and when the number of individual samples in each test lot outside the band does not exceed 2 and when they are not outside the gradation band by more than 2 percentage points on any one sieve.

The Contractor shall take steps to bring the plant mix bituminous seal coat into Specifications when the test results show a deviation from the job-mix formula that exceeds the Maximum deviation allowed.

b. That portion of the aggregate retained on the No. 4 sieve shall have not less than 90% of particles with at least one fractured face, or clear angular face, when tested in accordance with UDOT Test Procedure 8-929.

c. The aggregate shall have a percentage of wear not exceeding 30 when tested in accordance with AASHTO T-96.

d. The crushed mineral aggregate shall have a weighted percent of loss not exceeding 12% by weight when subjected to 5 cycles of sodium sulfate and tested in accordance with AASHTO T-104.

e. The aggregate shall be of such nature that when thoroughly coated with the bituminous material specified for the project not less than 90% of the coating shall be retained when tested in accordance with UDOT Test Procedure 8-945.

f. Before being fed to the drier the aggregate shall be separated into two or more sizes and stored separately. If two or three sizes are used the aggregate shall be separated on screens of such size that the quantity drawn from each storage is approximately equal.

The aggregate shall be fed to the drier at a uniform rate. The rate of feed shall be maintained within 10% of the amount set by the Contractor for his operation.

In placing the aggregate in storage or in moving from storage to the cold feed bins, any method which causes segregation, degradation, or the combining of materials of different gradings shall not be permitted. Any segregated or degraded material shall be re-screened or wasted.

Plant mix operations shall not commence until sufficient material for at least two days production has been separated and stockpiled.

g. The plant mix bituminous seal coat material shall have a co-efficient of thermal expansion of less than 1/2 inch per 100 feet when tested by the UDOT testing procedure. This requirement shall be used to determine the suitability of the aggregate source and shall not be used for routine project control. The Materials and Research Section of District Two Materials and Test Unit may be contacted for information regarding this test method and specification.

525.2.03 Bituminous Additive: Bituminous additive may be used to improve the coatability of the aggregate. The type and percent of super-concentrated additive to be used shall be approved by the Engineer. Bituminous additive shall conform to the requirements of Section 407 of the UDOT Standard Specifications for Road and Bridge Construction.

525.3 Construction Methods:

525.3.01 Temperature Control: The viscosity of the asphalt being used in the plant mix bituminous seal coat shall be between 400 and 900 centistokes at the time of mixing as determined in accordance with ASTM D-2170 of the UDOT Standard Specifications for Road and Bridge Construction. The exact temperature range shall be approved by the Engineer to be used for the asphalt, aggregate, mixing and laydown after notification as to asphalt source.

If a dryer-drum mixing process is used, the temperature of the bituminous mixture at discharge from the mixer shall be not less than 230°F. nor more than 260°F. Unless otherwise approved by City Engineer, the plant mix bituminous seal coat must be covered with a tarpaulin and delivered to the site before its temperature drops below 200°F. *It is necessary to complete compaction of the bituminous mixture before the temperature of the mixture drops below 180°F. unless otherwise approved by City Engineer. If the source of asphalt is changed during the course of work, a new mix design shall be made. In no case shall the asphalt from two different sources be intermixed.*

525.3.02 Mixing: Mixing shall be performed as specified in Subsection 402. 09 of the UDOT Standard Specifications for Road and Bridge Construction, except that the mineral aggregate shall be considered satisfactorily coated with bitumen when "all" particles are coated.

525.3.03 Tack Coat: The placing of the tack coat shall be in accordance with Section 404 of the UDOT Standard Specifications for Road and Bridge Construction.

525.3.04 Spreading and Compacting: The bituminous seal coat mixture shall be laid with self-propelled mechanical spreading and finishing equipment capable of laying at least a 12-foot width. The mixture shall be laid in one pass to the elevations, grades, and cross-sections shown on the Approved Plans.

Whenever asphalt slicks appear on the surface of the newly laid seal coat, they shall be raked immediately. Raking will usually cause the excessive asphalt to flow to the bottom of the mat. If a slick spot cannot be removed by raking, it shall be taken out and replaced by material which contains less asphalt. This replacement material shall be raked to conform to the contour of the seal coat. Asphalt slicks which appear after rolling has been completed shall be covered with a light course of fine sand. The slick spots shall then be rolled again.

The seal coat shall be rolled in a longitudinal direction, commencing at the outside edge or lower side and proceeding toward the higher side. Rolling shall be accomplished with a flat-wheel steel roller weighing not more than 10 tons. Each pass of the roller shall overlap the preceding pass by at least one-half the width of the roller. Rolling shall be confined to the amount necessary to consolidate the seal coat and bond it to the underlying surface course. Excessive rolling shall be avoided.

Longitudinal joints shall be located within 6 inches of what will be a traffic lane-line location.

The completed seal coat shall be protected from all traffic until it has hardened and set up sufficiently to resist abrasion as determined by the Engineer.

Acceptance of the completed plant mix seal coat with respect to thickness shall be based on the average thickness of the test lot. A test lot shall equal the number of tons of bituminous mix placed each production day. A lot shall be divided into sublots of approximately 3,200 square yards. A minimum of one thickness test, randomly selected by use of a random number table, shall be taken within each subplot. A lot shall be accepted when the average thickness of all sublots is not more than 1/4-inch greater nor 3/8-inch less than the total designated plant mix seal coat thickness.

Lots or sublots that are not acceptable because of deficient thickness shall be brought into compliance by placing a minimum of 3/4-inch additional plant mix seal coat to roadway or lane width at the Contractor's expense. Tapers shall be required on each end of the additional layer of plant mix seal coat. Tapers shall be constructed to the satisfaction of the Engineer.

In lots or sublots where the thickness exceeds the specified tolerance, 50% of the amount of material in excess of the specified tolerances shall be included in the pay quantities.

The Engineer will periodically check the depth of the plant mix bituminous seal coat with use of a depth probe. The Engineer, via his Inspector, will inform the Contractor or his laydown foreman/superintendent of any variance from the specified depth which exceeds 1/4-inch as soon as it is discovered. The Contractor will take immediate action to insure the plant mix bituminous seal coat thickness is adjusted to that specified on the Approved Plans.

Should the Engineer discover the depth of plant mix bituminous seal coat is less than 5/8-inch, he will direct the Contractor to take corrective action to add more material to the deficient area to produce the specified depth.

If the Contractor elects to overlay while the mat temperature is above 180°F. the total mat thickness must be at least that specified on the Approved Plans. *Corrections made after the mat has cooled to below 180°F. require an overlay of at least 3/4-inch.*

525.3.05 Weather and Seasonal Limitations: Weather and seasonal limitations shall conform to Sections 100.10 and 521.10.04.

525.4 Method of Measurement: Plant mix seal coat shall be measured by the specified thickness, per square yard in place, unless otherwise specified in the Special Conditions.

525.5 Basis of Payment:

- a. The accepted quantities of this plant mix bituminous seal coat shall be paid for at the contract unit price per square yard for "Plant m Bituminous Seal Coat," which price shall be full compensation for all work necessary to complete this item.
- b. Bituminous additive shall be measured and paid for as provided in Section 407 of the UDOT Standard Specifications for Road and Bridge Construction.
- c. Rubber latex additive shall be paid for as specified in the Special Conditions of this item.



SECTION 526

EMULSION SLURRY SEAL

526.1 Description: 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.

526.2 Materials:

a. Asphalt Emulsion. The emulsified asphalt shall conform to the requirements of ASTM of ISSA Specification, for type SS1h, CSS1h or QUICK SETTING, MIXED GRADE EMULSION.

b. Aggregate. The mineral aggregate shall consist of natural or manufactured sand, slag, crusher fines, and others, or a combination thereof. Smooth-textured sand of less than 1.25 percent water absorption shall not exceed 50 percent of the total combined aggregate. The aggregate shall be clean and free from vegetable matter and other deleterious substances. When tested by AASHTO T176 of ASTM D2419, the aggregate blend shall have a sand equivalent of not less than 45. When tested according to AASHTO T10-4 or ASTM C88 the aggregate shall show a loss of not more than 15%. when tested according to AASHTO T-96 or ASTM C131 the aggregate shall show a loss of not more than 35%.

Mineral fillers such as portland cement, limestone dust, fly ash, and other shall be considered as part of the blended aggregate and shall be used in minimum required amounts. They shall meet the gradation requirements of ASTM D242. Mineral fillers shall be used if needed to improve the workability of the mix or gradation of the aggregate.

The combined mineral aggregate shall conform to the following gradation when tested.

<u>Sieve Size</u>	<u>Passing</u>	Percent
1/2"	-	
3/8"	100	
No. 4	70-90	
No. 8	45-70	
No. 16	28-50	
No. 30	19-34	
No. 50	12-25	
No. 100	7-18	
No. 200	5-15	
Theoretical Asphalt Content % Dry Aggregate	17%	15%

Acceptable Variance + 2% 2%

c. Water. All water used with the slurry mixture shall be potable and free from harmful soluble salts.

526.3 Equipment: All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working order at all times. *Descriptive information on the slurry mixing and applying equipment to be used shall be submitted to the City Engineer for approval not less than five (5) days before the work starts.*

a. Slurry Mixing Equipment: The slurry mixing machine shall be a continuous flow mixing unit and be capable of delivering accurately a predetermined proportion of aggregate, water and asphalt emulsion to the mixing chamber and to discharge the thoroughly mixed product on a continuous basis. The aggregate shall be pre-wetted immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together. No violent mixing shall be permitted. The mixing machine shall be equipped with an approved fines feeder that provides an accurate metering device or method to introduce a predetermined proportioned of mineral filler into the mixer at the same time and location that the aggregate is fed. The fines shall be used whenever added mineral filler is a part of the aggregate blend.

b. Slurry Spreading Equipment: Attached to the mixer machine shall be a mechanical type squeegee distributor equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained so as to prevent loss of slurry on curving grades and crown by adjustments to assure uniform spread. There shall be a steering device and a flexible strikeoff.

The spreader box shall have an adjustable width. The box shall be kept clean, and build-up of asphalt and aggregate on the box shall not be permitted. *The use of burlap drags or other drags shall have prior approval by the City Engineer.*

c. 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 surface.

526.4 Preparation of Surface: Immediately prior to applying the slurry, the surface shall be cleaned of all loose material, silt spots, vegetation, and other objectionable material. Any standard cleaning method used to clean pavements will be acceptable, except *water flushing will not be permitted in areas where considerable cracks are present in the pavement surface.* The City Engineer shall give final approval of the surface.

526.5 Composition and Rate of Application of the Slurry Mix: The amount of asphalt emulsion to be blended with the aggregate shall be that as determined by the laboratory report after final adjustment in the field. A minimum amount of water shall be added as necessary to obtain a fluid and homogeneous mixture. The rate of application shall be a minimum of 18 lbs. of dry aggregate per square yard.

526.6 Weather Limitations: The slurry seal surface shall not be applied if either the pavement or air temperature is 55 degrees F. or below and falling, but may be applied when the air and also the pavement temperature is 45 degrees F. or above and rising.

526.7 Application of the Slurry Surfaces:

a. General: The surface may be pre-wetted by fogging ahead of the slurry box. The slurry mixture shall be of the desired consistency when deposited on the surface and no additional elements shall be added. Total time of mixing shall not exceed four minutes. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained. No lumping, balling or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement. No excessive breaking of the emulsion will be allowed in the spreader box. No streaks such as caused by oversized aggregate will be left in the finished pavement.

b. Joints: No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints.

c. Hand Work: Approved squeegees shall be used to spread slurry in non-accessible areas to the slurry mixer. Care shall be exercised in leaving no unsightly appearance from hand work.



SECTION 530

PORTLAND CEMENT CONCRETE

530.1 General: This section of the Specifications defines materials to be used in all Portland cement concrete work and requirements for mixing, placing, finishing and curing. *All codified mixes or designed mixes must be defined and approved prior to delivery. Approval for the mix specifications will be by the City Engineer.*

530.2 Materials: Materials used in Portland cement concrete and reinforcing of Portland cement concrete shall meet the following requirements:

530.2.01 Cement: Portland cement shall be Type II and shall comply with the Standard Specification for Portland Cement, ASTM C-150. Cement shall be stored in such a manner as to be protected from weather, dampness or other destructive agencies. Cement that is partially hydrated, caked, or otherwise damaged will be rejected.

530.2.02 Aggregates: Concrete aggregates shall conform to Specifications or Concrete Aggregates, ASTM C-33.

The maximum size of the aggregate shall not be larger than:

1. 1/5 narrowest dimension between sides of forms, nor
2. 1/3 depth of slabs, nor
3. 3/4 minimum clear spacing between reinforcing bars, bundles of bars.
4. Cover on reinforcing bars for columns, beams, girders and walls.
5. One inch for slabs having No. 6 or smaller bars.

530.2.03 Water: Water used in mixing or curing concrete shall meet the requirements of AASHTO T-26 shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter, or other deleterious substances.

530.2.04 Reinforcing Steel: All bar material used for reinforcement of concrete shall be intermediate grade steel conforming to the requirements of ASTM A615, Grade 40 or Grade 60.

Straight steel bars shall be deformed bars conforming to one of the following specifications:

Deformed Billet-Steel Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM A615.

Rail-Steel Deformed Bars for Concrete Reinforcement (Grade 50 or Grade 60) - ASTM A616.

Axle-Steel Deformed Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM A617.

Fabricated steel bar mats shall conform to the requirements of ASTM A184.

530.2.05 Welded Wire Fabric: Welded steel wire fabric reinforcement shall conform to the requirements of ASTM A185.

Welded deformed steel wire fabric for concrete reinforcement shall conform to the requirements of ASTM A497.

Cold-drawn steel wire for concrete reinforcement shall conform to the requirements of ASTM A82.

Deformed steel wire for concrete reinforcement shall conform to the requirements of ASTM A496.

530.2.06 Tie Bars: Tie bars shall be deformed steel bars meeting the requirements in ASTM A615. The bars shall be free from rust, loose mill scale, dirt, soil, grease or other defects affecting the strength or bond with the concrete.

530.2.07 Expansion (Through) Joints: Preformed joint filler for use in expansion (through) joints shall conform to the Standard Specifications for Preformed Expansion Joint Filler for Concrete, ASTM D1751. **Homex 300® is acceptable if used in accordance with manufacturer's recommendations.**

530.2.08 Calcium Chloride: The use of calcium chloride will be allowed only in accordance with the following:

A. Calcium chloride shall not be used in concrete in which aluminum or galvanized metal work is to be embedded or in concrete where it may come in contact with prestressed steel.

B. The Contractor may use a maximum of 1½ percent of calcium chloride by weight, or the cement in all other concrete placed when the mean daily temperature in the vicinity of the worksite is lower than 40°F.

C. Calcium chloride shall conform to ASTM D98 (AASHTO M-144).

D. Calcium chloride shall not be used until verbal approval has been obtained from the City Engineer.

E. Calcium Chloride shall be measured accurately and shall be added to the batch in solution in a portion of the mixing water.

F. Use of calcium chloride in the concrete shall in no way relieve the Contractor of responsibility for compliance with the requirements of the Specifications governing protection and curing of the concrete.

530.2.09 Water-Reducing and Set-Retarding Admixtures: Water-reducing and set-retarding admixtures shall conform to the requirements of ASTM Specification C494 (AASHTO 194), except that resistance to freezing and thawing shall be determined in all cases, and the minimum relative durability factor shall be 95.

The admixtures used shall be in conformance to the requirements of ASTM Specification C494 (AASHTO 194). When added in the manner and amount recommended by the manufacturer to the concrete used on the job, with no change in the cement content or proportions of the aggregates, admixtures shall have the following effects:

Type A or Type D: The water content at the required slump shall be at least 5 percent less with the admixture than without. The air content shall remain within the range specified, but shall not exceed 8 percent in any case.

Type D: The time of initial setting, determined as prescribed in ASTM C494, shall be from 1 to 3 hours longer with the admixture than without.

No other admixture (except those specified above) will be permitted to be used in Portland cement concrete unless such use is specifically authorized by the City Engineer.

530.2.10 Curing Compounds: Transparent curing compounds shall meet the requirements of ASTM 309 (AASHTO M-148). The compounds shall be Type 1-D or 2 and Class B.

The compound shall be a liquid that, at the time of application, is free from suspended matter. It shall be sufficiently low in viscosity to result in an even, uniform coating when applied by spraying.

The compound shall be sufficiently transparent and free from permanent color to result in no pronounced change in color from that of the natural concrete at the conclusion of the curing period. The compound shall, however, contain a dye of color strength sufficient to render the film distinctly visible on the concrete for a period of at least four (4) hours after application. Application rates shall comply with Section 530.20.

All curing compound shall be delivered to the site of the work in the original container bearing the name of the manufacturer and the brand name. The compound shall be stored in a manner to prevent damage to the containers and to protect water-emulsion types from freezing.

530.2.11 Entraining Agent: ***An air-entraining agent shall be used in all concrete exposed to the weather.*** The agent shall conform to ASTM C260 (AASHTO M-154), except the dilative durability factor in the freezing and thawing test shall not be less than 95.

530.2.12 Joint-Sealants: Joint sealants used in sealing pavement joints shall meet the requirements of one of the following: (1) AASHTO M-173, Concrete Joint Sealer, Hot Poured Elastic Type, (2) ASTM Designation D1850. Concrete Joint Sealed, Cold Application Type.

Upon request by the City Engineer, joint sealing materials shall be tested by an independent laboratory. In such case, a certificate shall be furnished by the laboratory stating that the materials have been tested and that they fully conform to the requirements of this section of these Specifications.

530.3 Classification: Concrete shall be classified according to the required compressive strength. The strength of the concrete at 28 days shall equal or exceed the Minimum Compressive Strength tabulated below for the class of concrete specified.

<u>Cement Content Class of Concrete</u>	<u>Minimum Compressive Strength Bags/Cubic Yard</u>	<u>Minimum Compressive Strength at 28 days (psi)</u>
5000	7	5000
4000	6½	4000
3500	6	3500
3000	5½	3000
2500	5	2500

530.4 Air Content and Consistency: Unless approved by the City Engineer, the air content (by volume) of the concrete at the time of placement shall be 6% ± 1%. *If the measured air content is found above or below this value, the contractor shall immediately make changes in mixing or materials as will be necessary to comply with the requirements for air content. If the air content of a load is found to be more than one (1%) percent above or below the required target, the load shall be rejected unless the air content can be brought into compliance through the addition of air-entrainment chemical or additional mixing. In no case shall remedial actions result in a mix that violates any of the parameters of the approved mix design.*

Aggregates shall be adjusted to compensate for increased yield resulting from air-entrainment so that the specified amount of cement is contained in each cubic yard of concrete. Adjustment shall be made by decreasing the weight of fine aggregates only, unless otherwise directed by the Engineer.

The consistency of the concrete shall be such as to allow it to be worked into place without segregation or excessive laitance. Unless otherwise specified, the slump shall be:

<u>Type of Structure</u>	<u>Required Slump (inches)</u>
Massive sections, pavements, footings, curbs and gutters	3 ±1
Heavy beams, thick slabs, thick walls (over 12 in. thick)	4 ±1
Columns, light beams, thin slabs, thin walls (12 in. thick or less), wall	4 ±1
Walls with 3 curtains of steel	5

530.5 Design of the Concrete Mix: At least 35 days prior to any placement of concrete the contractor shall inform the City Engineer in writing of the source and grading of aggregates and the brand and type of cement and the brand and type of admixture, if any, he proposes to use for each class of concrete, and shall furnish

certifications or other evidence satisfactory to the City Engineer that the proposed materials meet the requirements of these Specifications.

When acceptable sources, type and gradings of aggregates are designated in the Contract Documents, certifications for such aggregates will not be required.

After the job mix has been designated, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer.

If such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has designated a revised job mix.

When specified, a water-reducing, set-retarding admixture shall be used. When conditions are such that the temperature of the concrete at the time of placement is consistently above 75°F, a water-reducing, set-retarding admixture may be used, at the option of the Contractor. The cement content shall be same as that required in the mix without the admixture.

The use of calcium chloride will be allowed only in accordance with Specification 530.2.08.

When it is anticipated that a water-reducing set-retarding admixture will be used, the Contractor shall furnish to the Engineer a sample of the admixture he proposes to use sufficient for the tests required by Specification 530.2.08. Concrete containing the admixture shall not be placed until test results have been obtained showing that its performance in the job mix meets the requirements of Specification 530.2.09.

530.6 Inspecting and Testing: The following tests will be performed by the methods indicated:

<u>Test</u>	<u>Method (ASTM Designation)</u>
Sampling	C 172*
Slump Test	C 143*
Air Content	C 231 * or C 173*
Compression Test Specimens	C 31* or C 42*
Compressive Strength	C 39 or C 42
Unit weight Yield	C 138

* TESTS OF A PORTION OF A BATCH MAY BE MADE ON SAMPLES REPRESENTATIVE OF THAT PORTION FOR ANY OF THE FOLLOWING PURPOSES:

(1) DETERMINING UNIFORMITY OF THE BATCH.

(2) CHECKING COMPLIANCE WITH REQUIREMENTS FOR SLUMP AND AIR CONTENT WHEN THE BATCH IS DISCHARGED OVER AN EXTENDED PERIOD OF TIME.

(3) CHECKING COMPLIANCE OF THE CONCRETE WITH THE SPECIFICATIONS WHEN THE WHOLE AMOUNT BEING PLACED IN A SMALL STRUCTURE, OR A DISTINCT PORTION OF A LARGER STRUCTURE, IS LESS THAN A FULL BATCH.

The Engineer shall have free entry to the plant and equipment furnishing concrete under the Contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture and delivery of the concrete.

530.6.01 Concrete Testing:

A. All concrete testing and inspection shall be accomplished by an approved independent testing laboratory approved by the Engineer, and at the expense of the Contractor.

B. At least one (1) strength test shall be made for each 40 cubic yards, or fraction thereof, placed in any one day for each class utilized. Not less than three specimens shall be made for each test.

Specimens shall be taken and cured in accordance with current ASTM Specifications C-31 and C-39. One (1) additional specimen will be taken during cold weather concreting, and cured on the job site under the same conditions as the concrete it represents.

C. One (1) slump test shall be made on each batch tested in accordance with current ASTM Specification C-143. The contractor shall make the necessary corrections to bring the concrete to specifications before placing.

D. One (1) or more air content test shall be made at the beginning of each day's concrete placement and as deemed necessary by the Engineer. The Contractor shall make the necessary corrections to bring concrete to specification requirements before placing.

E. The standard age of tests shall be 28 days, but 7 day tests may be used provided the relation between the 7 and 28 day strengths of the concrete is established by tests for the materials and proportions used.

530.6.02 Acceptance of Concrete:

A. The strength level of concrete will be considered satisfactory as long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

B. If strength is not satisfactory, the Contractor may be required to have the concrete tested in place at his own expense.

530.7 Handling and Measurement of Materials: Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation or degradation, or intermingling of various sizes. Scales for weighing aggregates and cement shall be beam type or springless dial type. They shall be accurate within 1

percent under operating conditions. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean.

The quantities of cement and aggregates in each batch of concrete, as indicated by the scales, shall be within the following percentages of the required batch weights:

Cement	± 1.0 percent
Aggregates	± 2.0 percent

Measuring tanks for mixing water shall be of adequate capacity to furnish the maximum amount of mixing water required per batch and shall be equipped with outside taps and valves to provide for checking their calibration unless other means are provided for readily and accurately determining the amount of water in the tank.

Except as otherwise provided in Section 530.8, cement and aggregates shall be measured as follows:

Cement shall be measured by weight or in bags of 94 lbs. each. When cement is measured by weight, it shall be weighed on a scale separate from that used for other materials, and in a hopper entirely free and independent of the hopper used for weighing the aggregates. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be the required saturated, surface-dry weight plus the weight of surface moisture it contains.

Mixing water shall consist of water added to the batch, water occurring as surface moisture on the aggregates and water introduced in the form of admixtures. The added water shall be measured by weight or volume to an accuracy of 1 percent of the required total mixing water. Wash water shall not be used as a portion of the mixing water for succeeding batches.

Dry admixtures shall be measured by weight, and paste or liquid admixtures by weight or volume, within a limit of accuracy of 3 percent.

530.8 Mixers and Agitators: Concrete may be furnished by batch mixing at the site of the work or by ready-mix methods. Agitators may be truck mixers or track agitators.

Mixers shall be capable of thoroughly mixing the concrete ingredients into a uniform mass within the specified mixing time and of discharging the mix without segregation. Each mixer or agitator shall bear a manufacturer's rating plate indicating the rated capacity and recommended speeds of rotation, and shall be operated in accordance with these recommendations.

Concrete shall be uniform and thoroughly mixed when delivered to the work. Variations in slump of more than 1 (one) inch within a batch will be considered evidence of inadequate mixing and shall be corrected by changing batching

procedures; increasing mixing time, changing mixers or other means. Mixing time shall be within the limits specified below unless the Contractor demonstrates by mixer performance tests that adequate uniformity is obtained by different times of mixing. For this purpose the testing program and uniformity requirements shall be as set forth in ASTM C94, under supervision of the Engineer.

530.8.01 Stationary Mixers: For concrete mixed at the site of the work with paving mixers or stationary mixers, the time of mixing after all cement and aggregates are in the mixer drum shall be not less than 1 minute for mixer capacities of one cubic yard or less, plus 15 seconds for each cubic yard or fraction thereof of additional capacity.

The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates and all mixing water shall be introduced into the drum before one-fourth of the mixing time has elapsed.

When used for complete mixing of concrete, stationary mixers shall have controls provided to insure that the batch cannot be discharged until the required mixing time has elapsed.

If truck mixers are used, the requirements below for truck mixers and truck-mixed concrete shall apply.

530.8.02 Volumetric batching and continuous mixing at the site: Unless otherwise specified, volumetric batching and continuous mixing at the construction site will be permitted if approved by the Engineer. The batching and mixing equipment shall conform to the requirements of ASTM C685 (AASHTO 24I) and shall be demonstrated prior to placement of concrete, by tests with the job mix, as producing concrete meeting the specified proportioning and uniformity requirements.

530.8.03 Ready-mixed concrete: Ready-mixed concrete shall be mixed and delivered to the site of the work by one of the following methods (as per ACI 304 - Chapters 4 and 5):

- A. Truck-mixed concrete: Mixed completely in a truck mixer.

- B. Shrink-mixed concrete: Mixed completely in a stationary mixer, and the mixing completed in a truck mixer.

- C. Central-mixed concrete: Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitator or in a truck mixer operating at agitated speed or in non-agitating equipment.

Truck mixers and agitators shall be equipped with revolution counters by which the number of revolutions of the drum or blades may be readily verified.

When ready-mixed concrete is furnished, the supplier shall furnish the Engineer a statement-of-delivery ticket showing the time of loading, and the quantities of materials used for each load of concrete, amount and types of admixtures, bags of cement in lieu of batch weights, and all quantity of water added on site.

530.8.04 Truck-mixed concrete: Concrete that is completely mixed in a truck mixer shall be agitated at the mixing speed designed by the manufacturer *from 70 to 100 revolutions to produce a uniformity of concrete* as indicated in Appendix XI of ASTM C94. Mixing in excess of 100 revolutions shall be allowed only to reblend stagnant spots, 10 to 15 revolutions at mixing speed has shown to be adequate. Revolutions in excess of 115 must be at agitation speeds only.

The volume of mixed concrete shall not exceed 63% of the total volume of the drum or container. Exceeding this capacity is cause for rejection of the load unless performance tests for the mixer are provided.

A minimum of 30 revolutions shall be used at mixing speeds to blend the additional water added, at the job site, to bring the slump, of the concrete, to that specified. However, the water/cement ratio of the mix design should never be exceeded.

Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The mixing operation shall begin within 30 minutes after the cement has been added to the aggregates and the water shall be added during mixing. When mixing is begun during or immediately after charging, a portion of the mixing water shall be added ahead of, or with, the other ingredients.

If trucks are found to be loaded beyond mixer capacity this shall be deemed as cause for rejection of the entire load.

530.8.05 Dry-Batched Concrete-Float Delivery: When the cement is batched as the last ingredient with the drum stopped and not rotated until mixing is performed at the job site, delays of three hours will be acceptable *if the mixed concrete shows no signs of hydration and the mix is uniform and consistent.*

Load size should be reduced by 10 to 20 percent to avoid spilling of the dry cement.

It should be noted that extreme care is required to load the cement for this type of an operation and this method is to be used only as a last resort. Mixing is in accordance with truck mixed concrete and all phases of this procedure are to follow ACI 304, 5.23; ACI 305, 3.3.1.1, 3.3.1.2, 3.3.2.

530.8.06 Shrink-mixed concrete: When concrete is partially mixed at a central plant and the mixing is completed in a truck mixer, the mixing time in the central plant mixer shall be the minimum required to intermingle the ingredients and shall be not less than 30 seconds.

The mixing shall be completed in a truck mixer and the number or revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed.

Absolute volume of all ingredients batched shall not exceed 63% of the drum volume.

530.8.07 Central-mixed concrete: For central-mixed concrete, mixing in the stationary mixer shall meet the same requirements as batch mixing at the site.

When an agitator, or truck mixer used as an agitator, transports concrete that has been completely mixed in a stationary mixer, mixing during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed.

The use of non-agitating equipment to transport concrete to the work site will be permitted only if the uniformity is consistency of the concrete is shown to be such as will maintain the integrity for which it was designed. Equipment should meet the requirements outlined in ACI 304,5.3.

530.9 Forms: Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities. Forms shall be coated with a non-staining form oil before being set into place.

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones.

All edges that will be exposed to view when the structure is completed shall be *chamfered*, unless finished with molding tools as specified in Section 530.19.

530.10 Preparation of Forms and Subgrade: Prior to placement of concrete the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar or other harmful substances or coating. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Subgrade soils must be moist and uniformly compacted to the minimum required in the specifications. *Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted.*

Unless otherwise specified in the Contract Documents, when concrete is to be placed over drain fill, the contact surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl sheeting prior to placement of the concrete.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls shall be formed with nonferrous materials.

530.11 Conveying: Conveying should be accomplished as rapidly as practicable without segregation or loss of material. Metal or metal lined chutes should be used with adequate baffling and hoppers.

Belt conveyors shall conform to ACI 304 Chapter 3 of Placing Concrete with Belt Conveyors.

Conveying by pumping methods shall conform to ACI 304 Chapter 3 of Placing Concrete by Pumping Methods.

530.12 Placing: All phases of placing concrete shall conform to the recommended practices as outlined in ACI 304 Chapter 6 of Measuring, Mixing, Transporting, and Placing.

No concrete shall be placed until forms, subgrade, reinforcing steel and all other preparations have been checked for compliance with the related specifications. All concrete is to be placed in the presence of the City Engineer or his duly authorized representative.

The concrete shall be deposited in such a manner as will prevent the segregation of aggregates and the rate regulated to maintain a plastic state of the mix.

Tremies or pumps shall be used as necessary to ensure that concrete does not free-fall more than 4 feet during placement.

For monolithic construction successive layers should be placed while the underlying layer is still responsive to vibration.

Internal stays and braces used for form alignment and shape retention shall be removed when the concrete has been placed.

If placement is interrupted causing the formation of "cold joints," the Contractor shall stop the placement of concrete and form a construction joint as per Section 530.15 or he may continue as specifically directed by the City Engineer.

The depth of the horizontal layer shall not exceed the form design limits or usually be limited to 4 feet in walls up to 12 inches thick.

If placing is discontinued prior to the completion of a layer, vertical bulkheads shall be formed as per the Engineer's direction.

530.13 Consolidation: Unless otherwise specified in the Contract Documents, concrete shall be consolidated with an approved type mechanical vibrator. Internal type, form and surface (screed) vibrators are all acceptable so long as the size and shape of the vibrator is matched to the mass and design of the concrete.

The location, manner, and duration of the vibratory device shall be such as to thoroughly consolidate the concrete without causing settlement of the coarse aggregate, sand streaking, less air entrainment and form deflection.

Vibrators should be inserted vertically at uniform spacing over the entire area of placement. Distance between insertions should generally be about 1½ times the radius of action or such that the area clearly overlays the adjacent just-vibrated area by a few inches.

Previous layers should be penetrated by a minimum of six inches and held *momentarily* to insure knitting.

Under no circumstances should the vibrator be used to transport concrete along the conveying system or the forms.

530.14 Construction Joints: Construction joints shall be made at the locations shown on the Approved Plans. If construction joints are needed which are not shown on the Approved Plans, they shall be placed in locations approved by the Engineer.

Where a feather edge would be produced at a construction joint, as in the top surface of a sloping wall, an insert form shall be used so that the resulting edge thickness on either side of the joint is not less than 6 inches.

In walls and columns as each lift is completed, the top surfaces shall be immediately and carefully protected from any condition that might adversely affect the hardening of the concrete.

Steel tying and form construction adjacent to concrete in place shall not be started until the concrete has cured at least 12 hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. New concrete shall not be placed until the hardened concrete has cured at least 12 hours, or until the concrete is no longer plastic.

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by either wet sandblasting after the concrete has gained sufficient strength to resist excessive cutting, or air-water cutting as soon as the concrete has hardened sufficiently to prevent the jet from displacing the coarse aggregates, or both. The surface of the concrete in place shall be cut to expose clean, sound aggregate, but not so deep as to undercut the edges of larger particles of the aggregate. After cutting, the surface shall be thoroughly washed to remove all loose material. ***If the surface is congested by reinforcing steel, is relatively inaccessible, or it is considered undesirable to disturb the concrete before it is hardened, cleaning of the joint by air-water jets will not be permitted and the wet sandblasting method will be required after the concrete has hardened.***

The surfaces shall be kept moist for at least one hour prior to the placement of new concrete. The new concrete shall be placed directly on the cleaned and washed surface.

530.15 Expansion and Contraction Joints: Expansion and contraction joints shall be made as shown on the Standard Drawings or Approved Plans. (see Standard Drawings for details)

Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered, and the joints shall be free of mortar and concrete. Joint filler shall be left exposed for its full length with clean and true edges.

When open joints or weakened plane "*dummy*" joints are specified, the joints shall be constructed by the insertion and subsequent removal of a wood strip, metal plate or other suitable template in such a manner that the corners of the concrete will not be chipped or broken. The edges of the concrete at the joints shall be finished with an edging tool prior to removal of the joint strips.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed.

530.16 Waterstops: Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be brazed or welded. Joints in rubber or plastic waterstops shall be cemented, welded or vulcanized as recommended by the manufacturer.

530.17 Removal of Forms: Forms shall be removed only when the Engineer is present and shall not be removed without his approval. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

Forms, supports, and housings shall not be removed until the concrete has attained the strength specified for this purpose. The strength will be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM C31 for determining form removal time.

530.18 Finishing Formed Surfaces: All concrete surfaces shall be true and even, and shall be free from open or rough spaces, depressions or projections.

Immediately after the removal of forms:

All bulges, fins, form marks or other irregularities which in the judgment of the Engineer will adversely affect the appearance or function of the structure shall be removed. All form bolts and ties shall be removed to a depth of at least 1 inch below the surface of the concrete. The cavities produced by form ties and all other holes of similar size and depth shall be thoroughly cleaned. The interior surfaces of the cavities shall be coated with a bonding agent or kept continuously wet for at least 3 hours, then carefully packed with a non-shrink grout mixed not richer than 1 part cement to 3 parts sand.

Holes left by form bolts or straps which pass through the wall shall be filled solid with mortar.

Patching mortar shall be thoroughly compacted into place to form a dense, well-bonded unit, and the in-place mortar shall be sound and free from shrinkage cracks.

All patched areas shall be cured as specified in Section 530.20.

530.19 Finishing Unformed Surfaces: All exposed surfaces of the concrete shall be accurately screeded to grade and then float finished, unless specified otherwise by the Contract Documents or at the direction of the Engineer.

Excessive floating or troweling while the concrete is soft will not be permitted.

The addition of dry cement or water to the surface of the screeded concrete to expedite finishing will not be allowed.

Joints and edges on unformed surfaces that will be exposed to review shall be chamfered or finished with molding tools.

530.20 Curing:

A. Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed.

B. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied as specified below.

C. Moisture shall be maintained by sprinkling, flooding or fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material.

D. Wood forms (except plywood) left in place during the curing period shall be kept wet.

E. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed.

F. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

G. Water for curing shall be clean and free from any substances that will cause discoloration of the concrete.

H. Except as otherwise specified in the Contract Documents, and except for construction joint surfaces, concrete may be coated with curing compound in lieu of the continued application of moisture.

I. The curing compound shall be thoroughly mixed immediately before applying, and shall be applied at a uniform rate of 150 to 200 square feet per gallon. It shall form a uniform, continuous, adherent film that shall not check, crack or peel, and shall be free from pin holes or other imperfections.

J. Curing compound shall not be applied to surfaces requiring bonding with subsequently placed concrete, as at construction joints, shear plates, reinforcing steel, and other embedded items.

K. Surfaces subjected to heavy rainfall or running water within 3 hours after the compound has been applied, or surfaces damaged by subsequent construction operations during the curing period shall be resprayed in the same manner as for the original application.

530.21 Removal or Repair: When concrete is honeycombed, damaged or otherwise defective, the Contractor shall remove and replace the structure or structural member containing the defective concrete, or correct or repair the defective parts. The Engineer will determine the required extent of removal, replacement or repair.

Prior to starting repair work the Contractor shall obtain the Engineer's approval of his plan for making the repair. Such approval shall not be considered a waiver of the City's right to require a complete removal of defective work if the completed repair does not produce concrete of the required quality and appearance. Repair work shall be performed only when the Engineer is present.

Repair of formed surfaces shall be started within 24 hours after removal of the forms.

Except as otherwise approved by the City Engineer, the appropriate methods described in the ACI Manual of Concrete Practice shall be used. If approved in writing by the City, proprietary compounds for adhesion or as patching ingredients may be used. Such compounds shall be used in accordance with the manufacturer's recommendations.

Curing as specified in Section 530.20 shall be applied to repaired areas immediately after the repairs are completed.

530.22 Concreting in Cold Weather: When the atmospheric temperature may be expected to drop below 40 F at the time concrete is delivered to the work site, during placement, or at any time during the curing period, the following provisions also shall apply:

A. The temperature of the concrete at time of placing shall not be less than 50°F nor more than 70 F. The temperature of aggregates and mixing water prior to mixing with the cement shall be in accordance with "Recommended Practice for Cold Weather Concreting," ACI Standard 306.

B. When the daily minimum temperature is less than 40°F, concrete structures shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F nor more than 90°F for the duration of the curing period.

C. Methods of insulating, housing and heating the structure shall conform to "Recommended Practice for Cold Weather Concreting," ACI Standard 306.

D. When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with curing compound as specified in Section 530.20 or is covered tightly with an approved impervious material.

530.23 Concreting in Hot Weather: When climactic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90°F at the time of delivery at the work site, during placement, or during the first 24 hours after placement, the following provisions also shall apply:

A. The Contractor shall maintain the temperature of the concrete below 90°F during mixing, conveying, and placing. Methods used shall conform to "Recommended Practice for Hot Weather Concreting," ACI Standard 305.

B. The concrete shall be placed in the work immediately after mixing. Truck mixing shall be delayed until only time enough remains to accomplish it before the concrete is placed.

C. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying during the time between placement and finishing, and after finishing.

D. Finishing of slabs and other exposed surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay.

E. Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied as specified in subsection G, below.

F. Formed surfaces shall be kept completely and continuously wet for the duration of curing period (prior to, during and after form removal) or until curing compound is applied as specified in subsection G, below.

G. If moist curing is discontinued before the end of the curing period, a curing compound shall be applied immediately, following the procedures specified in Section 530.20.

530.24 Measurement and Payment: For items of work for which specific unit prices are established in the Contract Documents, concrete will be measured to the neat lines or pay limits shown on the drawings, and the volume of concrete will be computed to the nearest 0.1 cubic yard. No deduction in volume will be made for chamfers, rounded or beveled edges, or for any void or embedded item that is less than five cubic feet in volume. Where concrete is placed against the sides or bottom of an excavation without intervening forms, drain fill, or bedding, the volume of concrete required to fill voids resulting from over-excavation outside the neat lines or pay limits will be included in the measurement for payment where such over-excavation is directed by the Engineer to remove unsuitable foundation material; but only to the extent that the unsuitable condition is not a result of the Contractor's operations.

Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, cold and hot weather precautions, bracing and all other items necessary and incidental to completion of the concrete work, such as reinforcing steel, joint fillers, waterstops, dowels or dowel assemblies and shear plates.

Compensation for any item of work described in the Contract Documents but not listed in the Bid Schedule will be included in the payment for the item of work to which it is made subsidiary.



SECTION 531

CEMENT CONCRETE PAVEMENT

531.1 Description: The work covered in this section of Specifications pertains to the construction of Portland cement concrete pavements in streets, alleys and public rights-of-way.

531.2 Materials: Cement and other concrete materials, joint filler, curing materials and reinforcing steel, required by the Approved Plans and Specifications, shall conform to the requirements of Section 530. The job concrete mix shall be that shown in the Special Conditions. Ordinarily, the slump of the concrete then placed by machine methods shall be between one half (½) inch and three (3) inches.

531.3 Construction:

531.3.01 Subgrade: The preliminary subgrade before the setting of forms shall be graded and compacted as required under Section 503.

If subgrade paper or polyethylene sheeting is required it shall be placed in such a manner to protect it from tearing or puncturing. Minimum side lap is four (4) inches while minimum end lap is twelve (12) inches.

After the forms have been securely set to grade and alignment, the subgrade between the forms shall be brought to true cross-section. Where thickened edges for pavements are required, the subgrade shall be excavated and shaped to provide for the standard section.

Wherever possible, vehicles shall be kept off the finished subgrade. If vehicles must travel on the subgrade ahead of the paving, a power drag shall be carried immediately ahead of placing concrete. Irregularities in the subgrade caused by trucks during the placement of concrete shall be smoothed out and compacted immediately ahead of placing the concrete.

The subgrade as finally completed shall be maintained by the Contractor at required density and an optimum moisture content by wetting with water until the concrete is actually placed.

531.3.02 Forms: Forms may be of wood or metal or any other material at the option of the Contractor, provided the forms as constructed result in a pavement of specified thickness, cross-section, grade and alignment as shown on the Approved Plans. Slip form construction may be used subject to the approval of the City Engineer and the requirements of Section 531.3.04.

Forms shall be adequately supported to prevent deflection or movement. Forms shall be used which will result in concrete pavement conforming with the Approved Plans and Specifications. When checked for straightness, forms should not vary by more than 1/8 inch in 10 feet from the true plane surface on top and ¼ inch in 10 feet on the face of the form. Flexible or curved forms are highly recommended for use when the curve has a radius of 100 feet or less. The forms may be removed the day after placing if the concrete is sufficiently set to withstand removal without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth or sprayed with curing compound immediately. All forms shall be cleaned, oiled, and examined for defects before they are used again.

531.3.03 Compaction of Subgrade: Covered in Section 503.2.

531.3.04 Placing Concrete: The concrete shall be placed upon the prepared subgrade between the forms to the required depth and cross-section in a continuous operation between construction or expansion joints.

The concrete shall be thoroughly consolidated against and along all forms or adjoining pavements by such means as will prevent gravel pockets along the edges of the finished pavement. Any gravel pockets found after removing the forms shall be repaired.

When integral curb is being constructed with the pavement, fresh concrete for the integral curb shall be placed at such time as will enable the top section of the curb to be consolidated, finished, and bonded to the pavement slab while the concrete is plastic.

Where curb is not being placed integral with the pavement slab, reinforcing steel dowels or keyways shall be placed in the base section for the curb.

Prior to placing concrete around manholes, catch basins, gate chambers, etc., a temporary cover fitting below the rim of the ring casting shall be provided to prevent the concrete from flowing into them.

531.3.04.A Placing Concrete at Expansion Joints: Concrete placement around expansion joints shall be such that the expansion joint assembly will not be disturbed and that it will remain in a straight line perpendicular to the subgrade, as shown on the Approved Plans. The concrete shall then be spaded thoroughly or vibrated along the entire length of the joint to consolidate the concrete and leave no rock pockets anywhere at the joint. If any rock pockets are exposed, they shall be repaired.

531.3.04.B Placing Concrete With Reinforcing Steel Bars or Wire Mesh: When reinforcing is to be used, concrete shall be placed in one lift with an adequate method used to position and secure the reinforcing bars or wire mesh at the designated locations in the slab.

Reinforcement shall be free of dirt, mill scale, oil, grease, or other foreign material that may impair bond. Steel, coated with some rust, may be used if the oxidations are not deep or loose coated in the opinion of the City Engineer.

Successive mats of steel or wire mesh shall be securely lapped together and tied. Longitudinal bars will lap a minimum of 30 bar diameters. Wire mesh will lap 6 to 12 inches, and provided one complete series of square mesh is incorporated in the overlap.

Reinforcing steel or wire mesh shall be laid as a continuous mat. Continuity shall be maintained between expansion joints. Steel shall terminate within two to six inches of the joint.

531.3.04.C Slip-Form Construction: At the option of the Contractor and with the approval of the City Engineer, concrete pavement may be constructed by the use of slip-form paving equipment.

Slip-form paving equipment shall be provided with traveling side forms of sufficient dimensions, shape, and strength to support the concrete laterally for a sufficient period of time during placement to produce pavement

of the required cross-section; the equipment shall spread, consolidate, screed, and float-finish the freshly placed concrete in such a manner as to provide a dense and homogenous pavement.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads to avoid breaking or cracking the pavement edge.

After the concrete has been given a preliminary finish by the finishing devices in the slip-form paving equipment, the surface of the fresh concrete shall be checked with a straight edge to comply with the tolerances and finished as specified in Section 531.3.08E.

Final finishing of slip-form pavement shall be as specified in Section 5312.3.08D.

531.3.05 Compacting Concrete: Concrete may be compacted by (1) hand methods, (2) machine methods and (3) combined machine and vibrators method at the option of the contractor. The hand method will be limited to irregular areas, irregular sections, alleys and pavements placed in confined work areas.

531.3.05.A Hand Compacting: Concrete shall be spread evenly with shovels and spaded along the forms with a perforated spade after which it shall be struck off with a rigid metal shod tamping rod. The strike-off rod shall be operated with a combined tamping, crosswise and sawing action to produce a smooth surface free from depressions or inequalities. A small amount of mortar must be kept ahead of and extending substantially along the entire length of the rod. Excessive stinging of the rod will not be permitted.

531.3.05.B Machine Compacting: The machine used for compacting shall be self-propelled and designed to run on the side forms. Movable parts shall be capable of adjustment and they shall be adjusted so as to produce accurately the roadway sections shown on the Approved Plans. The machine shall be equipped with two reciprocating screeds. The tops of the forms shall be kept clean with a suitable device attached to the machine.

The travel of the machine on the forms shall be maintained true without lift, wobble or other vibrations which might prevent a precise strike off.

The machine shall be put in forward motion as soon as concrete is deposited on the subgrade. On the first pass, a roll of concrete shall be carried ahead of the screed. Screeds and tampers shall be operated so as not to disturb expansion joints and caps.

Machines shall be operated prior to placing longitudinal and transverse dry joints.

Machines shall be operated as many times as may be necessary to compact concrete free from rock pockets and to a section that can be finished properly.

Care must be exercised not to overwork the concrete and bring an excess of mortar to the surface.

531.3.05.C Combined Vibration and Machine Compacting: The combined vibration and compaction equipment shall be demonstrated to the satisfaction of the Engineer as being capable of consolidating the concrete

across the full width of the pavement into a homogeneous mass, free of rock pockets, and without separation of mortar and aggregates.

The equipment shall consist of the machine described in Section 531.3.05B, or an approved spreading machine to which is attached a vibrating unit composed of individual internal vibrators. The vibrators shall be spaced equidistantly, and the distance from the side forms to the nearest vibrator shall not exceed 14 inches.

The vibrating unit shall not rest upon the side forms nor impart vibration to the strike-off screeds. The individual vibrators shall be attached to a frame in a manner which will permit adjustment of both the depth of penetration into the concrete and the angle of the vibrator with the horizontal.

The vibrators shall be capable of vibrating at rates between 8,000 and 12,000 impulses per minute when inserted in the concrete.

On the first trip over the freshly placed concrete the vibration equipment shall be submerged in the concrete to ensure adequate consolidation. Unless otherwise directed by the Engineer, the vibration equipment shall be operated on the first pass only.

After the first pass with vibration, one or more trips without vibration shall be made as described in Section 531.3.05B.

As often as the Engineer may require, the Contractor shall make trial runs with concrete containing the full amount of cement as specified in Section 530.3, Concrete mixes, or as specified in the Special Conditions, compacting with and without vibration to determine the relative water contents required.

531.3.05.D Vibrating Screed Concrete Pavement Construction: The type of vibrating screed which the contractor proposes to use, whether roller or beam, shall be subject to approval by the Engineer. Upon request by the Engineer a test section of pavement shall be placed for the purpose of demonstrating the capabilities of the screed to satisfactorily compact and strike off the concrete to the established grade and section.

Concrete shall be uniformly distributed between the forms and it shall then be compacted and screeded to the level of the top of the forms by means of the vibrating screed. Supplemental compaction by hand spading or mechanical vibration of the concrete adjacent to the forms will be required if the concrete cannot otherwise be adequately compacted.

The vibrating screed shall be operated over the freshly placed concrete in successive passes only a sufficient number of times to obtain maximum compaction. Over-vibration of the concrete, resulting in an excess of mortar at the surface of the pavement, will not be permitted.

After the final passage of the vibrating screed, the surface of the concrete shall be at the established pavement grade and cross-section and shall be sufficiently smooth as to require only a very moderate amount of hand finishing for smoothness to meet approval of the Engineer.

531.3.06 Water: Water for pavement construction will be furnished as provided in Section 505.

531.3.07 Joints: Transverse and longitudinal joints for street pavement may be contraction joints, construction or expansion joints as shown in the Standard Drawing numbers 531A and 531B and as called for in these Specifications. When the pavement abuts an existing pavement, the locations of the joints in the new pavement shall coincide with the joints in the existing pavement unless otherwise shown in the Contract Documents.

531.3.07.A Formed Transverse Contraction Joints: Standard spacing of transversely formed contraction joints shall be at intervals of fifteen (15) feet or less across the full width of the pavement and at right angles to the center line of the roadway. On horizontal curves the spacing of fifteen (15) feet shall be along the outer edge of the pavement .

For intersections and other irregular areas, the arrangement of contraction joints shall be placed in accordance with standard intersection patterns. The area of any one irregular pattern formed by contraction joints in intersections shall not exceed two hundred twenty-five (225) square feet and the greatest dimension thereof shall not exceed fifteen (15) ft.

When paving a second lane adjacent to the previously paved lane, the contraction joints shall be matched with the former; except on curves where resultant panel would be less than twelve and one-half (12½) feet, measured longitudinally.

Where uncontrolled cracks are existing in the first lane, they shall be matched as nearly as possible in the second lane. Should the uncontrolled cracks in the existing paved lane be too frequent or in random locations and impossible to match with a uniform spacing in the second lane, then in that event the two lanes shall be completely separated by 3/16-inch joint material extending from the surface to one (1) inch below the bottom of the concrete being placed.

Where integral curb or doweled curb is placed along with the concrete pavement, premolded joint filler material shall be placed in the full section of the curb in true alignment with the pavement joint and in perpendicular position.

531.3.07.B Construction of Formed Contraction Joints: Formed construction joints shall be constructed by embedding preformed joint material. The filler shall be cut to the exact sections of the joint.

Transverse contraction joints (*dummy joints*) shall be placed after compaction and finishing of concrete have been completed and before initial set. A groove shall be cut into the surface at the location of joint, using a tool provided with stops (*tee iron*) to prevent cutting the groove deeper than the planned depth of the joint filler. The joint filler shall then be forced into the groove until the top is flush with the pavement surface.

After the joint filler has been imbedded in the concrete, the surface of the pavement shall be finished against the filler strip with hand floats to restore the surface finish. While performing this operation, the filler strip must be maintained in a vertical or normal position, true to alignment. After finishing, the entire area of the joint shall be true to grade and smoothness without any irregularities.

No payment will be made for contraction joint material or its placement, and all costs thereof shall be included in the unit contract price per square yard for "Cement Concrete Pavement (class, inches)."

531.3.07.C Sawed Contraction Joints: Sawed contraction joints shall be constructed by sawing a vertical groove in the hardened concrete on an approved schedule after placing and before development of random cracks in the concrete slab. Transverse contraction joints shall be sawed before the longitudinal joints are sawed.

Sawed longitudinal joints in general are not critical as to a specific time schedule after hardening of the concrete and may be delayed under favorable conditions before an incidence of longitudinal random cracking begins. *Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling*, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking occurs. If necessary, the sawing operations shall be carried on both day and night until completed, regardless of weather conditions, as directed by the Engineer.

Two or more sawing units may be required to accomplish the sawing in order to minimize random cracking. Standby equipment shall be on the job to ensure continuous sawing as specified regardless of any breakdown of equipment.

Where curing membrane is used, the area disturbed by sawing of joints shall be resprayed immediately upon completion of the sawing and sealing operation and care shall be exercised to prevent the curing compound from getting into the groove. *Joint sealing compound will not adhere to concrete if curing compound is present.*

The depth of sawed transverse and longitudinal contraction joints shall be not less than one-fourth ($\frac{1}{4}$) the depth of the slab.

After the curing period the joints shall be cleaned and sealed with joint sealants meeting requirements in Section 530.2.12. Excess scaling material shall be cleaned off the surface of the pavement before opening to traffic.

531.3.07.D Transverse Construction Joints: Transverse construction joints of the type shown in the Standard Drawings shall be placed whenever the placing of concrete is suspended for more than 30 minutes. A butt joint with dowels or a thickened-edge joint shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tie bars shall be used if the joint occurs at any other location.

No separate payment shall be made for construction joints or for the premolded joint material, extra concrete, or sealing compounds required for the construction joints. All costs therefor shall be included in the unit contract price per square yard for "Cement Concrete Pavement".

531.3.07E Transverse Expansion Joints: Transverse expansion joints are placed only where shown on the Approved Plans or where directed by the Engineer .

Transverse expansion joints shall be constructed with pre-molded material, one-half ($\frac{1}{2}$) inch in thickness and conforming to Section 530.2.07B. They shall extend the full width of the pavement and from one (1) inch into the subgrade to the one (1) inch below the top of the pavement. The joint alignment must be at right angles to the pavement center line, unless otherwise specified .

The expansion joint filler shall be held in a vertical position. An approved installing bar or other device shall be used if necessary to ensure proper grade and alignment during placing and finishing of the concrete. The device must be in place long enough to prevent sagging of the material, especially on streets having steep grade.

Finished joints shall not deviate in horizontal alignment more than ¼ inch from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

In multiple lane construction, the joints shall be matched so as to form a continuous alignment over all lanes.

Expansion joints shall extend continuously through all curbs, where curbs are integral, special care being exercised to preserve alignment perpendicular to the pavement in the curb section.

No additional payment will be made for expansion joint material or its placement. All such costs shall be included in the unit contract price per square yard for "Portland Cement Concrete Pavement" of the required class and thickness.

531.3.07.F Sealing Expansion Joints: After the pavement is cured and before any traffic, the space above the top of expansion joint filler strip shall be thoroughly cleaned of all loose material. The one-half (½) inch wide groove shall be completely free of any projecting concrete from the sides and the groove shall be continuous across the slab to each edge. It shall then be filled level with the pavement surface with joint sealant meeting the requirements of Section 530.2.12.

The joint sealant material shall be heated and placed in complete accord with the manufacturer's instructions. Burned material will be rejected. The expansion joint groove shall be dry at the time of pouring the sealing compound. No additional payment will be made for the sealing filler or its application and the cost thereof shall be included in the unit contract price per square yard for "Portland Cement Concrete Pavement" of the required class and thickness.

531.3.07.G Longitudinal Contraction Joints: The joints shall be constructed in true alignment with respect to their proper location on center line or parallel thereto as is shown in a succeeding subsection. No payment will be made for contraction joint material and its placement except in case of alternate bids as described in Section 531.3.07B.

531.3.07.H Standard Location for Longitudinal Joints: Standard location for longitudinal joints, whether contraction or construction, shall conform to Portland Cement Association recommendations.

531.3.07.I Longitudinal Expansion Joints: Longitudinal expansion joints shall be placed where shown on the Approved Plans or where required for concrete pavement between or along retaining walls, curbs or other structures. They shall be placed to conform to Portland Cement Association recommendations.

531.3.07.J Longitudinal Construction Joints: Longitudinal construction joints shall be as shown on the Standard Drawings. The Contractor may use an approved keyed joint in lieu of thickened edge for longitudinal

construction joint. The Contractor shall submit plans for the keyed joint for approval by the Engineer prior to construction.

Cost for the approved keyed joint used in lieu of the thickened edge will be included in the unit contract price per square yard for "Portland Cement Concrete Pavement" of the required class and thickness .

531.3.08 Finishing Concrete: Hand finishing or machine finishing of the entire pavement surface will be permitted unless otherwise provided in the Special Conditions.

On all vertical curves and at irregular intersections, modified tools shall be provided as necessary to secure a smooth, uniform contour and surface.

All tools shall be kept in first-class working order and shall be inspected daily. Worn or defective tools will not be permitted. A sufficient number of tools shall be provided for the work to proceed efficiently.

531.3.08.A Hand Finish: After the concrete has been struck off and consolidated, it shall be smoothed by longitudinal floating. Floating shall continue until all irregularities are removed.

After the final passage of the longitudinal float, transverse floating shall be continued with long handled floats operated from outside the pavement slab.

After floating, the surface shall be scraped with a grout rod at least ten (10) feet in length with a long handle for operating at the edge of the pavement. The grout rod shall be operated to correct irregularities in the pavement surface and remove water and laitance.

531.3.08.B Machine Finishing: The finishing machine shall be of a type approved by the Engineer. The machine shall be adjustable to both crown and plane of the finished pavement surface. The screed shall oscillate longitudinally during its travel transversely across the pavement.

The finishing machine shall be moved over the pavement as many times as is necessary to give the pavement a smooth even-textured surface, conforming to the exact crown and cross-section specified on the Approved Plans.

531.3.08.C Edging: Before final finishing is completed and before the concrete has taken the final set, the pavement shall be edged as indicated below:

Continued next page. . .

LOCATION

RADIUS

Edge of Pavement	One-Eighth (1/8) Inch
Formed Longitudinal Contraction Joints	One-Eighth (1/8) Inch
Longitudinal Construction Joints	One-Eighth (1/8) Inch
Transverse Construction Joints	One-Eighth (1/8) Inch
Formed Transverse Contraction Joints	One-Eighth (1/8) Inch
Expansion Joints - Type A	One-Eighth (1/8) Inch
Curbs--Back Edge	One-Half (1/2) Inch
Curbs--Front Edge	One (1) Inch

Particular attention shall be given to edge at the appropriate time. The concrete shall have attained a partial set and all free water shall have disappeared so that the edged joints will be clearly defined, which no tearing or slump of the edges.

531.3.08.D Final Finish: A burlap drag or broom shall be used for final finishing. The burlap drag shall be at least 3 feet wide and long enough to cover the entire pavement width. It shall be kept clean and saturated with water while in use. It shall be laid on the pavement surface and dragged in the direction in which the pavement is being placed. For a broom finish, a stiff bristled broom shall be drawn from the center to the edge of the pavement with adjacent strokes slightly overlapping to produce surface corrugations of uniform appearance and about 1/16 inch in depth.

Before using either the drag or the brush, the concrete shall have set sufficiently that the surface is not grooved or gouged in the finishing operation.

531.3.08.E Surface Smoothness: After all finishing is complete, the surface smoothness shall be checked with a straight-edge ten (10) feet long, mounted to a long handle to permit operation from outside the pavement. The straight-edge shall be placed on the surface of the pavement parallel to the center line and at intervals of no more than five (5) feet across the full width of the pavement. *At conclusion of the finishing operation the surface of the pavement shall not vary from a true surface, more than one-eighth (1/8) inch in 10 feet.*

In no case shall the grade in the gutter be such that it will allow pooling of water. If the surface smoothness of the pavement after curing is found to exceed the tolerance permitted, the high spots shall be ground until they meet the tolerance. If the surface tolerance cannot be met satisfactorily by grinding, then in that event the pavement shall be removed and be replaced in conformance with the Specifications at the expense of the Contractor.

531.3.09 Curing and Protection: The concrete pavement shall be protected against excess loss of moisture, rapid temperature change, rain, water and mechanical injury during and immediately following the placing and finishing operations. Normally this will require the use of curing compound.

Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, and mechanical injury for at least 7 days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used. After finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by a curing medium approved by the Engineer. The edges of concrete slabs exposed by the removal of forms shall be protected immediately to

provide these surfaces with continuous curing treatment equal to the method selected for curing the slab and curb surface.

The Contractor shall have at hand and ready to install before actual placement begins the equipment needed for adequate curing.

531.3.09.A Moist Curing: Moist curing shall be accomplished by a covering of burlap or other approved fabric mat used singly or in combination. Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the pavement surface for the duration of the moist curing period. Burlap or fabric mats shall be long enough to cover the entire width and edges of the pavement lane and lapped at joints to prevent drying between adjacent sheets.

531.3.09.B Waterproof Paper or White Polyethylene: Waterproof paper or white polyethylene sheets shall be in pieces large enough to cover the entire width and edges of the slab and shall be lapped not less than 18 inches. The paper or polyethylene shall be adequately weighted to prevent displacement or billowing due to wind, and material folded down over the side of the pavement edges shall be secured by a continuous bank of earth. Tears or holes appearing in the paper or polyethylene during the curing period shall be immediately repaired.

531.3.09.C Membrane: The membrane method of curing conforming to the requirements of Section 530.2.10 shall be applied behind the final finishing operation after all free water has disappeared from the surface. Complete and uniform coverage at the minimum rate of 150 sq. ft. per gallon shall be required. The compound shall be kept agitated to prevent the pigment from settling, and it shall be applied to the pavement edges immediately after the forms have been removed. *Membrane curing will not be permitted in frost-affected areas on paving that will be exposed to de-icing chemicals within 30 days after completion of the curing period.*

531.3.09.D Cold-Weather Protection: Except by specific written authorization, by the City Engineer, concreting shall cease when the descending air temperature in the shade and away from the artificial heat falls below 40°F. It shall not be resumed until the ascending air temperature in the shade and away from artificial heat rises to 35°F.

When concrete has been placed in cold weather and the temperature may drop below 35°F., straw, hay, insulated curing blankets, or other suitable material shall be provided along the line of work. Whenever the air temperature may reach the freezing point during the day or night, the material shall be spread over the concrete deep enough to prevent freezing of the concrete. *Concrete shall be protected from freezing temperatures until it is at least 10 days old. Concrete injured by frost action shall be removed and replaced at the Contractor's expense.*

531.3.09.E. Curing in Hot Weather: In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in order to prevent the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other curing media. The Engineer shall make the decision when the use of a fog spray is necessary.

531.3.10 Opening Pavements to Traffic: The pavement shall not be opened to truck traffic until the field-cured concrete has attained a flexural strength of 550 psi, or a compressive strength of 3,500 psi. If such tests are not conducted, the pavement shall not be opened to automobile traffic until 3 days after the concrete was placed. Likewise, it shall not be open to truck traffic until 14 days after the concrete is placed. Before opening to traffic, the pavement shall be cleaned.

531.3.11 Cleanup: In addition to the cleanup specified in Section 553, the Contractor shall, before final acceptance of the work, flush the pavement clean and remove the debris. He shall also clean out all open culverts and drains, inlets, catch basins, manhole and water main valve chambers, within the limits of the project, of dirt and debris of any kind. The clearing and disposal of such waste material shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract prices of various items of the work.

531.4 Measurement and Payment: Payment will be made for the items included in any particular contract as "Portland Cement Concrete Pavement (class, thickness)," per square yard. This item will include concrete for thickened edges, steel reinforcing bars, sawing contraction control joints, extra for furnishing high-early-strength cement, hot and cold weather precautions, and subgrade compaction.

Any feature covered by concrete during the concrete paving process that requires raising to a final grade must be raised to the proper grade within seven (7) days of being covered with the concrete. These features include but are not limited to: manhole covers, valve box covers, and monument covers. Under no circumstances can the access to utilities be delayed more than seven (7) days after paving unless otherwise approved by the City Engineer.



SECTION 532

CONCRETE CURB & GUTTER, CONCRETE CURB & DRIVEWAYS

532.1 Description: The construction of concrete curb and gutter and concrete gutter shall be in conformance with these Specifications and with the Standard Drawings.

532.1.01 High-Back Curb and Gutter (Type A): This type of gutter may only be used with written approval of the City Engineer. See Standard Drawing No. 532-A.

532.1.02 Outfall Curb and Gutter: This type of curb and gutter is limited to outfalling gutter conditions (i.e. medians parking lot islands). See Standard Drawing No. 532-A.

532.1.03 Depressed Curb (Handicap Ramp): At intersections where new cement concrete curbs are to be constructed, the contractor shall construct depressed curbs. The depressed curbs shall be constructed in accordance with Standard Drawing No. 533-A and as directed by the Engineer.

532.1.04 Roll Gutter: This type of curb and gutter is predominantly used on streets in Park City. Unless otherwise specified and approved, this type shall be installed along all City Streets. See Standard Drawing No. 532-A.

532.1.05 Drain Gutter: In intersections where water is to surface drain through the intersection drain gutters shall be used. See Standard Drawing No. 532-B.

532.1.06 Concrete Driveways: Concrete driveways shall conform to Standard Drawing No. 532-C.

532.2 Materials and Forms:

532.2.01 Concrete: The Portland cement concrete, joint filler, and curing materials shall conform to these Specifications - SECTION 530, PORTLAND CEMENT CONCRETE (Materials). Concrete mix for curbs shall conform to the requirements for Class 4000. Slump of the concrete mix shall not exceed three and one-half (3½) inches and the air content shall be 6% ± 1%. No reinforcing steel shall be used in City sidewalks, curb and gutter, concrete curb or driveways.

532.2.02 Preformed Expansion and Dummy Joint Filler: See Sections 530.2.07 and 530.15.

532.2.03 Curing Compounds: See Section 530.2.10.

532.2.04 Forms: See Section 531.3.02

532.3 Construction Details: Any deviation from the construction details shall be submitted to, reviewed and approved by the City Engineer before the start of any alternate procedures or use of alternate materials.

532.3.01 Excavation: All excavation for curb and gutter construction shall be the responsibility of the curb and gutter Contractor. *All excess excavated material shall be removed from the site within seven days after completion of the curb and gutter construction. After said time, the City may have such excess excavated material removed at the expense of the responsible Contractor.*

532.3.02 Bedding: All concrete curb and gutter, concrete drain gutter and concrete driveway shall be bedded with a minimum of five inches of untreated base course conforming to the requirements of Section 510, unless authorized in writing by the City Engineer.

532.3.03 Entrances: All driveways, alleys and other entrances disturbed by the curb and gutter construction shall be returned to a satisfactory usable condition with 96% (ASTM D-1557) relative subgrade compaction and surfacing equal to or better than the original. Such construction will not be measured for separate payment but will be considered incidental to the items to which they apply.

532.3.04 Placing and Finishing: While the concrete is being placed and consolidated, the face of the curb shall be formed with a fixed or moving form conforming to the dimensions shown on the Park City Standard Drawings. After placement, the concrete shall be consolidated by spading or vibration. The concrete shall be struck off and finished true to cross-section. As soon as the concrete has attained sufficient hardness, face forms, if used, shall be removed and the concrete finished with a wood float and trowel. Final finish shall be obtained with a brush. After final finishing, gutters and curb shall be tested with a ten-foot straight-edge to see that the finished gradient is uniform. ***Irregularities of more than one-quarter inch in ten feet shall be corrected at the expense of the Contractor.***

532.3.05 Contraction Joints:

A. Curb and gutter shall be divided into sections of length by contraction joints.

B. A contraction joint formed by division plates shall be used in such a manner so the curb and gutter shall be divided into uniform sections of ten feet except where shorter sections are necessary for closures, but no section shall be less than four feet in length.

C. The plates shall be one-eighth inch thick, fit neatly into the forms and be set perpendicular to the surface of the concrete and shall project through the curb head and no more than one-third of the depth of the gutter slab. The shape of the divider plate shall conform to the curb and gutter section with the exception that the lower two-thirds depth of the divider plate shall be removed.

D. This joint may be constructed by other methods that would obtain the same desired results if written authorization is first obtained from the City Engineer.

532.3.06 Expansion Joints: Non-extruding pre-molded expansion joint material of one-half inch thickness conforming to ASTM D1751 shall be placed at the junction of new concrete with existing concrete or existing structures at the tangent points of all alley and intersection returns as directed by the Engineer.

532.3.07 Backfilling: In fill sections a five-foot wide berm shall be constructed and compacted to 96% relative density, against the back of the curb and against the face of the gutter and sloped to the existing ground at a four to one slope. In cut sections the backfill shall be brought to the top of the curb and against the face of the gutter and compacted to 96% relative density (ASTM D-1557) so as to fill the area excavated during construction. *No areas within a street right-of-way may be sloped steeper than 2 to 1. No areas within 5 feet of the back of gutter may be sloped steeper than 10 to 1.* Cut and fill slopes shall be rounded into existing surfaces in accordance with the Approved Plans. The Contractor shall take precautions to prevent drainage water from draining or pooling behind or around the new curb and gutter. This work shall be the responsibility of the Contractor and payment for this work will not be a separate item but will be considered incidental to the items to which they apply.

532.3.08 Monolithic Construction: For all new construction the curb and gutter shall be constructed as one unit. For all areas where the curb heretofore has been constructed to the proper curb grades as established for such street, the gutter shall be constructed adjacent to such curb, but before placing such gutter the face of the curb shall be thoroughly scraped and brushed clear of all deleterious material. *If in the opinion of the City Engineer the existing curb is in need of repair, the City Engineer may order it removed and the combined curb and gutter installed.*

532.3.09 Driveway Installations:

A. All driveways constructed of concrete shall conform to the requirements of these Specifications and Standard Drawing 532-C.

B. When constructed of concrete the thickness shall not be less than seven inches in residential area and not less than eight inches in commercial areas and public alleys.

C. The subgrade shall be compacted to 96% of maximum relative density. (ASTM D-1557)

D. Driveways abutting a curb, gutter and sidewalk combination or drive-over curb and gutter or driveway gutter pan or any cross gutter shall have a strip of non-extruding expansion joint material one-half ($\frac{1}{2}$) inch thick, conforming to the cross-sections of the driveway, placed between the driveway and the sidewalk or curb or cross gutter so as to provide for the expansion of the sidewalk or curb or cross gutter and the concrete driveway.

E. All aforementioned expansion material shall conform to ASTM D1751.

532.3.10 Allowable Curb Cuts: Curb cuts will be allowed with authorization from the Engineer. The Engineer may permit valley gutter or any other types of curb cuts which, in his opinion best serve the property owner.

532.4 Measurement and Payment: Measurement and pavement will be made for the following bid items as they appear in the proposal:

1. "High-Back Curb and gutter" per linear foot.
2. "Outfall Curb and gutter" per linear foot.
3. "Roll Gutter" per linear foot.

Measurement for depressed curb (*handicap ramp*) will include that portion of the curb necessary to make the transition from the standard curb and gutter to the depressed curb and gutter.



SECTION 533

CEMENT CONCRETE SIDEWALKS

533.1 Description: Cement concrete sidewalks shall be constructed in compliance with these Specifications and the Standard Drawings. The particular type of sidewalk to be used will be that specified in the Contract Documents.

533.2 Materials: The Portland cement concrete, joint filler, reinforcing, steel and curing materials shall conform to the requirements specified in Section 530, Portland Cement Concrete. The concrete mix for sidewalk shall conform to the requirements for Class 4000. Slump of the concrete mix shall not exceed three and one-half (3-1/2) inches and the air content shall be 6% \pm 1%.

533.3 Construction Details:

533.3.01 Excavation and Subgrade: All excavation and subgrade preparation or sidewalk construction shall be the responsibility of the Contractor. The subgrade shall be compacted to 96% of maximum density (ASTM D-1557). Payment for this work will not be a separate item but will be considered incidental to the items to which they apply.

533.3.02 Bedding: All sidewalks are to be bedded with a minimum of four (4) inches of untreated base course conforming to Section 510 unless otherwise authorized in writing by the City Engineer.

533.3.03 Forms: The forms shall be wood or metal and shall be free from warp. Straight wood forms shall have a thickness not less than one and five-eighths inches. The forms shall be set so that the walk shall have a slope toward the street of one-quarter inch for each foot of width.

533.3.04 Thickness:

- A. All walks shall be constructed of concrete and shall have a minimum thickness of four inches.
- B. All curbs shall be constructed of concrete and shall have a minimum thickness of six inches.
- C. At residential driveways, the sidewalk thickness shall be seven inches. See Standard Drawing 532-C.
- D. In commercial driveway areas and public alleys the sidewalk thickness shall be increased to eight (8) inches.

533.3.05 Placing and Finishing:

- A. In all cases the walks shall be constructed in one course.

B. The surface shall be struck off to the established grade by means of a straightedge. The surface shall then be finished true to grade with a wooden float followed by a steel trowel, and afterwards roughened lightly with a broom or brush.

C. The walk shall be cut with a marking tool forming a groove at least one-half inch deep so that the walk is divided into sections, each section not longer than five feet.

D. In no case shall a walk section exceed twenty-five square feet in area unless approved by the Engineer.

E. Care should be exercised not to over work the concrete and bring an excess of mortar to the surface.

F. The slabs shall be rounded on all surface edges to a radius of one-quarter inch.

G. The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed longitudinally.

H. At intersections all sidewalks shall transition into handicap ramps as shown in Standard Drawing 533-A. Additional expenses incurred by this requirement shall be incorporated into the cost per linear foot of sidewalk.

533.3.06 Adjustments: Whenever any adjustments of the grade slope, or slab marking is necessary or advisable in order to have the walk conform to existing abutting walk or other abutting structures, the adjustment shall be made only with the permission of and under the direction of the City Engineer or his representative.

533.3.07 Expansion Joints: Strips of premolded non-extruding expansion joint material one-half inch thick conforming to ASTM D1751 shall be placed between the side forms and to the full depth of the walk at least once in every 100 feet of walk, or as directed by the City Engineer. Similar joints shall be provided when new walk abuts other concrete walk or structures.

533.3.08 Inscribing Contractor's Name: The Contractor, for the construction of any concrete sidewalk within the City limits, shall inscribe in the walk at each extremity thereof a seal designating the construction company name, and the month and year in which the walk is finished.

533.3.09 Protection from Traffic: When completed, the walk shall be protected from foot traffic and the elements for at least 72 hours, except alley and street crossings which shall be protected from light vehicular traffic for at least five (5) days and from trucks of more than one-ton gross weight for seven days.

533.3.10 Curing and Protection: The curing materials and procedures outlined in Section 531.2. shall prevail, except that white pigmented curing compound shall not be used on sidewalks. The curing agent shall be applied immediately after brushing and be maintained for a period of five (5) days.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the your of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the City Engineer because of damage or defacement, shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in hot weather shall be as outlined in Section 531.3.09E. Additional requirements for curing in cold weather shall be as outlined in Section 531.3.09D.

533.4 Measurement: Measurement for cement concrete sidewalk will be by the square yard or by linear foot for a specified sidewalk width for all surface of concrete walk placed. Measurement for thickened edge of sidewalk will be by the linear foot for the distance thickened.

533.5 Payment: Payment will be made for each of the following bid items as are included in the Contract Documents:

1. "Concrete Sidewalk _____ inches thick" per square yard.
2. " _____ foot wide Concrete Sidewalk _____ inches thick" per linear foot.

The unit contract prices shall be full compensation for all labor, tools, equipment and materials required to perform the work as specified. Any work which is essential to the construction but for which no bid item is included in the Special Conditions shall be considered as incidental and the costs thereof shall be included in the pay items of the proposal.

Excavation, selected materials, water and compaction will be measured and paid for in accordance with applicable sections of these Specifications only if they are set up among the items in the Contract Documents; otherwise, the work and materials involved shall be considered as incidental to the sidewalk construction and the costs thereof shall be included in the bid items of the Contract Documents.



SECTION 540

STREET LIGHTING AND SIGNING

540.1 Description: The work to be performed consists of furnishing and installing all necessary materials to complete in place the street lights as shown on Standard Drawings 540A, B and C. In-place street signs shall conform to Standard Drawing 540D and E.

540.1.01 Regulations and Code: All electrical equipment shall conform to the standards of the National Electrical Manufacturer's Association (MEMA) or the Radio Manufacturer's Association, whichever is applicable. In addition to the requirements of these Specifications, the Approved Plans and the Special Conditions, all material and work shall conform to the requirements of the National Electrical Code, hereinafter referred to as the Code and the American Society for Testing Materials (ASTM).

540.2 Materials:

540.2.01 General: Unless otherwise indicated on the Approved Plans or specified in the Special Conditions, all materials shall be new. The major components of the street light shall consist of the products specified in Sections 540.2.03A through 540.2.03C of these Specifications or an equivalent product. The major components of the street sign shall comply with those specified on Standard Drawing 540D and E.

540.2.02 Inspection: All material shall be subject to inspection after delivery to the site and during installation in the work. Failure of the Engineer to note faulty material during construction shall not relieve the Contractor of the responsibility for removing or replacing any such material at his own expense.

Inspection or sampling of certain materials may be made at the factory or warehouse prior to delivery to the site, when required by the Engineer.

Material which has been rejected previous to delivery shall not be delivered to the work, and all material which has been rejected at the work shall be immediately removed from the site.

As-built drawings shall be kept by the Contractor showing exact locations of all underground conduit and connections, as well as all street lights and street signs. The as-built drawings shall be forwarded to the Engineer upon completion of work.

540.2.03 Street Light Components: (See Standard Drawing 540A for approved alternate materials)

540.2.03A Luminaire: The luminaire shall consist of a Kim EKG 401 fixture with a GE color corrected high pressure sodium lamp, the corresponding ballast, a dark bronze Duranodic 313 finish, a photocell receptacle, and photocell. The lamp shall be 150 watts for 12-foot and 16-foot poles and 250 watts for 20-foot poles.

540.2.03B Pole: The pole shall be a Valmont D6 220, square tapered, Cor-ten steel pole having a mounting height of 16 feet for residential streets and 20 feet for arterial streets.

The pole package shall include full base cover, handhole with cover, pole cap, four anchor bolts, and templet.

540.2.03C Base: The base shall consist of an Alcoa Breakaway Support 100-1 embedded in a finished concrete foundation with a minimum compressive strength of 4000 psi at 28 days. Foundation dimensions shall be 24 inches in diameter by 54 inches. If the base is to be placed in disturbed soil or a fill section the area should be compacted to 96% of maximum relative density (ASTM D-1557). A sauna tube form may be used with compaction completed after the concrete has cured.

540.3 Construction Details:

540.3.01 General: All electrical construction shall be carried out by competent crews under the direction of a licensed electrical contractor, or by the manufacturer's representatives where so required in the Special Conditions. All workmanship shall be complete and in accordance with the latest accepted standards of the industry, as determined by the Engineer.

Failure of the City Engineer or the City Public Improvements Inspector to note faulty workmanship during construction shall not relieve the Contractor of the responsibility for correcting the faults at his own expense.

540.3.02 Placement: Street lights and signs shall be placed in accordance with Standard Drawing 800A. Conduit and power cables shall be placed as necessary to serve the street lights. All underground conduit and cable shall have a brightly-colored warning tape buried twelve inches directly above the underground conduit or cable. The conduit shall be 1-1/2" PVC and the cable shall be 8 AWG stranded copper. The cable shall be connected to an approved power source.

540.4 Measurement and Payment: Measurement will be made by the number of street lights installed of the various mounting heights.

Payment will be made at the contract bid price per each for "Street Light" of the mounting height specified which shall include all materials and work required to install the street light, including the conduit, luminaire, pole, base and foundation.



SECTION 541

TOPSOIL

541.1 Description: These Specifications shall apply where the Approved Plans or Special Conditions require the procurement of top soil by the Contractor for the surface finishing of an area, or where the removal and replacement of existing top soil is required for the finishing of a specific construction area, generally in lawns or planting strips.

541.2 Materials:

541.2.01 Topsoil: The topsoil shall be friable surface soil typical of the topsoil common to the area, free from materials toxic to plant growth, noxious weed seeds, sage brush, rhizomes, roots, subsoil, stones, and other debris. It shall be capable of sustaining healthy plant life. One hundred percent of the topsoil shall pass through a one inch screen, unless otherwise stipulated on the Plans.

The maximum allowable percentage of gravel retained on a No. 4 screen shall not exceed 20 percent by volume. Of the material passing the No. 4 screen, the maximum allowable percentage of gravel retained on a Number 10 screen shall not exceed 10 percent by weight.

The topsoil shall be shown to be within allowable levels of toxic mineral contaminants, said levels to be set by the Engineer or by the Chief Building Official in cooperation with the Utah State Board of Health.

541.3 Construction Details:

541.3.01 Placement of Topsoil: Immediately prior to placing topsoil, the surface area upon which it is to be placed shall be cleaned of objectionable matter and the area smoothed and compacted to 85% of maximum relative density. After compaction and immediately prior to spreading topsoil, the subgrade surface shall be scarified by raking or harrowing.

Topsoil shall be placed where shown on the Approved Plans and to depths provided for in the Special Conditions, or at the direction of the Engineer. In level or slightly sloped areas the topsoil shall be leveled, raked, and compacted to 85% maximum relative density so as to provide a well shaped and uniform appearance. On steep slopes, the topsoil shall be left rough and uncompacted.

541.3.02 Removal and Replacement of Topsoil: Whenever it is necessary to remove topsoil with the purpose of later replacing it in the same area, the Engineer will direct the limits of the area and the depth of topsoil to be removed. The topsoil shall be removed in a uniform depth and be stored in such manner that it will not become mixed with unsatisfactory soils. The stored topsoil shall be replaced at a uniform depth in its original area. The topsoil shall then be shaped, leveled, and compacted to blend with the contour of adjacent ground.

In the event that additional topsoil is required and is procured from a source other than the construction area, the Contractor shall furnish and place it in compliance with Section 541.3.01 and the intent of this subsection. Additional topsoil shall be of similar texture as native soil .

541.4 Measurement:

541.4.01 Topsoil: Measurement of topsoil will be made by the cubic yard in net volume of truck loads at point of delivery.

541.4.02 Removal and Replacement of Topsoil: Topsoil removed and later replaced in original area will be measured by the cubic yard calculated upon the square footage of the area by the depth of soil removed.

541.5 Payment: Payment will be made for such of the following items as are included in the proposal of any particular Contract:

1. "Topsoil," per cubic yard.
2. "Remove and Replace Topsoil," per cubic yard.

The unit contract price per cubic yard for "Topsoil" shall be full compensation for the furnishing, hauling and placing of the soil in accordance with the Specifications, whether it be for the full depth upon any area or an additional quantity required where removal and replacement of topsoil resulted in a deficiency.

The unit contract price per cubic yard for "Remove and Replace Topsoil" shall be full compensation for all work and costs of scalping the original soil from an area, transporting it to storage, and then replacing it in the area in accordance with the Specifications.



SECTION 542

SEEDING, LAWN REMOVAL AND REPLACEMENT

542.1 Description:

542.1.01 Sod Removal and Replacement by Seeding: In many areas the existing lawn is such that the removal and replacement of existing sod is not feasible. In these areas, where seeding is a part of the project and is included in the bid proposal, the Contractor shall seed all lawn areas which are damaged during construction and plant lawn where shown on the Approved Plans and/or as directed by the Engineer.

542.1.02 Sod Removal and Replacement by New Sod: In many areas the existing lawn is such that the removal and replacement of existing sod is not feasible. In these areas, where lawn repair, using new sod, is part of the project and is included in the bid proposal, the Contractor shall replace all lawn areas which are damaged during construction with new sod where shown on the Approved Plans and/or as directed by the Engineer.

542.1.03 Sod Removal and Replacement: The work shall consist of the removal and replacement of existing lawn turf by cutting the sod to be removed into convenient sized squares or strips, cutting to uniform thickness, piling and storing in a dampened condition, and finally replacing the sod in its original position. Removal and replacement shall be completed within a 24-hour period. Removed sod shall be protected from direct sunlight and intensive heating conditions. This work will be performed wherever the Special Conditions provide for such work.

The Contractor may at his option use sod brought in from an outside source in lieu of replacing existing sod. If the Contractor so elects to use sod from an outside source, this source of supply must be approved by the Engineer.

542.2 Materials:

542.2.01 Topsoil: The soil material shall conform to the requirements of Section 541.2.01.

541.2.02 Replacement by Seeding:

541.2.02.A Seed: Grasses, legumes, or cover crop seed of the type hereinafter specified shall conform to the standards for "Certified" grade seed or better. Seed shall be furnished in standard containers on which shall be shown the following information:

1. Seed name
2. Lot number
3. Net weight
4. Percentage of purity
5. Percentage of germination

6. Percentage of weed seed content in inert material clearly marked for each kind of seed in accordance with the applicable State and Federal Laws.

Upon request, the Contractor shall furnish to the Engineer, duplicate copies of a statement signed by the vendor certifying that each lot of seed has been tested by a recognized seed testing laboratory within six (6) months before the date of delivery on the project. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.

Seed mix and rate of application shall be as specified in the Special Conditions.

542.2.02.B Fertilizer: Fertilizer shall be a standard commercial grade of organic or inorganic fertilizer of the kind and quality specified herein. All fertilizers shall be furnished in standard unopened containers with weight, name of plant nutrients and manufacturer's guaranteed statement of analysis clearly marked, all in accordance with State and Federal laws. Fertilizer shall be stored in a dry and elevated location.

Acceptable commercial fertilizer may be supplied in one of the following forms:

1. A dry free-flowing granular fertilizer suitable for application by agricultural fertilizer spreader.
2. A soluble fertilizer ground to a fineness that will permit complete suspension of insoluble particles in water, suitable for application by power sprayer.
3. A granular or pelleted fertilizer, suitable for application by blower equipment.
4. A non-volatile liquid fertilizer.

Commercial fertilizer formulation and rate of application shall be as specified in the Special Conditions.

542.2.02.C Mulch: All mulch material shall contain a tackifier or it shall be crimped into the surface.

542.2.02.C.1 Straw: All straw mulch material shall be in an air dried condition free of noxious weeds, weed seeds, and other materials detrimental to plant life. Straw mulch so provided shall be suitable for spreading with mulch blower equipment.

542.2.02.C.2 Wood Cellulose Fiber: Wood cellulose fiber mulch shall be specially processed wood fiber containing no growth or germination inhibiting factors. When hydraulically sprayed on the ground, the material shall allow the absorption and percolation of moisture.

Each package of the cellulose fiber shall be packed by the manufacturer to show the air dry weight content. All fiber shall be kept dry before mixing. All mulch material must be acceptable to the Engineer.

542.2.02.D Tackifier: The proposed tackifier shall be of a readily available commercial type manufactured specifically for the purpose of tacking seed or mulch to soils. The type of tackifier, its manufacturer, and its supplier shall be submitted for approval by Engineer if requested by Engineer.

542.2.03 New Sod: All sod shall comply with the State and Federal laws, including quarantines, with respect to inspection, plant diseases and insect infestation. Sod shipments shall have a certificate of origination and/or certification of approved treatment when shipment originates in known infested areas.

All sod shall be guaranteed to survive in a healthy condition through an establishment period on ninety (90) days. The establishment period shall commence on the date of acceptance of placed sod by the Engineer. All sod which, in the opinion of the Engineer, is not in a healthy growing condition at the end of the establishment period, shall be removed and replaced by the Contractor at his own expense. Sod that is replaced shall be of the same mixture and grade as the surviving sod.

Sod shall be mature, densely-rooted grass and shall possess the following characteristics:

1. Uniformity.
2. Acceptable color.
3. Freedom from serious weeds and weed seeds.
4. Adequate sod strength for handling.
5. A minimum amount of thatch.

542.3 Construction Details:

542.3.01 Seeding:

542.3.01.A Preparation: All areas shall be scarified to a depth of two (2) inches unless otherwise specified immediately prior to topsoil distribution.

Cultivation of the soil shall be done at right angles to the natural flow of water on the slopes. All cost and expense incurred in performing the work herein specified shall be considered incidental to other bid items on the project and no additional compensation will be made.

Remove all visible rocks, clods and debris three (3) inches or larger in any dimension. Any exposed tree roots in cut slopes shall be neatly pruned at the finished grade of the slope and the cut treated with an approved sealer.

542.3.01.B Placement of Topsoil: Topsoil shall be evenly spread over the specified areas to a minimum depth of four inches unless shown otherwise on the Approved Plans. After the topsoil has been spread, all large clods, hard lumps, rocks and litter shall be raked up, removed and disposed of by the Contractor.

Topsoil shall not be placed when the ground or topsoil is frozen or excessively wet.

All damage occurring to existing roadbeds, shoulders, walks, curbs or other existing adjacent structures or areas due to the Contractor's operation in hauling and placing the topsoil shall be repaired by the Contractor at his own cost and expense.

542.3.01.C Compaction: All topsoil shall be compacted to 85% maximum relative density unless otherwise specified. Compaction shall be by sheepsfoot roller, cleated crawler tractor or similar equipment. Equipment shall be so designed and constructed to produce a uniform surface ready for sodding or seeding and mulching, and which will bond the topsoil to the underlying material. Compaction equipment shall be operated parallel to the natural flow of water on the slopes unless otherwise ordered by the Engineer .

542.3.01.D Seeding: Seeding shall not be done during windy weather or when the ground is frozen. Seed shall be placed at the rate and mix specified in the Special Conditions. A tackifier shall be used when seeding slopes steeper than 4 Horizontal to 1 Vertical. Seed may be sown by one of the following methods:

1. An approved type, hydro-seeder which utilizes water as the carrying agent, and maintains continuous agitation. Distribution and discharge lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic discharge spray nozzles which will provide a uniform distribution of the slurry. When only hydro-seeding is to be used the seed shall be raked into the surface. When hydro-mulching is used, a two step process of hydro-seeding followed by mulching shall be utilized.
2. Approved blower equipment with an adjustable disseminating device capable of maintaining a constant measured rate of material discharge that will insure an even distribution of seed at the rates specified. A tackifier shall be added to the seed mixture when blown on.
3. Approved power-drawn drills or seeders.

Areas inaccessible to above method of application shall be seeded and fertilized by approved hand methods. Distribution of the material shall be uniform and at the rates specified.

It shall be the Contractor' s responsibility to provide qualified personnel experienced in all phases of seeding and fertilizing operation, equipment and methods as herein specified.

542.3.01.E Fertilizing: Fertilizer shall be applied by mixing with the mulch at the rates and analysis specified. The fertilizing and mulching shall be done separately from seeding.

542.3.01.F Spreading Mulch: Tackifier and mulch material of the type herein specified shall be furnished, hauled, and evenly applied at the rates indicated, and shall be spread on seeded areas within forty-eight (48) hours after seeding unless otherwise spread.

542.3.01.G Contractor' s Responsibility for Work: The Contractor shall be responsible for all work herein described and the following requirements as directed by the Engineer.

1. Protect all areas involved against vehicles with barricades.
2. Reseed and fertilize areas failing to show a uniform stand of grass after germination of seed or damage through any cause before final inspection.

Maintenance and protection during a suspension of work shall be as herein described and as directed by the Engineer.

542.3.01.H Final Inspection and Acceptance: Acceptance of areas receiving seed, fertilizer and mulch as herein specified shall be based on a uniform stand of vegetation at the time of final inspection. Areas failing to show uniform stand of vegetation after germination, or damage through any cause prior to final inspection shall be reseeded as herein specified at the contractor's expense. Final inspection shall not be done before 90 days during which the temperature reaches or exceeds 40°F. on each of the 90 days.

542.3.02 Sod Removal and Replacement: The sod shall be removed to a uniform depth of approximately two (2) inches with an approved type of sod cutter. This operation shall be performed in such manner as to insure uniform thickness of sod throughout the operation.

As the sod scalping proceeds, the sod strips shall be placed in neat piles at convenient locations and from then on they shall be maintained in a damp condition continuously until the sod strips are replaced on the lawn. In no case shall the sod remain in piles longer than 24 hours before replacement on the lawn. Sod shall be kept shaded.

Prior to replacing the strips of sod, the scalped area shall be carefully shaped to proper grade, rototilled to a depth of six (6) inches, watered, raked smooth, and lightly compacted.

After rototilling, shaping and lightly compacting the finished grade, the topsoil shall be thoroughly dampened and fertilized prior to and immediately before replacing the sod. The sod shall be replaced to the required grade, taking care to butt each piece tightly against the adjacent one. Upon completion, the sod shall be dampened and rolled with a lawn roller.

All tools used shall be of a type specially designed for the work and be satisfactory to the Engineer. In no case shall sod be removed by the use of a mattock or other tool which will not meet requirements specified herein.

Wherever the construction operations have resulted in the placement or exposure of unsuitable or poorer soils in the area to be resodded, the surface shall be left low and covered with topsoil meeting all requirements of Section 541. 2. 01. Topsoil placement and replacement of the existing sod shall then be performed in the same manner as that set forth in Section 542.3.03.

542.3.03 New Sod:

542.3.03.A Grading:

542.3.03.A.1 Existing Subsoil Suitable for Sod Installation: Areas to receive sod shall be cleared, grubbed and leveled to a depth of four (4) inches below grade. Two (2) inches of topsoil shall be evenly spread over and cultivated into the top six (6) inches of existing subsoil and compacted so that the compacted surface is two (2) inches below finished grade. Topsoil shall be placed according to Section 542. 3.01A through 542.3.01C and Section 541.

5.2.3.03.A.2 Existing Subsoil is Poor: Areas to receive sod shall be cleared, grubbed and leveled to a depth of six (6) inches below grade. Four (4) inches of topsoil shall be evenly spread over the existing subsoil and compacted so that the compacted surface is two (2) inches below finished grade. Topsoil shall be placed according to Section 542.3.01A through 542.3.01C and Section 541.

542.3.03.B Fertilizer: A 16-16-8 fertilizer shall be rototilled into the top four (4) inches of the soil at a rate of three (3) pounds per 1000 square feet. Fertilizer shall be applied no less than two (2) days prior to sod placement.

542.3.03.C Sod Placement: Sod shall be placed in accordance with standard horticultural practices. Dry soil shall be moistened by sprinkling. All butt joints shall be staggered. On sloped areas the sod shall be laid with the long dimension parallel to the toe or top of slope. After placing, the sod shall be rolled and heavily watered by sprinkling.

542.3.03.D Establishment: The contractor shall be responsible for watering and fertilizing the sod during the establishment period of 90 days per Section 542.2.03. Watering shall be scheduled to prevent drying of joints between sod strips. 16-16-8 fertilizer shall be applied at three (3) week intervals at the rate of six (6) pounds per 1000 square feet per application.

542.4 Measurement:

542.4.01 Topsoil: Measurement for furnishing, hauling, placing and leveling will be made by the cubic yard.

542.4.02 Replacement by Seeding: Measurement for grade preparation, topsoil compaction, fertilizing, seeding, mulching, and water will be made by the square yard on the plane of surface planted.

542.4.03 Sod Removal and Replacement: Measurement for cutting, removing, storing, grade preparation, topsoil compaction, fertilizing, water and the placing of sod will be made by the square yard on the plane of surface scalped and resodded.

542.4.04 Sod Removal and Replacement With New Sod: Measurement for grade preparation, topsoil compaction, fertilizing, water and placing of new sod will be made by the square yard on the plane of surface scalped and resodded.

542.5 Payment: Payment will be made for such of the following items as are included in the proposal of any particular contract:

1. "Topsoil," per cubic yard.
2. "Seeding, " per square yard .
3. "Sod Removal and Replacement," per square yard.
4. "Sod Removal and Replacement With New Sod," per square yard.

The unit contract price per cubic yard for "Topsoil" shall be full compensation for furnishing, hauling, placing and leveling of the topsoil as required.

The unit contract price per square yard for "Seeding" shall be full compensation for the complete operation of grade preparation, topsoil compaction, fertilizing, seeding, mulching, and watering, as specified.

The unit contract price for square yard for "Sod Removal and Replacement" shall be full compensation for the complete operation of cutting, removing, storing, grade preparation, topsoil compaction, fertilizing, replacing of the sod, and watering, as specified.

The unit contract price per square yard for "Sod Removal and Replacement with new Sod" shall be full compensation for the complete operation of sod removal, made preparation, topsoil compaction, fertilizing, furnishing and placing of new sod, and watering, as specified.



SECTION 543

RIP-RAP

543.1 Description: This item shall consist of furnishing and hand placing or placing loose rip-rap in accordance with these specifications, at the locations indicated, and in conformity with the lines, grades, and dimensions shown on the Approved Plans or as directed by the Engineer.

5.3.2 Materials: Rip-rap shall consist of durable, angular field or quarry stone of approved quality, sound, hard, and free from seams, cracks, or other structural defects.

543.2.01 Hand-Placed Rip-Rap: When hand-placed methods are used, 75% of the rock shall not be less than one-third of a cubic foot in volume nor less than 3 inches in thickness. The stones shall be graded so that a reasonably dense mass is obtained.

543.2.02 Loose Rip-Rap: The greatest dimension of 50% of the loose rip-rap stone shall be at least two-thirds but not more than one and one-half times the thickness of rip-rap specified in the Contract Documents. The stones shall be graded in size so as to produce a reasonably dense mass. Not more than 10% of the rock shall have dimension less than 0.1 the thickness of rip-rap.

543.3 Construction Details:

543.3.01 Hand-Placed Rip-Rap:

543.3.01.A Placing: Slopes where rip-rap is used shall not be steeper than the angle of repose of the abutting material, unless otherwise indicated in the Contract Documents or as directed by the Engineer. The rocks shall be hand-placed and bedded, one against the other, and as far as practicable shall be keyed together. *Any large irregularities between the stones shall be filled with spalls of suitable size rammed tightly into place.*

543.3.01.B Finished Surface: The finished surface of the rip-rap shall present an even, tight surface, true to the lines, grades, and sections specified. *The rip-rap shall extend sufficiently below ground surface, as directed by the Engineer, to secure a firm foundation.*

543.3.02 Loose Rip-Rap:

543.3.02.A Placing: Slopes to be protected shall be free of brush, trees, stumps and other objectionable material and dressed to a reasonably smooth surface. The stone shall be dumped into place so as to secure a rock mass with the minimum thickness and height as specified. The rock shall be manipulated to secure a regular surface of graded sizes and mass stability. Excavation as shown in the Contract Documents or as directed by the Engineer, shall be made at the toe of the slope to provide a firm foundation and protection against undercutting.

543.4 Method of Measurement: Loose rip-rap shall be measured by the cubic yard computed from the specified thickness and the surface area.

543.5 Basis Of Payment: The accepted quantities of this item shall be paid for at the contract unit price per cubic yard for "Hand-Placed Rip-Rap" or "Loose Rip-Rap," which price shall be full compensation for all work necessary to complete the item.



SECTION 550

REMOVAL OF EXISTING STREET IMPROVEMENTS

550.1 Description: The work shall consist of the removal and disposal of various existing improvements, such as pavements, structures, pipe, curb, curb and gutter, gutter and other items necessary for the accomplishment of the improvement. Some of the items may be included in the Bid Proposal or covered in the Contract Documents.

Removal of items or things not contained in this section or in other sections of these Specifications shall be considered as incidental to the construction and the costs thereof shall be included in other items of the Contract by the Contractor, unless the Contract Documents specifically provide payment such work.

550.2 Construction Details:

550.2.01 General: ***The removal of street improvements shall be conducted in such a manner as not to injure utilities and any portion of the improvement that is to remain in place. Any deviation in this matter will obligate the Contractor at his own expense, to repair, replace or otherwise make proper restoration to the satisfaction of the City Engineer.***

When sawing of concrete or combinations of rigid materials is called for in the Approved Plans or in the Special Conditions, the Contractor will be paid the work at the unit contract price for the quantity involved.

550.2.02 Removal of Pavement: The pavement removal shall consist of those instances where portions or all of existing pavements are being removed in conjunction with street construction and for the placing of utilities such as sewers. Because of variable underground conditions, the limits of the pavement removal cannot be accurately determined prior to actual construction.

Pavement removal shall also consist of the removal required for narrow and shallow utility cuts in order to install light cables, conduits and similar shallow utilities.

The Contractor shall remove existing permanent type pavement and driveway pavement shown on the Approved Plans or as directed by the Engineer. Permanent type pavements will be classified according to their composition and thickness as defined below, unless the Contract Documents provide otherwise.

In the event a pavement, classified as described below, shall average more than the maximum thickness specified for its class, an additional payment will be made to cover the extra thickness removed at a mutually agreed to price or as stipulated in the Special Conditions. Where pavement removal is located in future planting areas, all pavement material and compacted base material shall be entirely removed to the native material. Prior to filling or topsoiling the subgrade shall be scarified to a minimum of 12 inches.

550.2.02.A Pavement Removal, Class A: Class A pavement removal shall apply to all cement concrete pavement having average thickness between four (4) inches and ten (10) inches.

550.2.02.B Pavement Removal, Class B: Class B pavement removal shall apply to all pavements which have a wearing surface of asphalt concrete upon a cement concrete pavement or cement concrete base, and for which the total combined thickness of the pavement will average between seven (7) inches and twelve (12) inches.

550.2.02.C Pavement Removal, Class C: Class C pavement removal shall apply to early type pavement on a cement concrete base upon which is a brick or cobblestone wearing surface (or perhaps an additional layer of asphalt concrete upon that), and for which the total combined thickness of pavement will average between ten (10) inches and twenty (20) inches.

550.2.03 Removal of Asphalt Concrete Pavement: Removal of existing pavements such as asphalt concrete, bituminous road mix, multiple lift bituminous surface treatments and any other combinations of above described components, placed upon an earth or granular subgrade located within the roadway excavation area shall be removed and paid for as "Common Excavation," per cubic yard. The roadway excavation area is defined as the area one (1) foot back of new curbs on either side and all areas in between.

Where asphalt concrete pavement exists in planting strips and is to be removed, it will be paid for as "Remove Existing Asphalt Concrete Pavement," per square yard.

Where "Remove Existing Asphalt Concrete Pavement," per square yard is being paid for and a vertical meet line must be trimmed, it shall be considered incidental to the removal.

Side street approaches to the project and street approaches at each end of the project paved with asphalt concrete having a depth of greater than two (2) inches, on an earth or granular base and which are to be removed, will be paid for per square yard as "Remove Existing Asphalt Concrete Pavement." (also see SECTION 552 PAVEMENT PATCHING)

550.2.04 Removal of Curbs: Existing curbs shall be removed where shown on the Approved Plans or where encountered in the work and designated by the Engineer. When pavement is being removed, the curb shall be considered as pavement removal and the measurement for payment thereof will be made to the back of the curb. Precast curbs and curbs of other materials which are to be removed will be further identified on the Approved Plans and in the proposal if payment is contemplated; otherwise, the second paragraph of Section 550.1 will apply.

550.2.05 Removal of Curb and Gutter: Curb and gutter to be removed may be of cement concrete, or may be a cement concrete curb with a brick gutter on a cement concrete base, or may be other combinations of rigid materials. In any event it is intended that the full section shall be removed.

When curb and gutter is removed, provisions shall be made by the Contractor to channel any runoff which would normally flow in the gutter into existing drainage structures to reduce undermining and erosion during construction.

Where cement concrete pavement is being removed, curb and gutter removal shall be considered as pavement removal and the measurement for payment thereof will be to the back of the curb.

550.2.06 Removal of Cement Concrete Sidewalks: All concrete slabs that average four (4) inches or less in thickness and which are to be removed, shall be considered as sidewalk removal. Pavement breakers used for this purpose shall meet the requirements outlined for pavement removal. Where concrete sawing is required, the provisions previously described shall apply. Sidewalk aprons and private walks on street grading and paving projects shall be removed to the extent necessary to provide for construction of pavements and curbs. After the curbs and pavement have been constructed, the Contractor will be required to provide proper connections and grades, as determined by the Engineer.

550.2.07 Removal of Catch Basins, Manholes, Curb Inlets, Sumps, Etc.: Where structures or installation of concrete, brick, blocks, etc., interfere with the construction, they shall be removed and all pipe openings shall be properly plugged watertight with Class 4000 psi (3/4), Type II concrete. Payment for such work will be made in accordance with bid items in the Contract Documents. If however, there is no bid item to cover any one or more of such removals, then in that event the removal shall be considered as incidental to the construction and costs thereof shall be included in other items of the work.

Where the structures are removed, the voids shall be backfilled with suitable job excavated material and compacted as the Engineer may direct, and such compaction work shall be considered as incidental to the removal work.

If the Engineer determines the job-excavated material to be unsuitable for backfill and he, therefore, specifies or directs that backfill from another source shall be used, the payment for such materials will be made at the unit contract price if same is carried in the proposal, or at a mutually agreed to price.

The removal and disposal of wooden structures shall be considered as incidental to the work, unless payment is otherwise provided in the Contract Documents.

550.2.08 Salvage: Unless otherwise indicated in the Approved Plans or in the Special Conditions, all castings, pipe and other material or recoverable value taken from the discarded facilities shall be carefully salvaged and delivered to the Owner in good condition and in such order of salvage as the Engineer may direct. Materials and items deemed of no value by the Engineer shall be removed by the Contractor and become his property to be disposed of as he wishes.

550.2.09 Waste Disposal: Unless otherwise provided in the Approved Plans, the Contractor shall provide the waste site for disposal of materials not required for the construction.

550.3 Measurement and Payment: Measurement and payment will be made for each of the following items as may be included in the proposal of any particular Contract Documents:

1. "Remove Existing Pavement, Type Class A," per square yard.

2. "Remove Existing Pavement, Type Class B," per square yard.
3. "Remove Existing Pavement, Type Class C," per square yard.

continued...

4. "Remove Existing Curb," per linear foot.
5. "Remove Existing Curb and Gutter," per linear foot.
6. "Remove Cement Concrete Sidewalk," per square yard.
7. "Remove Catch Basin," per each.
8. "Remove Manhole," per each.
9. "Remove Inlet," per each.
10. "Remove Curb Inlets," per each.
11. "Remove Sumps," per each.



SECTION 551

PLACEMENT AND ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO FINISH GRADE

551.1 Description: This work consists of constructing and/or adjusting all new and existing utility structures encountered on the project to finished grade.

551.1.A: Any structure or feature covered during the construction process that requires raising to a final grade must be raised to the proper grade within seven (7) days of being covered. These features include but are not limited to: manhole covers, valve box covers and monument covers. Under no circumstances can the access to utilities be delayed more than seven (7) days unless otherwise approved by the City Engineer.

551.2 Contractor to Schedule Work: The Contractor shall schedule his work and cooperate to the fullest extent so that structure adjustments by others can be satisfactorily accomplished. The Contractor shall do all pavement patching which may be necessary after adjustment of structures, and the cost thereof shall be considered as incidental to the adjustment of the various structures, except as modified hereinafter, and except that private utilities shall reimburse the Contractor for such patching.

551.3 Construction Details:

551.3.01 Adjusting of Manholes, Catch Basins, and Similar Structures:

551.3.01.A General: Manholes shall be brought to proper finished grade by utilizing the same methods of construction as required for manhole construction in Section 604.

551.3.01.B Cement Concrete Paving Projects: Manholes, catch basins and similar structures shall be constructed. The final adjustment shall be made and cast iron frame be set after forms have been placed and checked. In placing the concrete pavement, extreme care shall be taken not to alter the position of the casting in any way.

551.3.01.C Asphalt Concrete Paving Projects: On asphalt concrete paving projects, the manholes shall be adjusted prior to paving unless otherwise requested by S.B.W.R.D.'s director or engineer. See Section 551.3.01B for further discussion.

551.3.01.D Asphalt Resurfacing Projects: Adjustment of manholes on asphalt resurfacing projects shall meet the requirement of Section 551.3.01C. Existing pavement shall be removed to the extent necessary to remove the manhole casting. The cost of removing the pavement shall be considered as incidental to the work of adjusting the manhole.

551.3.01.E Storm and Sanitary Sewer or Water Projects: Manholes, catch basins, gate valve structures and other similar type structures being constructed in conjunction with sewer or water projects on graded or paved streets shall be brought to final grade as outlined previously in these Specifications.

551.3.02 Adjustment of Inlets: The final alignment and grade of cast iron frames for new and old inlets to be adjusted to grade will be established from the forms or adjacent pavement surfaces. The final adjustment of the top of the inlet will be performed in similar manner to that described for manholes.

551.3.03 Adjustment of Monuments and Cast Iron Frame and Cover: Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

551.3.04 Adjustment of Valve Box Castings: Adjustment of valve box castings shall be made in the same manner as for manholes.

551.3.05 Furnishing Castings: Where adjustment of existing manholes, catch basins, inlets, valve boxes, etc. are required and the existing castings are discarded or ordered to be salvaged by the City Engineer, the Contractor shall furnish new castings of the type specified and payment for such items will be made as specified in the Contract Documents and will be in addition to payment for making the adjustment. Ring extensions shall be in accordance with the Standard Drawings.

551.4 Measurement and Payment: Pavement will be made for each of the following applicable bid items as are included and show in any particular Contract, consistent with measurement and payment requirements contained in the Specifications for each particular item.

1. "Adjust Existing Manhole, Catch Basin or Valve Chamber to Grade," per each.
2. "Adjust Existing Inlet to Grade," per each.
3. "Adjust Existing Monument Frame and Cover to Grade," per each.
- 4 "Furnish Manhole Ring and Cover Casting Type ()," per each.
5. "Furnish Inlet Frame and Cover Castings Type ()," per each.
6. "Furnish Precast Concrete Manhole Reducing Slab (D to 'd')," per each.



SECTION 552

PAVEMENT PATCHING

552.1 Description: This work shall consist of the patching of various types of pavement cuts, the performance of which shall be in accordance with the requirements outlined hereinafter and as shown on Standard Drawing No. 552-A.

552.2 Materials: All materials shall conform to the requirements specified for material in other sections of these Standard Specifications.

552.3 Construction Details:

552.3.01 General: Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

The patching and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of the various applicable Sections of these Specifications.

Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangular section with straight edges and faces. All edges shall be saw cut full depth and *the twelve (12) inches minimum distance set back from trench excavations or any other disturbed material shall be strictly adhered to.*

Proper signs, barricades, lights and other warning devices, as may be required by the City Engineer, shall be maintained all 24 hours of the day until the patch is completed and ready for traffic. The expense of these materials and effort shall be borne by the Contractor. Barricades in use during night-time hours shall have a working flashing amber light affixed. (Typical)

552.3.02 Cement Concrete Pavements: After the subgrade for the pavement has been compacted to 96% maximum relative density (ASTM D-1557) and constructed to line and grade, the cement concrete pavement patch shall be placed, compacted and struck off to the grade of the adjacent pavement in accordance with the pertinent provisions of Section 531. The Contractor shall submit for approval the type of curing compound to be used at the time of permit application. The approved curing compound shall be placed on the finished concrete immediately after finishing.

552.3.03 Asphalt Concrete Streets on Granular Base: After the subgrade has been prepared as shown on the Standard Drawings, or as directed by the Engineer, asphalt concrete pavement shall be placed to a minimum thickness of six (6) inches or to the thickness of the existing asphalt pavement depth plus 1 inch, whichever is greater. The edges of the existing asphalt pavements and castings shall be painted with CRS-2 asphalt emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled, and compacted to a minimum of 97%, of maximum relative density, (averaging of density tests is not allowed) to conform to the adjacent paved surface. ***Immediately thereafter, all joints between***

the new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies. The material for tacking the bottom and sides of patches for asphaltic concrete shall be CRS-2 emulsion. For sealing the edges after placing the asphaltic concrete patch, RC70 cutback shall be used, the surface shall be sanded to prevent tracking.

552.3.04 Oil Mat Streets: The existing oil mat shall be uniformly trimmed to a straight line. After the subgrade has been prepared as shown on the Standard Drawing, or as directed by the City Engineer, a minimum of two (2) inches of asphalt concrete pavement shall be placed and compacted to 97% of the laboratory maximum density.

552.3.05 Responsibility for Pavement Patching: The Contractor shall perform all work backfilling of excavations made under existing pavements, and the restoration of pavement cuts and patching, in accordance with these Specifications unless otherwise provided in the Contract Documents. ***Temporary or permanent asphalt patch maintenance shall be the responsibility of the Contractor until final acceptance by the City Engineer.***

Any structure or feature covered during the construction process that requires raising to a final grade must be raised to the proper grade within seven (7) days of being covered. These features include but are not limited to: manhole covers, valve box covers, and monument covers. Under no circumstances can the access to utilities be delayed more than seven (7) days unless otherwise approved by the City Engineer.



SECTION 553

FINISHING AND CLEANUP

553.1 Description: After all other work embraced in the Contract is completed and before final acceptance of the Contract, the entire roadway including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades, and cross-sections shown on the Approved Plans and as hereinafter specified.

553.2 Construction Details: Slopes, sidewalk areas, planting areas, and roadway shall be smoothed and finished to the required cross-section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees, and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the Engineer.

Upon completion of the cleaning and dressing the project shall appear uniform in all respects. All graded areas shall be true to line and grade as shown on the typical sections and as required by the Engineer. Where the existing planting is below sidewalk and curb, the areas shall be filled and dressed out to the walk regardless of limits shown on the Approved Plans. Wherever fill material is required in the planting area it shall be left higher to allow for final settlement but, nevertheless, the raised surface shall present a uniform appearance.

Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and legally disposed of and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Contractor shall remove and dispose of same at his own expense. Damage to existing vegetation shall be repaired by a qualified tree surgeon at the Contractor's expense. Pruning shall maintain the natural shape of the plant.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the contractor's operations, unless the Specifications of any particular section or the Contract Documents provide otherwise.

Where, by permission, soil is dumped on private property, the Contractor will not be required to perform any work beyond that described in the Contract Documents.

All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the Engineer. Castings for manholes, monuments, water gates, lamp poles, vaults, and other similar installations which have been sprayed with the asphalt material shall be cleaned to the satisfaction of the Engineer .

The Contractor shall sweep the street at the conclusion of the work unless otherwise provided in the Contract Documents. Sidewalks shall be hand broomed.

On sewer and water distribution projects where all or portions of the construction is in undeveloped areas, *the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties.* All other requirements outlined previously shall be met, except that it will not be necessary to pick up more surficial rocks than is necessary to result in the appearance of adjacent undisturbed areas unless so provided in the Contract Documents.

553.3 Measurement and Payment: Measurement for "Finishing and Cleanup" will be based upon a lump sum contract price.

Payment shall include the finishing and cleaning of all side street approaches.

In event the proposal does not include a bid item for "Finishing and Cleanup," the work thereof shall be considered as incidental to the construction of the project and all costs thereof shall be included by the Contractor in other items of work.



SECTION 600

SANITARY SEWERS AND STORM DRAINS

600.1 General: All sanitary sewer construction within Park City or for connection to the Snyderville Basin Water Reclamation District (S.B.W.R.D.) sewerage system shall conform to the S.B.W.R.D. Standards and Specifications.

All storm drain construction within Park City or intended for connection into the Park City Storm Drainage System shall conform to the requirements of these Specifications.

600.2 Approved Plans: Sanitary sewer and storm sewer main construction shall be done in accordance with the Contract Documents for the work prepared under the direction of a Professional Engineer licensed in Utah. Sanitary sewer construction plans shall be approved by the Snyderville Basin Water Reclamation District. Storm drainage construction plans shall be approved by the City Engineer.

600.3 Licenses and Permit Required:

- A. All sanitary sewer and storm drain construction shall be done by a General Utility Contractor licensed and bonded in Utah.
- B. When construction is required within the public right-of-way, a permit shall be secured by the Contractor from Park City Building Department and approved by the City Engineer at least 48 hours before initiating construction.
- C. A street cut permit fee will be charged by the City Engineer.
- D. A cash bond shall be posted to guarantee the work for a period of one year after completion and acceptance of all public portions of the work including necessary street repairs.
- E. An indemnity bond may also be posted to guarantee that work will conform to Park City's Construction Standards and to guarantee that Park City will not be liable for any accidents, property damage or physical damage to any individual related to acts of the Contractor.
- F. Current costs of permit fees and bonding amounts are available by calling the City Engineer's office.
- G. The City Engineer and the Department of Public Works shall be notified 48 hours (two [2] full working days) before the planned construction is to commence.

600.4 Inspection: All work shall be inspected by a City authorized Inspector who shall have the authority to halt construction. Whenever any portion of these Specifications are violated, the City Manager or designee, by written notice, may order that portion of construction which is in violation of these Specifications and Contract

Documents to cease until such violation is corrected. A copy of the notice shall be filed with the Contractor's permit applications for future review. If deficiencies are not corrected, performance shall be required of the Contractor's Surety.

Inspections require a two (2) full working day (Mon.-Fri.) notification prior to the requested inspection.



SECTION 601

PIPE, MATERIALS, AND TESTING

601.1 Description: Pipe used in sanitary sewer construction shall conform to S.B.W.R.D. Standards and Specifications.

Pipe used in storm drains and culvert pipe shall be *reinforced concrete* unless otherwise approved by the City Engineer.

It is not intended that materials listed herein are to be necessarily considered equal or generally interchangeable for all applications. The Engineer shall determine from the materials list those suitable for the project and he shall so specify in the Specifications and/or the Approved Plans.

601.2 General: All pipe shall be clearly marked with type, class and/or thickness as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

601.3 Materials and Testing:

601.3.01 Pipe and Joints:

601.3.01.A. Concrete Pipe, Non-reinforced: Non-reinforced concrete pipe up to and including 27-inch size, shall conform to ASTM Designation C14, Class 3 except as otherwise provided. All pipe shall be made using Type V cement.

601.3.01.B. Concrete Pipe, Reinforced: Reinforced concrete pipe shall be used for all concrete storm drainage installations larger than 27 inches and for all installations which do not provide a cover of at least 3 feet over the top of the pipe. Reinforced concrete pipe shall comply with the requirements of ASTM C76 (Class III) unless otherwise noted in the Contract Documents.

Joints of reinforced concrete pipe shall be bell and spigot, with compression type rubber gasket design conforming to ASTM C443.

Both bells and spigots shall be reinforced in pipe thirty (30) inches or more in diameter.

601.3.01.C. Vitrified Clay Pipe: Vitrified clay pipe shall conform to ASTM Designation C700, Extra Strength, unless otherwise provided. All joints shall be of bell and spigot design. Flexible gasketed joints shall be polyurethane conforming to ASTM C425.

601.3.01.D. PVC Pipe: PVC sewer pipe will be permitted for storm drain installations up to 15-inch diameter. All PVC pipe and fittings shall conform with the provisions of ASTM D3034, with a minimum wall thickness of SDR-35.

All PVC pipe shall be made from clean, virgin Type 1, Grade 1, PVC conforming to ASTM D-1784. All pipe joints shall be bell and Spigot type with integral bell gaskets. Gaskets shall conform with ASTM D3212. Joints on pipe may be the solvent weld type.

601.3.01.E. Galvanized Corrugated Steel Pipe: Galvanized corrugated steel pipe used for storm drains and culverts shall conform to the material, fabrication and inspection requirements of AASHTO M36 as applicable. Pipe shall be 14 gauge (.079") for 12 and 15 inch pipe, 12 gauge (.109") for 18 through 33 inch pipe, and 10 gauge (.138") for 30 inch or larger pipe. Metal storm drain pipe shall not be used without specific approval from the City Engineer.

Pipe with helical corrugations shall have a continuous seam extending from end to end of each length of pipe section. Helical seams shall be fabricated in such a manner that they will develop the full strength of the pipe and not affect the shape or nominal diameter. Folded lock seams or ultra-high frequency resistance butt welded seams shall be used.

Folded lock seams shall be formed with sufficient pressure to prevent any seam slippage that would affect the load carrying capacity of the pipe but without creating a plane of weakness.

Welded seams shall be controlled to such an extent that the combined width of the weld and the adjacent spelter coating which has been burned shall not exceed three times the thickness of the metal. The weld and damaged spelter coating shall be cleaned and painted as specified in AASHTO M36, if the spelter coating is damaged beyond the width specified above.

The gauge or plate thickness shall conform to the requirements of Standard Drawings or as otherwise designated in the Contract Documents.

601.3.01.E.1. Protective Treatment: Steel pipe and pipe arch culverts and sewers shall be coated by one of the following protective treatments when such treatment is specified.

Treatment 1 - Coated uniformly inside and out with asphalt.

Treatment 2 - Coated uniformly inside and out with asphalt and with an asphalt paved invert.

Treatment 3 - Coated inside and out with asphalt and a 100% periphery inside spun asphalt lining (100% paved).

601.3.01.E.2 Asphalt Coatings and Paved Inverts: Asphalt for asphalt coatings and paved inverts shall meet the requirements of AASHTO M190, Section 4. The coatings for aforementioned treatments shall be uniform, inside and out, and applied in accordance with the following requirements:

The metal shall be free from grease, dirt, dust, moisture or other deleterious contaminants.

The pavement shall have a minimum thickness of 1/8 inch above the crest of the corrugations except where the upper edges intercept the corrugation. The pavements shall be applied following the coating with asphalt or fiber bonding.

601.3.01.E.3 Spun Asphalt Lining: Asphalt for spun lining over 100% periphery shall conform to AASHTO M190, Section 4. Asphalt spun linings shall provide a smooth surface for the full interior of the pipe by completely filling the corrugations to a minimum thickness of 1/8 inch above the crests. The interior lining shall be applied by centrifugal or other approved methods.

The thickness of the lining over the crest of the corrugation shall not vary by an amount in excess of 1/2 inch over the entire area of the spun lining.

601.3.01.E.4 Galvanized Steel End Sections: Galvanized steel end sections shall be flared, beveled shop-assembled units to serve as structural, hydraulic and esthetic end treatment to corrugated steel culverts. They may be attached to corrugated steel culverts by threaded rods, by riveting or bolting per manufacturer's standard procedure.

The material for the end section shall be galvanized steel meeting the requirements of AASHTO M136.

If the end section is shop-attached to a stub of pipe (manufacturer's standard Type No. 3 connection), the pipe stub shall not be lighter in gage than the end section.

601.3.01.F Corrugated Aluminum Culvert Pipe: Corrugated aluminum alloy culvert pipe and coupling bands, as specified in the Contract Documents, shall conform to the material, fabrication and inspection requirements of AASHTO M196. Pipe shall be 14 gauge for 12 and 15 inch pipe, 12 gauge for 18 through 33 inch pipe, and 10 gauge for 36 inch or large pipe.

601.3.01.F.1 Coupling Bands for Corrugated Metal Pipe: Coupling bands for corrugated metal pipe shall be watertight and shall be for corrugated steel pipe shall meet the requirements of AASHTO M36, and for corrugated aluminum pipe shall meet the requirements of AASHTO M196 and M197. Coupling bands for corrugated metal pipe shall be made by the same manufacturer as the pipe and shall be made of the same base material as the pipe which it connects. Asphalt coating on bands will only be required for asbestos impregnated galvanized corrugated steel bands. The coupling, bands shall also be so constructed as to lap on an equal portion of each end of the pipe sections to be connected.

601.4 Fittings: All fittings shall be of sufficient strength to withstand all handling and load stresses normally encountered. All fittings shall be of the same materials as the pipe. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface.

601.5 Material Certification: The intent of this requirement is that the pipe manufacturer or fabricator shall furnish appropriate certification, based on manufacturer's routine quality control tests, that the materials in the pipe meet the requirements of the pertinent ASTM or ANSI Specification. Such certification can be required by the Engineer once per construction season for each manufacturer.

601.6 Measurement and Payment: Measurement and payment for pipe and incidental accessories and for the testing as have been specified herein will be included in such other of the sewer and culvert sections to which their use is related. Accessories and testing shall be considered as incidental to the materials affected and the costs thereof shall be included in the unit contract prices of applicable bid items in the Bid Documents.

When corrugated pipe is used, the end section including the pipe stub, where applicable, will be paid for separate from the pipe.



SECTION 602

**TRENCH EXCAVATION, BACKFILL, FOUNDATION AND BEDDING FOR
SEWERS, DRAINS, AND CULVERTS**

602.1 Description: Trench excavation and backfill shall include all excavation, backfilling, disposal or surplus and unsuitable material, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes or other structures forming a part of the pipe line and not otherwise classified as "Structure Excavation."

Trench excavation, initial backfill, foundation and bedding for sanitary sewers shall conform to S.B.W.R.D. Standards and Specifications. Backfill above the initial backfill or pipe zone in sanitary sewer installations shall conform to these Specifications. All storm drain construction shall conform to these Specifications.

602.2 Construction Details:

602.2.01 Excavation: The Contractor shall notify S.B.W.R.D. and the City Engineer's Office 48 hours (two [2] full working days) prior to the start of sanitary sewer construction. The length of trench excavated in advance of the pipe laying shall be kept to a minimum and in no case shall it exceed three hundred (300) feet unless otherwise specifically authorized by the City Engineer. Trench widths, shoring, bracing, and trenching procedures shall conform to Utah Occupational Safety and Health Rules, Regulations and General Standards.

The maximum permissible trench width from the bottom of the trench to the crown of the pipe, shall be as follows:

15-inch diameter and smaller	40 inches
18-inch diameter and larger	1½ x inside diameter + 18 inches

In all cases, trenches must be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner. If the maximum trench width is exceeded by the Contractor without the written authorization of the City Engineer, the Contractor will be required at his own expense to provide a higher class of bedding, as may be deemed necessary by the City Engineer.

Removal of Pavement, Sidewalks, Curbs, etc., shall be in accordance with Section 550. The pavement, sidewalk, curb and gutter, driveway etc., shall be cut along the lines forming the trench, in such a manner as to not damage the adjoining pavement. An undercut level of one (1) inch per foot of thickness or an underlap joint shall be provided at the proposed junction between old and new surfaces. The portion to be removed shall be broken up in a manner that will not cause damage to the pavement outside the limits of the trench. Large broken paving materials resulting from the operations shall be removed immediately from the site of the work.

Tunneling or boring may be permitted as directed by the City Engineer for economy of construction or necessity of preserving existing improvements. Steel casings for bored or jacked construction shall be steel pipe conforming to ASTM A139.

Excavation for manholes and other structures shall be sufficient to provide a minimum of twelve (12) inches between their surfaces and the sides of the excavation.

All material excavated from the trenches and piled adjacent to the trench or in a roadway or public thoroughfare shall be piled and maintained so that the toe of the slope of the material is at least two (2) feet from the edge of the trench. It shall be piled in such manner as will cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where such is necessary. Free access shall be provided to all fire hydrants, water valves and meters, and clearance shall be left to enable free flow of storm water in all gutters, other conduits, and natural water courses.

602.2.02 Control of Water: All trenches shall be kept free from water during excavation, fine grading, pipe laying, jointing, and embedment operations. Where the trench bottom is mucky or otherwise unstable because of the presence of ground water and in cases where the static ground water elevation is above the bottom of any trench or bell hole excavation, such ground water shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. Surface water shall be prevented from entering trenches.

602.2.03 Bedding and Initial Backfill for Sewer and Drains:

602.2.03.A Bedding and Initial Backfill for Rigid Conduits: Bedding and initial backfill procedures shall be categorized by various field conditions, *i.e. suitable subgrade, unsuitable subgrade, and solid rock*. The approximate limits for the various types of bedding will be indicated on the Approved Plans where it is feasible to do so.

The District or City Engineer shall have the authority to change the type of bedding and limits thereof as he may deem necessary during the progress of the construction, consistent with the requirements outlined under the definitions and requirements of the various types contained herein. Type of bedding will not constitute a pay item in itself.

Where unauthorized excavation has been made below the established grade the Contractor shall provide, place and compact suitable bedding material to the proper grade elevation at his own expense.

602.2.03.A.1 Suitable Subgrade: The trench bottom shall be constructed to provide a firm and stable support for the entire length of the pipe. The pipe subgrade shall be shaped to fit the bottom of the pipe for a width of ½ the diameter of the pipe. Each joint shall be properly bedded to insure uniform and continuous bearing along the pipe. Initial backfill shall be placed a minimum of 12 inches above the top of the pipe.

Selected backfill material consisting of earth, or sand, free of stones larger than 2 inches, hard clods, frozen material or other debris shall be placed in the trench simultaneously on each side of the pipe in 6-inch lifts and

properly compacted for the full width of the trench in such a manner as not to damage or disturb the pipe. Compaction requirements will be as specification 602.2.06.

602.2.03.A.2 Unsuitable Subgrade: Whenever unsuitable subgrade material is encountered, 4 to 6 inches of foundation material will be required. This material shall be 1/4" to 3/4" clean, angular rock or clean sand. This same material shall be used for haunching. Haunching shall be placed to the springline of the pipe. Selected backfill material consisting of earth, or sand, free of stones larger than 2 inches, hard clods, frozen material, or other debris shall be placed in the trench simultaneously on each side of the pipe in 6 inch lifts and properly compacted for the full width of the trench in such a manner as not to damage or disturb the pipe. This selected backfill shall be placed a minimum of 12 inches above the top of pipe. Compaction requirements will be as specified in 602.2.06.

602.2.03.A.3 Solid Rock Excavation: In solid rock excavation, all ledge rock, boulders, or stones shall be removed to provide a minimum clearance of six (6) inches under the pipe. All materials thus removed shall be replaced with bedding sand.

A minimum thickness of 6 inches of foundation material will be required. The bedding sand shall be placed in the trench *simultaneously* on each side of the pipe in 6 inch lifts and properly compacted for the full width of the trench to an elevation 12 inches above the top of pipe. Compaction requirements will be as specified in 602.2.06.

602.2.03.A.4 Materials: Bedding material for suitable and unsuitable subgrade shall be one of the following, at the Contractor's option unless otherwise provided in the Special Conditions.

Sand: Sand bedding shall be a clean sand-gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
3/4"	100
3/8"	75-100
#4	55-100
#10	35-95
#20	20-80
#40	10-55
#100	0-10
#200	0-3

continued . . .

Gravel: Gravel bedding shall be a clean mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
1½"	100
¾"	95-100
#8	0-10
#200	0-3

Gravel Sand:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
1½"	100
¾"	30-75
½"	15-55
¼"	0-40
#200	0-3

Crushed Rock: Crushed rock bedding shall be a clean mixture free from organic material and conforming to the following gradation when tested in accordance with ASTM D422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
¾"	100
¼"	50-65
#40	8-23
#200	0-10

Native Material: Native material will be acceptable for suitable or unsuitable subgrade bedding material provided it meets the requirements for any one of the above listed materials. The cost of bedding material, where required, shall be included in the unit Contract price for sanitary sewer or storm drain per lineal foot for each size of pipe. Payment will be made in accordance with applicable bid items in the Contract Documents.

602.2.03.B Bedding and Initial Backfill for Flexible Conduits:

602.2.03.B.1 Bedding for PVC and ABS Composite Materials: Material to be used for bedding of these Flexible Conduits shall conform to material listed under 602.2.03A4. Bedding and initial backfill shall be placed in the same manner as outlined under 602.2.03A2.

602.2.03.B.2 Bedding and Initial Backfill for Corrugated Metal Pipe: Material for sidefill around and to the crown elevation of corrugated metal pipe shall be selected and shall not contain stones larger than 3 inches in greatest dimension, frozen lumps, roots, or moisture in excess of that permitting thorough compaction. Compaction zones shall be brought up simultaneously on each side of the pipe to 12 inches above the top of

the pipe and compacted to 96% density as defined by ASTM D-1557 and verified by ASTM D2922 (AASHTO T238) or ASTM D1556 (AASHTO T91).

602.2.04 Cribbing and Sheeting - Shoring: Unless otherwise provided in the Special Conditions the Contractor shall provide all materials, labor, and equipment necessary to adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The method of shoring shall be according to the Contractor's design. If the Contractor elects he may use a combination of shoring and overbreak, tunneling, boring, sliding trench shields or other methods of accomplishing the work provided the method meets with the Utah Occupational Safety and Health Rules and Regulations of the Utah State Industrial Commission.

Removal of any cribbing and sheeting, from the trench shall be accomplished in such a manner as to fulfill the above requirements.

Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Contractor. Cribbing will not be a pay item and the cost thereof shall be included in the unit contract price for "Trench Excavation" or the "Lineal Feet of Installed Pipe or Conduit. "

That portion of cribbing or sheeting extending below the springline of rigid pipe, or below the crown elevation of flexible pipe, shall be left in place unless satisfactory means of reconsolidating bedding or side support, disturbed by cribbing or sheeting removal, can be demonstrated.

The use or horizontal strutting below the barrel of pipe or the use of the pipe as support for trench bracing will not be permitted.

602.2.05 Backfilling for Sewers and Drains: In backfilling the trench, the Contractor shall take all necessary precautions to protect the pipe from any damage or shifting of the pipe. In general, backfilling shall be performed by pushing the material from the end of the trench into, along and directly over the pipe so that the material is applied in the form of a rolling slope rather than by side filling. Backfilling from the sides of the trench will be permitted after the initial backfill has been carefully placed over the pipe to the required depth.

During all phases of the backfilling operations and testing as outlined herein, the Contractor shall protect the sewer installation, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and persons.

602.2.06 Compaction of Trench Backfill: Unless otherwise provided in the Special Conditions, compaction of trench backfill material is required. One of the following methods or combination thereof as set forth below shall be used. The Engineer shall retain the right to change methods and limits to better accommodate field conditions. The density of backfilled material shall be 96% of maximum relative density as determined by the Compaction Control Test specified in ASTM D-1557 and verified by ASTM D2922 (AASHTO T238) or ASTM D1556 (AASHTO T91), except that 90% relative compaction is allowable in areas where vehicle traffic will never occur, when approved by the City Engineer.

602.2.06.A Water Settling: Water settling, when permitted, shall be performed as specified in Sections 702.2.08A through C.

602.2.06.B Mechanical Compaction: When mechanical compaction is specified, backfill shall be placed in lifts and each lift shall be compacted to the density specified in 602.2.06.

602.2.06.C Flowable Fill (CLSM-CDF): When approved by or required by the City Engineer, flowable fill may be used. If such use is proposed by the Contractor, the Contractor shall submit a materials proposal, including manufacturer's specifications, to the City Engineer for review no less than five (5) days prior to the proposed use. Flowable fill shall not exceed 100 psi compressive strength at 28 days.

602.2.07 Culvert Bedding and Backfill: Placement of materials around and over culverts shall be performed in accordance with requirements specified herein within a defined pipe compaction zone as shown on Standard Drawing No. 602-A.

Material placed within the pipe compaction zone shall be selected and shall not contain stones larger than 2 inches in greatest dimension, frozen lumps, roots, or moisture in excess of that permitting thorough compaction. Material placed within the pipe compaction zone shall be brought up simultaneously on each side of the culvert to the top of the culvert.

In either trench or embankment installations the material within the pipe compaction zone shall be placed in layers of not more than 6 inches in loose thickness and compacted to 96% maximum relative density as defined in ASTM D-1557. Placement of materials within the pipe compaction zone shall be in accordance with Standard Drawing No. 602-A.

The contractor shall not operate tractors or other heavy equipment over the culvert until it has been backfilled as provided above, or until the embankment has reached a height of 2 feet above the top of the culvert, or as provided in Section 602.2.08 if the site of the culvert is at a location where legal highway load limitations are not in effect. Damage resulting from use of construction equipment over culvert shall be repaired by Contractor at his own expense.

602.2.08 Load Limits: After the culvert has been constructed and backfilled in accordance with the Specifications, and the embankment has reached a height of 2 feet above the top of the pipe. The Contractor may operate across those pipes with equipment having an axle weight on single axles of not more than 24,000 pounds or an axle weight of not more than 16,000 pounds each for tandem axles having an axle spacing of less than 10 feet in accordance with Standard Drawing No. 602-A.

After the embankment has reached a height of 5 feet above the top of the pipe, the Contractor may operate across those pipes with equipment having an axle weight on single axles of not more than 100,000 pounds if the outside wheel spacing is a minimum of 7 feet on centers on the axle.

602.2.09 Preservation of Existing Trees: Preservation of existing trees shall be performed in accordance with Subsection 501.2.

602.2.10 Topsoil Removal and Replacement: Removal of topsoil and replacement of it shall be performed in accordance with the provisions of Section 541 and payment will be made at the unit contract price per cubic yard as specified herein.

602.2.11 Lawn Removal and Replacement: Removal of lawn and the replacement of it shall be performed in accordance with the provisions of Section 542 and payment will be made at the unit contract price per square yard as specified herein.

602.3 Measurement and Payment:

602.3.01 Trench Excavation and Backfill: When the proposal contains a bid item of "Trench Excavation and Backfill," the measurement for payment such work will be made on the basis of section 602.3.01A as it applies to the Contract Documents.

When no bid item for "Trench Excavation and Backfill" is included in the Bid Proposal, all work and costs for excavating trenches to the grades shown on the Approved Plans and for backfilling with excavated materials shall be considered as incidental to the construction, and shall be included in the price per linear foot of sewer or storm drain.

602.3.01.A Measurement by the Linear Foot: When measurement and payment is called for by a unit contract price per linear foot, the trench shall be measured continuously along center line from the beginning point to the terminus and including the distances through structures is a bid item in connection with the structures, the allowable distance along center line through the structure excavation shall be deducted from the total length of trench.

The unit contract price per linear foot shall be full compensation for all labor, materials, tools and equipment required to excavate, backfill and compact the trench in accordance with the Approved Plans and Specifications .

602.3.01.B Unexpected Objects: Where unexpected objects, such as stumps, railroad ties, buried pavement, etc. are encountered in the trench excavation, they shall be removed and disposed of by the Contractor. In cases where they can be removed by the same equipment or method at hand for excavation, and where it is unnecessary to employ special equipment, install shoring or bracing, or to increase the trench width or depth more than two feet for any one object, then in that event the removal of such obstructions shall be considered as an incidental part of the Contractor's work and no additional payment will be made the work.

Where such unexpected objects require extra work beyond the scope of work outlined above, or extra equipment for their removal, the Contractor may submit to the Engineer a request for due compensation as "Extra Work."

602.4 Payment: This item of work shall be included in the unit bid price per linear foot for furnishing and the installation of pipe of the various sizes and types shown in the Contract Documents. This price shall be full compensation for all materials, labor and equipment necessary to complete this item of work.

The contractor shall obtain import fill material from one source only for each classification of fill material used on each project. The material from each source must meet the specifications for the classification and be approved by the City Engineer prior to delivery on site. Submittals to the City Engineer must be made a minimum of five (5) working days prior to the intended use of the material.



SECTION 603

PIPE LAYING AND JOINTING

603.1 Description: This section covers the pipe laying and jointing of storm drains and culverts. The construction of these lines shall meet the requirements stated herein and in the Standard Drawings. Pipe laying, jointing and testing of sanitary sewers shall conform to SBSID Standards and Specifications.

Before final acceptance of the Contract or before expiration of the guarantee period, any pipe or appurtenance which inadvertently or otherwise has been laid or jointed in non-conformance with these Specifications and Contract Documents shall, upon direction of the Engineer, be repaired, removed or replaced at the expense of the Contractor, and to the satisfaction of the City Engineer.

603.2 Material: The materials shall conform to requirements outlined in the various applicable sections of the Specifications.

603.3 Construction Details:

603.3.01 Survey Line and Grade: Survey line and grade control hubs will be provided by the Engineer in a manner consistent with accepted practices.

The Contractor shall constantly check line and grade and in the event they do not meet specified limits described hereinafter, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

603.3.02 Storm Drain Pipe Laying: Laying of storm drain pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared in accordance with Section 602. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surfaces.

All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within the limits that follow.

Unless authorized by the City Engineer all storm drain shall have a minimum cover of 18 inches. Variance from established line and grade shall not be greater than one thirty-second ($1/32$) of an inch per inch of pipe diameter and not to exceed one-half ($1/2$) inch, provided that such variation does not result in a level or reverse sloping invert.

The storm drain pipe, unless otherwise approved by the Engineer, shall be laid up grade from point of connection on the existing sewer or from a designated starting point. The storm drain pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

Where pipelines are to be laid on specified curves of sufficiently short radius to deflect the pipe joints in an amount greater than recommended by the manufacturer, the curves shall be achieved with a series of tangents and shop-fabricated bends, subject to the approval of the Engineer.

603.3.03 Culvert Pipe: Laying of culvert pipe shall conform to the requirements of Section 602.3.02.

603.3.04 Control of Water: See Section 602.2.02.

603.3.05 Plugs and Connections: Pipe branches, stubs or other open ends which are not to be immediately connected shall be capped, retained, or plugged and marked in a manner satisfactory to the Engineer. Under no circumstances shall such plugging, retaining or capping be done in such a manner as to allow soil to enter the pipe.

603.3.06 Pipe Jointing: All storm drain pipe shall have flexible gasketed joints unless otherwise specified.

603.3.06.A Gasket Type Joints: Flexible gasketed joints shall be assembled in strict accordance with the instructions furnished by the pipe manufacturer, and shall be in accordance with other provisions described below except in any case where they may be inconsistent with the manufacturer's instructions.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced, cleaned and re-lubricated if required, before the jointing is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.

Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. At the end of the work day, the last pipe laid shall be blocked in an effective way to prevent creep during "down time."

603.3.06.B Joints of Dissimilar Pipes: For dissimilar pipes where suitable adaptor couplings are not available, the jointing shall be accomplished with a special fabricated coupling or concrete encasement expansion block, as approved by the Engineer.

603.3.06.C Solvent Welded Joints: Solvent welded joints shall be made in accordance with manufacturers instructions.



SECTION 604

MANHOLES

604.1 Description: Sanitary sewer manholes shall conform to S.B.W.R.D. Standards and Specifications. Storm drain manholes shall conform to these Specifications.

604.2 Materials:

604.2.01 Precast Manhole Components: Precast manhole components shall conform to ASTM C478 except as modified herein.

604.2.01.A Base Sections: Base Sections shall conform to the requirements for precast manhole sections in Section 604.2.01B herein, except that the reinforced base slab shall be made an integral part of the unit, and openings for pipe shall be provided to meet job requirements as indicated on the Approved Plans. The base slab shall be not less than 6" in thickness and shall be cast monolithically with the wall section, or otherwise constructed in such a manner as to achieve a completely watertight structure.

The walls of the base section shall be reinforced in accordance with ASTM C478. Openings to receive pipe shall be circular, tapered in toward the inside of the section, and shall be held to the minimum size possible to accommodate the pipe to be inserted and to effectively seal the joint. For storm drain installations, openings shall be equipped with flexible pipe connectors conforming to ASTM C923. Openings for pipe up to 21" diameter may be provided in 4 foot base sections. Openings for pipe up to 30" diameter may be provided in 5 foot base section.

604.2.01.B Precast Manhole Sections: Standard precast sections shall consist of circular sections in standard nominal inside diameters of, 48", 54", 72", and 96". Heights of 36" and 48" sections shall be multiples of 12" at the option of the manufacturer. Heights of 72" and 96" sections shall be as required to fit site conditions. Reinforcement for standard sections shall be as designed by the manufacturer. Joints shall be made with mortar, mastic, or flexible gaskets unless otherwise provided in the Special Conditions, and shall conform to ASTM C478.

604.2.01.C Precast Cones: Standard precast cones shall be eccentric type, except for manholes deeper than 6 feet, in which case eccentric cones with steps meeting latest O.S.H.I.A. Standards shall be supplied in the manhole.

604.2.01.D Flat Slab Lids: Standard flat slab lids shall be capable of carrying H₂O live loads and shall conform to ASTM C478. The 30" diameter opening shall be *eccentrically* located as specified in the Approved Plans.

604.2.02 Cast-In-Place Concrete Bases: All cast-in-place concrete placed under these Specifications shall have a minimum compressive strength of 4000 psi at 28 days.

Strength determination shall be in accordance with ASTM C39 (AASHTO T22), unless otherwise approved by the Engineer. Precast components shall conform to the strength requirements of ASTM C478.

604.2.03 Cast Iron Frames and Covers: All iron castings shall conform to the requirements of ASTM A48 (Class 30) for grey iron castings. Rings and covers shall have machined bearing surfaces. Castings shall be

cleaned and painted with a bituminous asphalt coating before delivery to the site. All castings shall have a combined minimum weight of 400 pounds with the cover approximately 150 pounds and the ring approximately 250 pounds. The cover shall be 24 inches in diameter. All covers shall be unvented with a pick-hole for opening, and marked "STORM DRAIN." The foundry name and casting number shall appear on the casting.

604.2.04 Grout: Grout for jointing precast manhole sections or masonry manhole units shall be pre-mixed non-shrink type (i.e. Master Builders "Embeco Mortar," Sohneborn "Ferrolith G- D.S. Redi-Mixed," or equal as approved by Engineer.

604.2.05 Steps: Steps shall be supplied in manholes deeper than four (4) feet at a maximum spacing of 12 inches O.C. and steps shall conform to ASTM C478. Steps shall be aluminum with a plastic coating to protect from corrosion with concrete. Steps shall be Comco 12653B or Neenah R-1982-W or M.A. Industries PS1-PF or equal as approved by Engineer.

604.2.06 Other Material: Manholes constructed from material other than concrete in the method as approved by these Specifications shall be allowed only on prior approval by the Engineer.

604.3 Construction Details:

604.3.01 Foundation Preparation:

604.3.01.A Dewatering: Dewatering of the site shall conform to the requirements for sewer trench dewatering in Section 602.2.02.

604.3.01.B Sub-base Preparation: Adequate foundation for all manhole structures shall be obtained by removal and replacement of unsuitable material with well graded granular material, or by such other means as provided for foundation preparation of the connected storm drains. Where water is encountered at the site, all cast-in-place bases shall be placed as to prevent any movement of water into the fresh concrete.

604.3.02 Bedding: Precast base sections shall be placed on suitable undisturbed soil or a well graded granular bedding course conforming to the requirements for sewer bedding in Section 602.2.03, extending either to the limits of the excavation or to a minimum of 12" outside the outside limits of the base section.

604.3.03 Precast Manholes:

604.3.03.A General: Precast manholes shall conform to the Standard Drawings in S.B.W.R.D. Specifications.

604.3.03.B Precast Base: The base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment, and making sure that all entering pipes can be inserted on proper grade.

All lift holes and all joints between sections, grade rings and castings shall be sealed with a continuous bead of watertight bitumastic material or non-shrink grout. manholes in areas of high ground water shall have joints and lift holes grouted on the outside of the manhole in addition to standard sealing procedures.

Precast sections shall be placed and aligned to provide vertical sides and, when required, vertical alignment of the ladder runs. The completed manhole shall be rigid, true to dimensions, and watertight.

604.3.03.C Cast-In-Place Base: The base shall be poured monolithically. Cast-in-place bases shall be at least 6 inches in thickness below the invert and shall extend at least six inches radially outside of the outside dimensions of the precast manhole wall section. The base shall extend at least six inches above the bottom of the wall section on the outside of the wall section. The initial precast wall section shall be supported on concrete blocks and adjusted to proper alignment and grade prior to pouring of the base. *The precast wall section shall not bear directly on any of the pipes.* The joints and lift holes will be treated as specified in 604.3.03B.

604.3.04 Channels (Inverts): Channels shall be made to conform accurately to the pipe grade and shall be brought together smoothly with rounded junctions, satisfactory to the Engineer. Minimum drop through manholes shall be 0.2 feet. Channel sides shall be carried up vertically to between 2/3 and 3/4 of the height of the crown elevation of the largest pipe, and the concrete shelf between channels shall be smoothly finished and warped evenly with slopes to drain.

Where pipe lines pass through or enter manholes the invert channels shall be smooth and semi-circular in cross-section. The pipe shall protrude into the manhole *a maximum of three inches*. All openings around pipes shall be grouted to form a watertight seal. Changes of direction of flow within the manholes shall be made with a smooth curve with as long a radius as possible.

604.3.05 Streets at Grade: Where work is in paved streets or areas which have been brought to grade, the top of the cone or slab shall be constructed to provide a clearance not more than 24" and the underside of the manhole casting ring for adjustment of the casting ring to street grade.

Top of castings shall be set parallel and ½" to 1" below finished road surface. Castings shall be fully and uniformly supported. Wedges or shims used to elevate castings shall be brick or metal *with concrete placed for uniform support*. One full course of brick, with all joints sealed, may be used to elevate castings. Collars around manholes shall consist of hot-mix asphalt to match existing paving, except in areas where manholes are set in concrete pavement in which case a concrete collar of 9 inches minimum width will be required.

604.3.06 Streets With no Established Grade: Where work is in streets or other areas which have not been brought to grade, the top of cone or slab shall be constructed so as to provide clearance not less than 12" or more than 24" below the surface to be restored, unless otherwise directed by the Engineer. Castings shall be fully and uniformly supported, as specified in 604.3.05 .

604.3.07 Backfill: Backfill around the manhole and extending at least one pipe length into each trench shall be hand placed and tamped with selected native material up to an elevation of twelve (12) inches above the crown of all entering pipes. Work shall conform to the applicable provisions of sections 602.2.03 and 602.2.05.

604.4 Measurement: Each manhole will be measured to the nearest one tenth (0.10) of a foot, from invert of the outlet pipe vertically to the top of the casting.

604.5 Payment: Payment for each manhole shall consist of a basic price for each, plus a unit price per foot for all depth in excess of ten (10) feet, plus a unit price per linear foot for drop connections where they occur.

Where more than one type or size designation is shown on the Standard Drawings or called for in the Special Conditions, each shall be covered by a separate bid item of the following for.

- 1: "Manhole Type (No.____), Basic Price" per each.
2. "Extra Depth Manhole Type (No.____) ," per vertical foot.

Where an existing manhole is encountered in the work and it is required that it must be adjusted to new grade, the work and payment therefore shall be as extra work provided in Section 551.3.01, Adjust Existing Manhole or Catch Basin to Grade .

3. "Adjust Existing Manhole or Catch Basin to Grade," per each.

The unit contract prices shall be full compensation for furnishing and constructing manholes complete and connected to the storm drains, excepting however, that excavation, backfill, gravel bedding or foundation material or additional connection not shown on the Approved Plans will be paid for in accordance with the applicable bid items for other Sections.

Any structure or feature covered during the construction process that requires raising to a final grade must be raised to the proper grade within seven (7) days of being covered. These features include but are not limited to: manhole covers, valve box covers, and monument covers. Under no circumstances can the access to the utilities be delayed more than seven (7) days unless otherwise approved by the City Engineer.



SECTION 605

CATCH BASINS AND INLETS

605.1 Description: Standard catch basins and inlets may be constructed of precast units, or cast-in-place concrete, all in accordance with the Standard Drawings 605-A, 605-B, or 605-C and Construction Specifications.

605.2 Materials:

605.2.01 Frame and Grate: The frame and grate shall be bicycle-safe conforming to Standard Drawing 605-D.

605.2.02 Mortar: Mortar for jointing catch basins and inlets shall be one part non-shrinking Portland cement and not less than one part nor more than one and one-half parts plaster sand, mixed with the least amount of water necessary to provide a workable mortar.

605.3 Construction Details: Backfill around catch basins shall be adequate as a foundation to support shallow outlet connection pipe. The backfill material placed around the catch basins shall be compacted into place with mechanical tampers.

605.3.01 Grade Adjustment: The inlet frame shall not, in any case, be grouted to final grade until the final elevation of the pavement, gutter, ditch or sidewalk in which it is to be placed has been established and permission has been given by the Engineer to grout the casting in place. Location of elevation of catch basins will be staked by the Engineer.

605.3.02 Pipe Connections: All openings in the walls of catch basins constructed with precast sections for the insertion of pipe connections and outlet trap castings shall, after pipe or castings have been placed to their final position, be grouted tight in place using non-shrinking mortar in a workmanlike manner to present an inside and outside surface conforming to the Standard Drawings.

605.3.03 Traps: Traps shall be installed where shown on the Approved Plans.

605.4 Measurement and Payment: Payment will be made for such of the following bid items as are included in the Proposal:

1. "Catch Basin Type (___)," per each.
2. "Inlets Type (___)," per each.
3. "Catch Basin Trap (type size)," per each.
4. "Adjust existing catch basins (or inlet) to grade," per each.

The above unit bid contract prices shall be payment in full for all labor, materials, tools, and any other work necessary of whatsoever nature it may be to complete the work item as described in accordance with the Contract Documents.



SECTION 606

SUBSURFACE UNDER DRAINS

606.1 Description: This work shall consist of constructing UNDER DRAINS using filter fabric, pipe and granular filter materials, in compliance with the specifications and to lines and grades shown on the Approved Plan or as directed by the Engineer.

This section is intended to cover only the collection and control of subsurface water and does not apply beyond the point at which the water is discharged into the storm drain or other outlet.

606.2 Materials: All materials required to complete the work as described in this section shall conform to the minimum requirements specified on the Plans, in the Special Provisions or as indicated herein, whichever is applicable.

Prior to purchasing materials, the Contractor shall submit samples of the specified pipe and fabric material along with physical and chemical data sheets and Manufacturer's Certificates of Compliance to the Engineer, for his approval.

All material found to be defective at time of delivery or at any time during the progress of the work will be rejected by the Engineer. Rejected materials shall be promptly removed from the site of the work by the Contractor. The Contractor shall be responsible for all material(s) furnished by him and shall replace at his own expense any pipe, fabric or other materials which are found to be defective.

Materials shall meet the following minimum requirements, unless otherwise specified or directed by the City Engineer.

606.2.01 Pipe: Pipe for UNDER DRAINS shall be of the type and dimensions shown on the Plans, indicated in the Special Provisions and as herein specified:

1. Corrugated steel pipe shall conform with the requirement of AASHTO M-36.
2. Bituminous coated corrugated metal pipe shall conform with the requirements of AASHTO M-36 or M-197. Bituminous coating shall conform with the requirements of AASHTO M-190 and as further specified in the Special Provisions.
3. Corrugated aluminum alloy pipe shall conform with the requirements of AASHTO M-197.
4. Perforated clay pipe shall meet the requirements of ASTM Designation C-278 for extra strength pipe and shall be perforated in accordance with ASTM Designation C-211.
5. Perforated concrete pipe for UNDER DRAINS shall conform with the requirements of AASHTO M-175 or ASTM C-444.

6. Perforated bituminized-fiber pipe shall conform to the requirements of AASHTO M-177.

7. Polyvinyl Chloride (PVC) pipe shall conform to the applicable requirements of ASTM Test Methods D-1785, D-2464, D-2467 and D-2564 for the schedule shown on the plans. Unless shown otherwise on the plans, perforations shall conform to the requirements of AASHTO M-175.

606.2.02 Filter Fabric Material: Filter fabric shall be installed to the lines and limit specified on the Approved Plans or in the Special Provisions. If specific fabric criteria is not otherwise specified in the Special Provisions, then the fabric shall meet the following minimum requirements:

606.2.02.A Fabric Type: The fabric material shall be non-woven type.

Table 606.2.02.B Minimum Physical Requirements

<u>Property</u>	<u>Value</u>
Tensile strength, lbs.	115 lbs. min.
Puncture Strength, lbs.	50 lbs. min.
Mullen Burst strength, psi	200 psi min.
Equivalent Opening Size (EOS)	No. 60 max. size No. 140 min. size
Coefficient of Permeability, cm/sec	0.10 cm/sec. min.
Abrasion Resistance, lbs. (Bearded or soft side)	35 lbs. min.

606.2.03 Aggregates: As indicated on the Approved Plans or in the Special Provisions, the under drain trenches shall be filled with permeable aggregate material to the lines and grades indicated.

The aggregates shall consist of hard, durable, clean sand, gravel or crushed stone and shall be completely free from organic material, clay balls and/or other deleterious substances. The aggregates shall conform to one of the following grading requirements as specified or as directed by the Engineer:

continued . . .

Table 606.2.03.A Grading Requirements for Permeable Materials

<u>Percent Passing by Dry Weight</u>			
<u>SIEVE SIZE</u>	<u>TYPE 1</u>	<u>TYPE 2</u>	<u>TYPE 3</u>
2"	100	-	-
1½"	95-100	-	-
¾"	50-100	100	-
½"	-	95-100	-
3/8"	15-55	70-100	100
No. 4	0-25	0-55	95-100
No. 8	0-5	0-10	80-100
No. 16	-	-	50-85
No. 30	-	-	25-60
No. 50	-	-	10-30
No. 100	-	-	2-10
No. 200	0-3	0-3	0-2

606.3 Construction Details: Unless otherwise approved by the City Engineer, no under drain shall be installed without the use of an approved drainage fabric meeting the minimum requirements specified herein.

606.3.01 Trench Excavation: Drain trenches shall be excavated to the alignments, dimensions and grades indicated on the Approved Plans or as directed by the Engineer. The Contractor shall clean the trenches of all loose and protruding materials, including the removal of additional soil and/or rock, to provide unrestricted continuous flow throughout the entire length of the trench or trenches.

The trenches shall be excavated and graded to conform to the percent of slope specified on the Plans, in the Special Provisions or as directed by the Engineer. In lieu of a designated sloping requirement, the Contractor shall grade the trenches to provide a continuous, uniform flow throughout the length of the trench.

Extreme care shall be exercised by the Contractor at all times during the performance of the work to maintain the trench and excavated material with such condition that there will be no mixing of excavated material in the filter material to be used for backfilling. All excess excavated material not required for construction, shall be disposed of by the Contractor, unless otherwise provided in the Special Conditions.

Wherever necessary, sheeting, bracing, or cribbing shall be provided in accordance with the provisions of Section 602.2.04.

606.3.02 Fabric Installation: The Contractor shall install the specified or designated grade and type of fabric completely to the lines and grade indicated. Fabric installation shall be in strict accordance with the manufacturer's recommendation except as modified below:

1. Where lapping of the fabric is required the lap distance shall be a minimum of eighteen (18) inches. Laps placed longitudinally in the trench or along the blanket drain area shall be made such that the overlying fabric edge is down slope from the direction of flow

2. Trench closures of the fabric shall be made in such a manner as to provide a full width, double fabric, cover over the trench surface. Blanket drain closures shall be made in such a manner that the minimum fabric lap, previously specified herein, shall be strictly maintained.

606.3.03 Pipe Installations: Where required, subdrain pipe of the type and size specified shall be installed as indicated on the Plans or in the Special Provisions. Unless otherwise specified or directed by the Engineer, the pipe shall be installed directly on the fabric.

Unless otherwise shown on the plans, perforated pipe shall be placed with the perforations down. The pipe section shall be joined securely with the appropriate couplings, fittings, or bands.

Non-perforated pipe shall be laid with the bell end upgrade and with open joints. The pipes shall be wrapped with suitable material to permit entry of water, or unwrapped, as specified. Upgrade ends of all subdrainage pipe installations shall be closed with concrete plugs to prevent entry of soil materials.

If required by the Engineer or otherwise specified, prior to laying the pipe, a six (6) inch layer of filter material, meeting the requirements for permeable materials as specified herein, shall be placed uniformly in the bottom of the trench. This material shall be placed immediately prior to laying the pipe and shall be uniformly spread to true grade and be properly compacted. Should any of this filter material become contaminated by slough of the trench, by storm water or from other causes, it shall be immediately removed and be replaced with acceptable filter material at the expense of the Contractor.

606.3.04 Pipe Jointing: All pipe shall be inspected prior to lowering into the trench and, if necessary, cleaned of any material which might plug the perforations of the pipe.

The Contractor shall have available the proper tools, men and equipment for efficient execution of the work. All pipe and fittings shall be carefully lowered into the trench to avoid any contamination of the filter bedding material. Pipe shall be laid with perforations down, unless otherwise specified or directed by the Engineer.

606.3.04.A Corrugated Pipe: Corrugated metal pipe and fittings shall be connected with an approved band provided by the manufacturer.

606.3.04.B Clay Pipe: Clay pipe sections shall be butted up tight and centered so as to provide a continuous and uniform line of pipe with a smooth and regular interior surface. Pipe shall be laid without joint closure unless otherwise provided in the Special Provisions.

606.3.04.C Concrete Pipe: Concrete pipe sections shall be butted up tight and centered so as to provide a continuous and uniform line of pipe with a smooth and regular interior surface. Pipe shall be laid without joint

closure unless otherwise provided in the Special Provisions. Where joint closure is specified, jointing shall conform to the requirements indicated in the Plans or specified in the Special Provisions.

606.3.05 Aggregate Installation: The specified permeable aggregate materials shall be placed to the lines and grades indicated on the Plans or as directed by the Engineer. Care shall be taken not to displace the pipe or to alter open joints.

The permeable materials shall be compacted as directed by and subject to the approval of the Engineer. Where specified on the Plans or in the Special Provisions, the material shall be compacted to a minimum of ninety (90) percent of the laboratory maximum dry density as determined by ASTM Test Method D-1557 or other applicable test methods designated by the City Engineer.

606.3.06 Drain Cover: Following completion of the installation, as specified herein, the under drain shall be further backfilled, or covered with compacted soil or recompacted aggregate base as indicated on the Plans.

The cover material shall conform to the material and compaction requirements specified on the Plans, in the Special Provisions or as specified in Section 501 or 510, of this Standard Specifications, whichever may be appropriate.

606.3.06.A Drain Discharge Protection: Where UNDER DRAINS discharge onto fill or cut slope subgrade, the discharge area shall be protected against erosion by the placement of crushed gravel, cobbles or other approved materials. The extent of the cover shall be shown on the Plans or indicated by the Engineer.

The furnishing and placement of such protective materials shall be considered incidental to the construction and no direct payment will be made therefore.

606.4 Measurement and Pavement:

606.4.01 General: Except as otherwise specified herein, no direct payment will be made for the various miscellaneous and incidental items of work to be performed, nor for accessories to be furnished and installed. All cost in connection therewith shall be considered as incidental to the construction and shall be included in the unit contract price of the appropriate item(s) in the Bid proposal.

606.4.02 Pipe: Pipe of each kind and size, as required or specified, shall be measured by the linear foot for the pipe in place and accepted. The unit contract price per linear foot shall be full compensation for the kind and size specified in place, including connecting accessories, all fittings such as elbows, tee, wye, etc., and the price shall be full compensation for the furnishing of all material, labor and equipment necessary to complete the pipe laying and jointing as specified, and to the satisfaction of the Engineer.

606.4.03 Filter Material: Filter material both fabric and permeable aggregate, shall be paid for at the unit contract price per linear foot in place. Filter material will be placed in accordance with the limits shown on Standard Drawings, or as described in the Contract Documents.

606.4.04 Method of Measurement: Under drain and outlets will be measured by the linear foot for



pipe of the type and size specified. Blind drains will be measured by the linear foot in place.

SECTION 607

SEWER LATERALS AND CLEANOUTS

607.1 General: Sewer lateral and cleanout installations shall conform to S.B.W.R.D. Standards and Specifications.



SECTION 608

FINISHING AND CLEANUP FOR UNDERGROUND CONDUITS

608.1 Cleanup: Before acceptance of sewer line construction, all pipes, manholes, catch basins, and other appurtenances shall be cleaned of all debris and foreign material.

After all backfill has been completed, the ground surface shall be shaped to conform to the contour of adjacent surfaces. General cleanup of the entire construction area shall otherwise conform to applicable requirements specified in Section 553.

