

# CITY OF ALBANY

## Standard Specifications Technical Provisions

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# CITY OF ALBANY

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### Section 1

#### Mobilization

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

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

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

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

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### Section 2

#### Clearing & Grubbing

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

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

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

#### **2-2 Pavement Removal**

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

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

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

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

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

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

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

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

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

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

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

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

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

**CITY OF ALBANY**  
**Standard Specifications**  
**Technical Provisions**

**Section 3**

**Earthwork**

**3-1 Earthwork**

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### **3-14 Measurement**

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

Excavating in excess of the planned or authorized cross section will not be paid for. The Contractor shall backfill and compact unauthorized excavated areas to

the original ground elevation or authorized section at no expense to the City.

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

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

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

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

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

### **3-15 Payment**

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

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

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

### **3-16 Structure Excavation and Backfill**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### **3-17 Embankment Construction**

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

1. The maximum dimension of any piece used shall be six inches.
2. Pieces larger than 4 inches shall not be placed within 12 inches of any structure.
3. Pieces larger than 3 inches shall not be placed within 12 inches of the subgrade for paving.
4. "Nesting" of pieces will not be permitted.

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

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

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

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

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

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

### **3-18 Compaction**

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

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

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

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

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

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

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

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

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

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

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

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

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 4

#### Dust Control and Watering

##### 4-1 Dust Control

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

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

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

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

##### 4-3 Dust Palliative

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

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

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

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

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

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

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

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

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

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

#### **4-4 Watering**

**4-4.1 Description** — This work shall consist of developing a water supply and furnishing all water required for the work, including water used in the performance of work paid for as extra work, and applying all water.

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

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

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

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

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

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

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

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

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

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

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

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

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

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



# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 5

#### Street Failed Area Repair

##### Street Failed Area Repair

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

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

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

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

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

- a) Removed from the project limits and disposed of as provided for in Section 6-18 of the General Provisions, or
- b) Prepared by means approved by the Director of Public Works to meet the

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

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

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

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

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

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

## **5-2 Specifications for Application of Crack Seal**

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

### **5-2.2 Materials**

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

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

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| No. 8             | 100                    |
| No. 10            | 98-100                 |
| No. 30            |                        |
| No. 40            | 0-10                   |

The sealant shall conform to the following requirements:

|                                   |         |
|-----------------------------------|---------|
| Cone Penetration,<br>77 degrees F | 40 Max  |
| Softening Point,<br>degrees F     | 175 Min |
| Resilience,<br>77 degrees F, %    | 30 Min  |

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

Modifiers may be used to facilitate blending.

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

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

Cracks with an average clear opening of ⅛ inch or more in width and less than ¾ inch in width shall be routed to provide a minimum sealant reservoir of ⅜ inch wide by ¼ inch deep. Cracks having an average clear opening wide of ¾ inch or greater need not be routed, but shall be cleaned to a minimum depth of ¾ inch. Cracks less than ⅛ inch clear opening width need not be sealed.

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

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

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

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

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

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

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

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

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

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 6

#### Subgrade Preparation

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

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

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

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

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

separate payment will be made therefor.

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

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

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

**CITY OF ALBANY**  
**Standard Specifications**  
**Technical Provisions**

**Section 7**

**Aggregate Subbase**

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

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

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

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

| <u>Sieve Size</u> | <u>Percentage Passing Sieves</u> |
|-------------------|----------------------------------|
| 3"                | 100                              |
| 2½"               | 90-100                           |
| #4                | 40-90                            |
| #200              | 0-25                             |
| #200              | 0-25                             |

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

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

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

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

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

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

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

|                      | <b>Test Method<br/>No. Calif.</b> | <b>Requirements</b> |
|----------------------|-----------------------------------|---------------------|
| Resistance (R-Value) | 301                               | 50 Minimum          |
| Sand Equivalent      | 217                               | 20 Minimum          |

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

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

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



# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 8

#### Aggregate Base

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

#### **8-2 Material**

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

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

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

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

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

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

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

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

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

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

**8-6 Measurement** — Measurement shall be by the cubic yard based on the theoretical volume obtained from the planned cross section on the contract plans. Volume shall be based on actual field measurement of the horizontal surface of subbase material placed.

**8-7 Payment** — The contract limit price per cubic yard shall include all materials, tools, equipment, labor, compacting, water, preparation of recycled material, and incidentals necessary to perform and complete the work, and no additional payment shall be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 9

#### Asphalt Concrete

**9-1 General** — This work shall consist of furnishing and placing asphalt concrete as specified in Section 39, "Asphalt Concrete," of the State Standard Specifications, and as modified herein.

Unless otherwise specified in the plans or in the Special Provisions, and as modified herein, asphalt concrete shall be Type B, half-inch maximum for surface course and Type B, three-quarter inch maximum, medium grading, for base course. Asphalt binder shall be paving asphalt, Grade AR-4000.

**9-2 Temperature** — At the time of delivery to the site of the work, the temperature of the mixture shall not be lower than 250 degrees F, or higher than 320 degrees F. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F, or during unsuitable weather. When feather-edging asphalt concrete between atmospheric temperatures of 40 degrees F to 65 degrees F, any combination of the following methods may be required by the Engineer:

- A. Heat existing asphalt.
- B. Use ¼" to ⅜" maximum aggregate asphalt.
- C. Change paving asphalt viscosity grade.
- D. Prohibit traffic on the feather-edge to prevent damage.
- E. Other methods as approved by the Engineer.

**9-3 Tolerances** — The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be specified cross section and grade of the course being constructed. Upon completion, the pavement shall be true to grade and cross section. When a 10-foot straightedge is laid on the finished surface parallel to the center line of the roadway, the surface shall not vary from the edge of the straightedge more than one-eighth inch, except at intersections or at change of grade. Any areas that are not within this tolerance shall be brought to grade immediately following the initial rolling.

However, if the paving material has been cooled below the lower limits of the

spreading temperatures specified, the surface of the pavement shall be brought to a true grade and cross sectioned by removing the paving material in the area to be repaired by an approved method to provide a minimum laying depth of one inch or new pavement material at the join line. Repairs shall not be made to pavement surfaces by feather-edging at the joining. Cost of this work shall be entirely at the Contractor's expense.

**9-4 Asphalt Binder** — Asphalt binder to be mixed with aggregate shall have a paving asphalt viscosity of AR4000 and conform to the applicable provisions of Sections 39 and 92 of the State Standard Specifications.

| MIX DESCRIPTION            | PERCENTAGE ASPHALT RANGE |
|----------------------------|--------------------------|
| (A) ¾" Max. Size Materials | 4.5 to 6.0               |
| (B) ½" Max. Size Materials | 5.0 to 7.0               |

The amount specified by the Engineer shall be within the general range of percentages of the total mixed material as shown above. The actual amount, however, will be determined through a complete asphalt concrete mix design performed on materials intended for use on this project.

The allowable tolerance in percentage of asphalt content from that percentage specified by the Engineer shall be  $\pm 0.3$  percent.

**9-5 Aggregates** — Mineral aggregate shall conform to the following requirements:

| Sieve Size | Percentage Passing Sieve for |            |
|------------|------------------------------|------------|
|            | ¾" Maximum                   | ½" Maximum |
| 1"         | 100                          | —          |
| ¾"         | 95-100                       | 100        |
| ½"         | 85-100                       | 95-100     |
| ⅜"         | 65-85                        | 80-95      |
| No. 4      | 45-65                        | 50-75      |
| No. 8      | 30-50                        | 35-60      |
| No. 30     | 15-30                        | 20-35      |
| No. 200    | 3-8                          | 3-8        |

Note: The amount of asphalt shall be the optimum as determined by Calif. Test No. 367. The exact proportions of asphalt binder and mineral aggregates shall be approved by the Engineer.

**9-6 Asphaltic Concrete Placement** — A surface course of asphaltic concrete consisting of a mixture of aggregate and asphalt that has been mixed at a central mixing plant shall be spread and compacted on the prepared subgrade to the specified thickness.

The Contractor shall protect all building foundations, planters, screens, etc., from splash, roller scrape, or overspray.

Vegetation between the edge of pavement and gutter lip shall be removed and the area treated with an approved weed killer.

Any surface to be overlaid shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt, and all other extraneous material. Pavements impregnated with grease, oil, or fuel shall be thoroughly scrubbed and then flushed and swept clean.

The asphalt concrete shall be placed in a compacted thickness as indicated on the plans.

If the pavement is constructed in lifts using an asphalt concrete base in the first lift, the base shall be thoroughly cleaned by whatever means necessary prior to the application of tack coat and the placement of the surface layer.

Initial rolling shall be performed when the sum of the air temperature and the temperature of the asphaltic concrete is between 300 and 375 degrees F.

Finish rolling shall be started after the pavement has cooled sufficiently to permit removal of the roller marks, and shall be continued in whatever direction is necessary to produce a pavement surface free of indentations.

Asphalt density is to be measured through use of a nuclear density gauge, or core tests. The nuclear gauge is preferred since results can be more conveniently determined at the time of paving.

Asphalt concrete shall be compacted to 95% relative compaction and shall be finished to the lines, grades, and cross section shown on the plans. In-place density of asphalt concrete will be determined prior to opening the pavement to public traffic.

Relative compaction will be determined by California Test 375. Laboratory specimens will be compacted in conformance with California Test 304. Lots will be established for asphalt concrete areas to be tested as specified in California Test 375.

If the test results for any lot of asphalt concrete indicates that the relative compaction is below 95.0 percent, but above 92.9 percent, the Contractor will be advised that he is not attaining the required relative compaction and that his materials or his

procedures, or both, need adjustment. Asphalt concrete spreading operations shall not continue until the Contractor has notified the Engineer of the adjustment that will be made in order to meet the required compaction.

If the test results for any lot of asphalt concrete indicate that the relative compaction is less than 93.0 percent, the asphalt concrete represented by that lot shall be removed and replaced or deducted from contract payments at the discretion of the City. Asphalt concrete spreading operations shall not continue until the Contractor makes significant adjustments to his materials or procedure or both in order to meet the required compaction. The adjustments will be agreed to by the Engineer.

Areas inaccessible to spreading and compaction equipment may be placed and compacted by such procedures as may be approved by the Engineer. Relative density requirements may be reduced to 90 percent in such areas provided they will not be subjected to vehicular traffic. Any compaction less than 90% in such areas shall be cause for rejection.

The pavement surface, when completed, shall be smooth, dense and of uniform texture and appearance. All areas shall drain and be free of standing water. The compacted thickness shall not be less than 0.02 feet of that shown on the plans. The finished surface shall not vary more than 0.02 feet in a 10-foot distance as determined by a straightedge placed in any position on the finished surface, except across flow lines.

**9-7 Certificates of Compliance** — The Contractor shall furnish the Engineer, at least two (2) weeks prior to the start of work, with a list of material sources together with Certificates of Compliance, indicating that materials to be incorporated in the work fulfill the requirements of these specifications. The Certificates of Compliance shall be signed by the material supplier or representative. The Engineer may permit the use of paving materials, aggregate, cement, lime, anti-strip agents, asphalt, or any combination thereof prior to sampling and testing when accompanied by a Certificate of Compliance.

**9-8 Equipment** — All equipment used shall be in good working condition and shall be capable of performing the work intended in a safe and satisfactory manner.

**Paving Equipment:** Asphalt concrete surfacing shall be placed with a self-propelled (vibrator type) asphalt paving machine, except where inaccessibility precludes its use. When approved by the Engineer, surfacing may be spread by means of a spreader box and, where necessary, by hand.

**Rollers:** Self-propelled compacting rollers shall comply with applicable requirements of the State Standard Specifications.

**9-9 Adjustment of Utility and Manhole Covers** — The Contractor shall adjust all City-owned (sewer, storm drain, and some street lighting) manhole and utility

covers (and all other similar structures) to finished grade in accordance with the provisions of Section 301-1.6 and Section 302-5.7 of the Standard Specifications for Public Works Construction, except as modified herein.

The Contractor shall locate and reference all manholes, valve covers, and survey monuments prior to construction.

All manholes, survey monuments and water valve covers shall be thoroughly cleaned of any construction debris resulting from the Contractor's operations.

Survey monument covers shall be adjusted as directed by the Engineer. The survey monument shall be protected in place by the Contractor. For monuments requiring resetting, the work shall be performed by a licensed land surveyor and all costs shall be at the Contractor's expense.

Manholes, meters and valve covers not owned by the City shall be adjusted to grade by the utility owner involved and at the utility company's expense. It shall be the responsibility of the Contractor to notify affected utility companies and coordinate their work with his/hers.

**9-10 Prime Coat** — The prime coat shall be liquid asphalt grade MC-70 in conformance with Sections 38-4 and 93 of the State Standard Specifications. A prime coat shall be applied to the finish surface of aggregate base at a rated of 0.25 gallons per square yard prior to asphalt concrete pavement construction.

**9-11 Tack Coat** — The tack coat shall be asphalt grade RS-1 in accordance with Section 94 of the State Standard Specifications. A tack coat shall be applied to all vertical surfaces abutting the asphalt concrete paving, to all surfaces upon which asphalt concrete overlay or resurfacing is to be constructed and to such other areas as may be directed by the Director of Public Works, at the rate of 0.02 to 0.10 gallons per square yard. The exact rate shall be as approved by the Engineer and shall provide a thorough coating of the area to receive asphalt concrete leveling course. Surfaces to receive tack coat shall be clean and free of loose and foreign material before application.

**9-12 Measurement** — Asphalt concrete shall be measured by the ton. Measurement by tons will be based on certified weighmeters, certificates showing gross, tare and net weight, and plant source; and the type and grading of the mix for each load. No measurement shall be made, regardless of acceptance of certifications, for any surfacing not meeting requirements, placed outside the lines shown, or rejected for any reason. Certificates must be given to the City at the time of delivery of the asphalt concrete. Certificates will not be accepted after the fact. When payment is by the ton, no payment for asphalt quantities exceeding five percent of the contract bid amount plus extra quantities added by contract change order will be made; such excess material shall be at no expense to the City.



**9-13 Payment** — Shall be at the unit price bid, which price and payment shall be full compensation for furnishing and placing the surfacing, complete in place, in accordance with the plans and specifications, including all labor, materials, equipment, compacting, prime coat, tack coat, and incidentals, and no additional compensation shall be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 10

#### Asphaltic Seal Coats

##### 10-1 General

**10-1.1 General** — The Contractor shall arrange for and coordinate the notification of the neighborhoods and individuals as necessary to accomplish the removal and general clearing of parked vehicles from the area of work to the extent he shall require to execute his work in a reasonable and efficient manner. The Contractor shall notify residents in advance of all paving operations or other operations that would restrict parking. This will include, but not be limited to, placing a notification at each residence or business, and on each parked car not less than thirty-six (36) hours prior to paving operations. Notification shall be reviewed and approved by the Engineer prior to issuance.

Prior to beginning operations, the Contractor shall submit a plan for maintaining traffic movements during all of his operations. Said traffic plan shall be approved by the Engineer prior to commencement of any work.

The Contractor shall execute his work in a safe, orderly and expeditious manner and shall specifically exercise due care and consideration to minimize inconvenience to residents and businesses of the project areas relative to parking of vehicles, access to properties and the movement of vehicles and persons through the work areas. To that end, general clean-up and debris removal shall be scheduled to precede surface preparation and paving work by the least feasible period of time.

**10-1.2 Weather Limitations** — The asphaltic seal shall be applied only when the existing surface is clean and free of visible moisture. The slurry seal shall be applied only when the pavement is above 50 degrees F and the atmospheric temperature is at least 60 degrees F and rising. The slurry seal may be applied at a lower atmospheric temperature (minimum 50 degrees F) upon the approval of the Engineer. The slurry seal shall not be applied if rainfall is forecast for the next four (4) hours or if air temperatures below 35 degrees F are predicted for the next 24 hours.

**10-1.3 Trial Applications** — Prior to the start of work, the Contractor shall place a test strip of at least 60 square yards in an area designated by the Engineer. The test section shall be placed using the same equipment and methods as will be used on the job. The Contractor shall also furnish the Engineer with a calibration sheet for each mixing machine used to lay the test strip. Slurry mixture placed in the test strip shall conform to the job mix. Work shall not commence without the Engineer's approval of the test strip.

**10-1.4 Pre-Inspection** — The seal coat shall not be applied until an inspection of the surface has been made by the Engineer, and the Engineer has determined the surface is suitable for seal coat application.

**10-1.5 Pavement Markers** — Immediately prior to applying the slurry seal, all pavement markers shall be masked, and all utility covers shall be protected with butcher paper and a thin layer of 30-mesh sand or by means approved by the Engineer. Upon completion of the slurry seal application, pavement marker masking shall be removed and the markers shall be cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

**10-1.6 Surface Preparation** — Preparatory repair work shall be completed prior to application of the asphalt-rubber. Repairs shall be performed when the weather will not damage the quality of the finished product. Asphaltic concrete patches shall be allowed to set a minimum of twenty-four (24) hours before asphalt-rubber is applied.

Vegetation between the edge of pavement and gutter lip shall be treated with an approved weed killer and removed.

The surface shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt, and all other extraneous material. Pavements impregnated with grease, oil, or fuel shall be thoroughly scrubbed with water and an approved detergent and then flushed and swept clean.

For the cape seal, all pavement markers shall be masked prior to applying the asphalt-rubber. In contrast, all markers shall be removed, by means approved by the Engineer, prior to applying the first asphalt-rubber lift of the double cape seal. For both the cape and double cape seals, all utility covers shall be protected by means approved by the Engineer.

No segregation of the emulsion and aggregate will be permitted.

No streaks such as caused by oversized aggregate shall be left in the finished surface. No excessive build-up nor unsightly appearance shall be permitted on longitudinal or transverse joints.

Evidence of solidification of the asphalt, balling or lumping of the aggregates, or the presence of uncrated aggregates shall be cause for rejection of the slurry.

The slurry shall be applied in such a manner that no ridges will remain.

The Contractor shall exercise care to prevent slurry from being deposited on other than asphaltic concrete surfaces. Slurry on surfaces not designated to be sealed shall be removed at the Contractor's expense. The method of slurry removal shall be approved by the Engineer.

At the direction of the Engineer and at the Contractor's expense, the Contractor shall repair and reseal all areas which have not been properly or completely sealed.

Hand squeegees shall be used to spread slurry in areas inaccessible to the slurry mixer. Care should be exercised to leave no unsightly appearance from hand work. Burlap drags, suitable to even the surface and leave a rough texture of slurry application, shall be used if the spreader box is equipped with a burlap drag.

Where the completed slurry is not uniform in color, the areas affected shall be treated to eliminate the color variation at the Contractor's expense.

**10-1.7 Post Sweeping** — All pavements shall be vacuum swept before striping, or two (2) weeks after slurry placement, whichever is sooner.

**10-1.4 Pre-Inspection** — The seal coat shall not be applied until an inspection of the surface has been made by the Engineer, and the Engineer has determined the surface is suitable for seal coat application.

## **10-2 Slurry Seal**

**10-2.1 General** — Slurry seal shall be Type II conforming to Section 37-2, "Slurry Seal," of the State Specifications, and as modified herein.

An emulsified asphalt slurry seal surface shall be applied at all locations designated on the Plans.

All incidental work such as surfacing returns, shall be done concurrently with surfacing of the street proper, and shall not be postponed for completion at a later date. All covers for utility structures and monuments shall be adequately protected before the slurry seal is applied.

The slurry seal surface shall consist of a mixture of emulsified asphalt, mineral

aggregate and water, properly proportioned, mixed and spread evenly on the surface as specified herein and as directed by the Engineer. The cured slurry shall have a homogenous appearance, fill all cracks, adhere firmly to the surface and have skid resistant texture.

**10-2.2 Materials**

**10-2.2.1 General** — Emulsion-aggregate slurry shall be a stable mixture of emulsified asphalt, mineral aggregate and water. It is intended for surface sealing of bituminous pavements.

The average applied aggregate weight per square yard based on materials applied and area covered per day shall conform to the following requirements. Additionally, the Asphalt Emulsion content and the Residual Asphalt content shall conform to the limits listed below:

|   | <b>TYPE II</b> |
|---|----------------|
| Asphalt Emulsion Content<br>Percentage of Aggregate by Dry Weight | 11-25          |
| Residual Asphalt Content<br>Percentage of Aggregate by Weight     | 7.5-13.5       |
| Pounds of Aggregate per Square Yard                               | 10-15          |

The slurry mixture shall be composed of asphalt emulsion, aggregate, mineral filler, and water. The amount of emulsified asphalt shall be determined by the wet track abrasion test results and by trial laboratory mixes in accordance with ASTM D3910. The aggregate fractions and mineral filler shall be sized, uniformly graded and combined in such proportions that the resulting mixture meets the grading requirements of the JMF. The combined aggregate and filler shall be graded smoothly and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve. The slurry seal mixture shall have the following additional characteristics:

**10-2.2.2 Consistency** — The slurry seal mixture shall contain the minimum amount of water necessary to obtain a consistency of 3-5 cm in accordance with ASTM D3910. For placing slurry on grade of 8 percent or more, adjustments shall be made to the consistency of the mixture as directed by the Engineer.

**10-2.2.3 Non-Segregation** — The mixture shall not segregate during or

after application to the pavement.

10-2.2.4 Water — Water shall be clear, potable, and compatible with the slurry mixture, and shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place.

10-2.2.5 Asphalt Emulsion — The emulsified asphalt shall conform to the requirement of Section 94 of the State Specifications using CRSI Cationic Asphaltic Emulsion.

10-2.2.6 Aggregate — The mineral aggregate shall consist of natural or manufactured sand, crushed rock or gravel, and approved fines. Smooth-textured sand of less than 1.25 percent water absorption shall not exceed 50 percent of the total combined aggregated. The aggregate shall be clean and free from dirt, vegetable matter and other deleterious substances.

Mineral fillers such as portland cement, limestone dust, and aluminum sulphate fly ash shall be considered s part of the blended aggregate and shall be used in minimum required amounts. Mineral fillers shall only be used if needed to improve the workability of the mix of gradation of the aggregate.

10-2.2.7 Gradation of Aggregate — The combined mineral aggregated shall conform to the following gradation.

| Sieve Size | TYPE II<br>Percent Passing |
|------------|----------------------------|
| 3/8        | 100                        |
| No. 4      | 90-100                     |
| No. 8      | 65-90                      |
| No. 16     | 45-70                      |
| No. 30     | 30-50                      |
| No. 50     | 18-36                      |
| No. 100    | 10-24                      |
| No. 200    | 5-15                       |

All equipment, tools and machines sued in the performance of this work shall be maintained in satisfactory working order at all times.

10-2.2.8 Accelerator or Retardant — The retardant shall be of the type stated in the JMF and approved by the Engineer. The amount of accelerator to be included in the mixture shall be that amount necessary to ensure the applied slurry can support vehicular traffic within four (4)

hours after the last application.

### **10-2.3 Equipment**

**10-2.3.1 General** --- Only equipment conforming to these specifications shall be used in performance of the work and all such equipment shall be maintained in safe and satisfactory working condition at all times.

**10-2.3.2 Mixer** — The slurry machine shall be capable of rapid discharge of the mixed materials into a spreader. The self-contained slurry unit shall be mounted on a truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation so that the slurry is spread evenly.

The slurry mixing machine shall be a continuous flow mixing unit, capable of accurately delivering a predetermined proportion of aggregate, water, emulsified asphalt, and accelerator and retardant to the mixing chamber. The mix chamber shall discharge the thoroughly mixed product on a continuous basis.

The aggregate shall be pre-wetted immediately prior to mixing the emulsified asphalt.

The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together.

The mixing machine shall be equipped with an approved fines feeder that provides a method to accurately introduce a predetermined proportion of mineral filler at the same time and location that the aggregate is fed into the mixer. The fines feeder shall be used whenever added mineral filler is a part of the aggregate blend or a dry chemical additive is used.

The mixing machine shall be equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface ahead of the spreading equipment with an application up to 0.05 gallons per square yard.

Sufficient machine storage capacity to properly mix and apply a minimum of 5 tons of the slurry shall be provided.

Proportioning devices shall be calibrated prior to placing the seal coat. The Contractor shall furnish the Engineer with a calibration sheet for each mixing machine prior to use on the job.

**10-2.3.3 Slurry Spreading Equipment** — Attached to the mixer machine

shall be a mechanical type squeegee distributor, having suitable controls to allow adjustment for variations in pavement grades and slope, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor which may result from varying grade or crowns.

- A lateral control device and a flexible strikeoff shall be provided.

The spreader box shall have an adjustable width. The box shall be kept clean, and build-up of asphalt and aggregate on the box will not be permitted.

**10-2.3.4 Cleaning Equipment** — Power brooms, power blowers, air compressors, water flushing equipment, and hand brooms shall be suitable for cleaning the surface and cracks of the old pavement.

**10-2.3.5 Hand Tools** — Hand squeegees, shovels, hand burlap drags, and other equipment shall be available for those areas inaccessible to the spreader box.

### **10-3 Application of the Slurry**

**10-3.1 General** — The amount of asphalt emulsion, aggregate, and water shall be proportioned according to Section 37-2.03 of the State Specifications and as specified herein. The Engineer shall give final approved to the design and rate of application used.

**10-3.2 Mixing Slurry** — The mixing of the slurry shall be sufficient to produce a uniform mixture of the desired consistency in accordance with the JMF. Under no circumstances shall the emulsion content be changed to control the consistency of the mix. If breaking, hardening, segregation, balling, or lumping occurs during the mixing process, the batch shall be discarded. All aggregate particles shall be uniformly coated with asphalt.

**10-3.3 Slurry Seal Application** — The surface shall be fogged with water directly preceding the spreader at a rate of 0.03 to 0.05 gallons per square yard.

The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. The water content shall be adjusted to maintain the proper consistency at the point of application.

A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained.

No segregation of the emulsion and aggregate will be permitted.



No streaks such as caused by oversized aggregate shall be left in the finished surface. No excessive build-up nor unsightly appearance shall be permitted on longitudinal or transverse joints.

Evidence of solidification of the asphalt, balling or lumping of the aggregates, or the presence of uncoated aggregates shall be cause for rejection of the slurry.

The slurry shall be applied in such a manner that no ridges will remain.

The Contractor shall exercise care to prevent slurry from being deposited on other than asphaltic concrete surfaces. Slurry on surfaces not designated to be sealed shall be removed at the Contractor's expense. The method of slurry removal shall be approved by the Engineer.

At the direction of the Engineer and at the Contractor's expense, the Contractor shall repair and reseal all areas that have not been properly or completely sealed.

Hand squeegees shall be used to spread slurry in areas inaccessible to the slurry mixer. Care should be exercised to leave no unsightly appearance from hand work. Burlap drags suitable to even the surface and leave a rough texture of slurry applications shall be used if the spreader box is equipped with a burlap drag.

Where the completed slurry is not uniform in color, the areas affected shall be treated to eliminate the color variation at the Contractor's expense. The method of treatment shall be approved by the Engineer.

#### **10-3.4 Testing**

**10-3.4.1 General** — Samples of the slurry seal mixture to be incorporated in the work shall be taken by the Engineer at the point of application. Testing of these samples shall be done at the discretion of the Engineer.

The Contractor will be notified within five (5) working days of the results of any tests performed.

**10-3.4.2 Slurry Mixture** — Each sample of slurry mixture shall be tested for conformance to the JMF. The following tests shall be performed:

Water content as percent of dry weight of slurry before extraction.

Residual asphalt content as percent of dry weight of aggregate shall be determined in accordance with ASTM D2172.

Gradation of extracted aggregate shall be determined in accordance with

ASTM C136.

Percent of emulsified asphalt in slurry mixture based on weight of dry aggregates shall be calculated.

Wet track abrasion in accordance with ASTM D3910.

10-3.4.3 Tolerances — Tolerances for individual materials as well as the slurry seal mixture are as follows:

After the designed residual asphalt content is determined, a  $\pm$  One (1) percentage point variation will be permitted.

The percent of aggregate passing each sieve shall not vary more than  $\pm$  4.0 percent from the JMF.

The percent of aggregate passing shall not go from the high end to the low of the specified range of any two successive sieves.

The slurry consistency shall not vary more than  $\pm$  0.5 cm from the JMF after field adjustments.

10-3.4.4 Access — Where necessary to provide vehicular or pedestrian crossings over the fresh slurry, the Engineer shall direct the spreading of sufficient sand to eliminate tracking or damage to the slurry mixture. Otherwise, Contractor shall provide barricades and flagmen to keep traffic off the fresh slurry.

10-3.4.5 Measurement — Measurement for slurry seal shall be at the square foot of surface completed as shown and specified to the nearest square foot. No deduction will be made for manhole or valve covers cleaned after the project. No measurement will be made for slurry seal outside the limits of work or not furnished and installed according to specifications.

10-3.4.6 Payment — Payment for slurry seal will be made at the contract unit bid price which price and payment shall include furnishing and placing, site preparation, traffic control, cleaning up, protection of all utility covers, labor, material, equipment and all incidentals to complete the work as shown and specified.

## **10-4 Specifications for Application of Asphalt-Rubber Cape Seal**

### **10-4.1 General**

**10-4.1.1 Scope** — The work to be accomplished under these specifications includes such equipment, personnel, materials, and skill as may be necessary to place an asphalt-rubber cap seal onto an existing asphaltic concrete pavement.

**10-4.1.2 Description** — As referenced in these specifications, the term “cape seal” is defined as the application of an asphalt-rubber chip seal, followed by the application of a conventional aggregate slurry seal. Similarly, “double cape seal” is defined as the application of two consecutive asphalt-rubber chip seals, followed by the application of conventional aggregate slurry seal.

#### **10-4.1.3 Control of Materials**

**Certified Test Reports:** The Contractor shall submit certified test reports stating that the following materials are in compliance with these specifications:

- ▶ Mineral Aggregates
- ▶ Bituminous Materials

**Manufacturer’s Data:** The Contractor shall submit the temperature-viscosity relationship of the asphalt cement.

**Certificate of Compliance:** The Contractor shall furnish the Engineer, at least two (2) weeks prior to the start of work, with a list of material sources together with Certificates of Compliance, indicating that materials to be incorporated in the work fulfill the requirements of these specifications. The Certificates of Compliance shall be signed by the material supplier or representative.

**10-4.1.4 Job Mix Formula** — The Contractor shall furnish the Engineer with a Job Mix Formula (JMF) for the slurry seal. The JMF prepared by the Contractor must represent materials that have been used within the previous six (6) months. The JMF must be submitted no later than two (2) weeks prior to the commencement of work. The JMF shall indicate the type and quantity of asphalt emulsion, the quantity and type of chemical additive, the residual asphalt content, the water content, aggregate type and gradation, type and quantity of mineral filler, rate of application, the abrasion loss from the wet track abrasion test, results of

consistency test, and set time and cure time in accordance with ASTM D3910. Samples of materials to be used on the job shall be used to determine the job mix.

**10-4.1.5 Delivery and Storage** — Materials delivered to the site shall be inspected by the Engineer for contamination and damage. Materials shall be unloaded and stored with a minimum of handling. Aggregates shall be stored in such a manner to protect them from contamination and segregation. All storage sites must be approved by the Engineer.

**10-4.1.6 Samples** — The Engineer shall have the right to obtain samples of all materials to be used in the work and to test such samples for the purpose of determining specification compliance. The Engineer reserves the right to obtain said samples at the point of delivery and/or at the point of manufacture. The Engineer shall also have the right to inspect sources of materials to be used in the work to determine acceptability of procedures used by the materials supplier.

## **10-5 Materials**

**10-5.1 General** — Only materials conforming to these specifications shall be incorporated in the work.

### **10-5.2 Rubberized Chip Seal**

**Asphalt:** The grade of asphalt cement of the asphalt-rubber mixture shall be AR-4000 and shall comply with the requirements of ASTM D3381.

If indicated necessary by laboratory testing, an approved anti-stripping additive may be added to the asphalt cement up to 1.0 percent by weight of asphalt.

**Granulated Reclaimed Rubber:** The granulated reclaimed rubber used shall be produced primarily from the processing of automobile and truck tires. The rubber shall be produced by ambient temperature grinding processes only.

The gradation of the granulated reclaimed rubber, when tested in accordance with ASTM C136 and using a 50 gram  $\pm$  1 gram sample, shall meet the following requirements:

| SIEVE SIZE | PERCENT PASSING |
|------------|-----------------|
| No. 8      | 100             |
| No. 10     | 95 - 100        |
| NO. 30     | 0 - 10          |
| No. 50     | 0 - 5           |

The use of rubber from multiple sources is acceptable provided that the overall blend of rubber meets the gradation requirements.

The individual granulated rubber particles, irrespective of diameter, shall not be greater in length than 3/16th inch (5 mm).

The granulated rubber shall have a specific gravity of  $1.15 \pm 0.05$  and shall be free of loose fabric, wire and other contaminants except that up to 4 percent (by weight of rubber) calcium carbonate or talc may be added to prevent rubber particles from sticking together. The rubber shall be sufficiently dry so as to be free-flowing and not produce a foaming problem when blended with the hot asphalt cement.

The granulated reclaimed rubber shall be accepted by certification from the rubber supplier.

Diluent: The diluent shall have the following properties:

|                                  |               |
|----------------------------------|---------------|
| Flash Point                      | 130°F Minimum |
| Initial Boiling Point (ASTM D86) | 340°F Minimum |
| Dry Point (ASTM D86)             | 390° - 415°F  |
| Total Saturates                  | 85% Minimum   |

Diluent shall not be added to the first asphalt-rubber lift of the double cape seal.

Polymer: For the second asphalt-rubber lift of the double cape seal, a granulated polymer modifier shall be added with the rubber to the asphalt. The type of polymer shall be approved by the Engineer and shall replace 2½ to 3 percent, by weight, of the rubber in the asphalt-rubber mixture.

Asphalt-Rubber: The asphalt-rubber supplier shall furnish to the Engineer, a minimum of two (2) weeks before the beginning of placement, the asphalt-rubber mix formulation which shall contain the following information:

|   |
|---|
| <p><b><u>Asphalt Cement</u></b><br/> Source of Asphalt Cement<br/> Grade of Asphalt Cement<br/> Percentage of Asphalt Cement by total weight of the asphalt-rubber mixture</p>  |
| <p><b><u>Granulated Reclaimed Rubber</u></b><br/> Source of Granulated Rubber<br/> Grade of Granulated Rubber<br/> Percentage of Granulated Rubber by total weight of the asphalt-rubber mixture</p> <p>If granulated rubber from more than one source is utilized, the above information will be required for each granulated rubber used.</p> |
| <p><b><u>Diluent</u></b><br/> Source of Diluent<br/> Grade of Diluent<br/> Percentage of Diluent-allowable by volume of the asphalt-rubber mixture.</p>   |

**10-5.3 Screened Aggregate** — The cover material shall be crushed stone, crushed gravel, or both, and shall consist of clean, sound, durable particles, free of soft or disintegrated fragments and foreign matter. At least 90 percent by weight of the screenings shall consist of crushed particles as determined by California Test Method 205, and at least 90 percent by weight of the particles shall have at least two fractured faces.

Screened aggregate shall be of such nature that a thorough coat of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Drying may be required, as directed.

The cover material shall be precoated, one-quarter (0.25) to three-quarters (0.75) percent, with AR-4000 paving grade asphalt at a temperature of 300 to 375 degrees F.

Maximum aggregate size for the cape seal and for the second asphalt-rubber lift of the double cape seal shall conform to the following grading as per ASTM C136 and C117:

| SIEVE SIZE | PERCENT PASSING<br>3/8" x NO. 6 |
|------------|---------------------------------|
| 3/4"       | —                               |
| 1/2"       | 100                             |
| 3/8"       | 90-100                          |
| No. 4      | 5-30                            |
| No. 8      | 0-10                            |
| No. 16     | 0-5                             |
| No. 30     | —                               |
| No. 200    | 0-1                             |

Maximum aggregate size for the first asphalt-rubber lift of the double cape seal shall conform to the following grading as per ASTM C136 and C117:

| SIEVE SIZE | PERCENT PASSING<br>1/2" x NO. 6 |
|------------|---------------------------------|
| 5/8"       | 100                             |
| 1/2"       | 95-100                          |
| 3/8"       | 0-40                            |
| 1/4"       | 0-15                            |
| No. 8      | 0-2                             |
| No. 200    | 0-1                             |

Aggregate screenings shall also conform to the following requirements:

| TEST   | RESULTS |
|--|---------|
| Loss in L.A. Rattler per ASTM C131 (after 100 revolutions) | 10% Max |
| Loss in L.A. Rattler per ASTM C131 (after 500 revolutions) | 40% Max |
| Film Stripping per California Test Method 302              | 25% Max |
| Cleanness Value per California Test Method 227             | 75 Min  |

Samples of the proposed aggregate shall be submitted to the asphalt-rubber supplier, a minimum of twenty-one (21) days prior to application, to test for aggregate stripping characteristics. The results shall be submitted to the Engineer.

## **10-5.4 Equipment**

**10-5.4.1 General** — Only equipment conforming to these specifications shall be incorporated in the work and all such equipment shall be maintained in safe and satisfactory working condition at all times.

### **10-5.4.2 Rubberized Chip Seal**

**General:** The equipment used by the Contractor shall include a self-propelled rotary power broom or mobile pickup broom for pavement cleaning and excess cover material removal.

**Asphalt-Rubber Equipment:** All equipment utilized in the production and application of the asphalt-rubber shall be as described as follows:

An asphalt heating tank with a hot oil heat transfer system or retort heating system, capable of heating asphalt cement to the necessary temperature for blending with the granulated rubber. This unit shall be capable of heating a minimum of 3,000 gallons of asphalt cement.

An asphalt-rubber mechanical blender with a two-stage continuous mixing process, capable of producing a homogenous mixture of asphalt cement and granulated rubber, at the mix design specified ratios, as directed by the Engineer. This unit shall be equipped with a granulated rubber feed system capable of supplying the asphalt cement feed system, as not to interrupt the continuity of the blending process. A separate asphalt cement feed pump and finished product pump are required. The mechanical blender shall have both an asphalt cement totalizing meter in gallons and a flow rate meter in gallons per minute.

A truck or trailer mounted self-powered distributor truck equipped with a retort heating unit, and an internal mixing device capable of maintaining a uniform mixture of asphalt cement and granulated rubber. It shall be equipped with a full circulating spreader bar and a pumping system capable of applying asphalt-rubber material within  $\pm 0.05$  gallons per square yard tolerance of the specified application rate and must give a uniform covering of the surface to be treated. The distributor shall have a boot board on the rear of the vehicle and a bootman shall accompany the distributor. The bootman shall ride in a position so that all spray bar tips are in full view and readily accessible for unplugging if a plugged tip should occur. The distributor shall also include a tachometer, pressure gauge, volume measuring device and a thermometer.

The Engineer reserves the right to order the discontinuance of use of equipment, which, in his opinion, fails to produce a satisfactory distribution



of asphalt-rubber in accordance with these specifications.

**Cover Material Spreader:** The cover material (Chip) spreader shall be a self-propelled machine with an aggregate receiving hopper in the rear, belt conveyors to carry the aggregate to the front, and a spreading hopper equipped with a full-width distribution auger and spread roll. The spreader shall be in good mechanical condition and be capable of applying the cover material uniformly across the spread at the specified rate.

**Rolling Equipment:** A minimum of three operational self-propelled pneumatic-tired rollers shall be used for the required rolling of the cover material. The pneumatic-tired rollers shall carry a minimum loading of 3,000 pounds on each wheel and a minimum air pressure of 100 pounds per square inch in each tire.

**Hauling Equipment:** Trucks for hauling cover material shall be tailgate discharge and shall be equipped with a device to lock onto the hitch at the rear of the cover material spreader. Haul trucks shall also be compatible with the cover aggregate spreader so that the dump bed will not push down on the spreader when fully raised, or have too short a bed which results in aggregate spillage while dumping into the receiving hopper.

#### **10-5.4.3 Slurry Seal**

**Mixer:** The slurry machine shall be capable of rapid discharge of the mixed materials into a spreader. The self-contained slurry unit shall be mounted on truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation so that the slurry is spread evenly.

The slurry mixing machine shall be a continuous flow mixing unit, capable of accurately delivering a predetermined proportion of aggregate, water, emulsified asphalt, and accelerator and retardant to the mixing chamber. The mix chamber shall discharge the thoroughly mixed product on a continuous basis.

The aggregate shall be pre-wetted immediately prior to mixing the emulsified asphalt.

The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together.

The mixing machine shall be equipped with an approved fines feeder that provides a method to accurately introduce a predetermined proportion of mineral filler at the same time and location that the aggregate is fed into

the mixer. The fines feeder shall be used whenever added mineral filler is a part of the aggregate blend or a dry chemical additive is used.

The mixing machine shall be equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface ahead of the spreading equipment with an application up to 0.05 gallons per square yard.

Sufficient machine storage capacity to properly mix and apply a minimum of 5 tons of the slurry shall be provided.

Proportioning devices shall be calibrated prior to placing the seal coat. The Contractor shall furnish the Engineer with a calibration sheet for each mixing machine prior to use on the job.

Slurry Spreading Equipment: Attached to the mixer machine shall be a mechanical type squeegee distributor, having suitable controls to allow adjustment for variations of pavement grades and slope, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor which may result from varying grades or crowns.

A lateral control device and flexible strikeoff shall be provided.

The spreader box shall have an adjustable width. The box shall be kept clean, and build-up of asphalt and aggregate on the box will not be permitted.

The use and condition of burlap drags or other drags shall be approved by the Engineer.

Cleaning Equipment: Only vacuum sweepers will be permitted to clean the cape seal surface prior to slurry seal placement.

Hand Tools: Hand squeegees, shovels, hand burlap drags, and other equipment shall be available for those areas inaccessible to the spreader box.

## **10-5.5 Execution**

### **10-5.5.1 General**

Notification of Work: A minimum of ten (10) working days prior to the start of any work, the Contractor shall submit a Work Phasing Schedule for the approval of the Engineer.

Prior to the start of any construction, the Contractor shall notify the Albany Fire Department and the County Sheriff giving the approximate starting date, anticipated completion date, and the name and telephone number of a person who may be contacted at any hour in the event of a critical condition requiring immediate attention. It shall also be the Contractor's responsibility to notify the Engineer seventy-two (72) hours prior to the start of construction to review traffic control plans.

Material Disposal: The Contractor shall remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up of spillage will be at the Contractor's expense.

All material removed from the site shall be disposed of at the Contractor's expense at a site approved by the Engineer.

#### 10-5.5.2 Asphalt-Rubber

General: Due to the handling characteristics of the asphalt-rubber, when radii and other irregular areas are to be sealed, it is recommended that this be done with an RS or CRS chip seal emulsion or paving grade asphalt cement.

Asphalt-Rubber Mixing Reaction: The percentage of granulated rubber shall be 23 percent  $\pm$  3 percent by weight of total asphalt-rubber mixture, the exact granulated rubber content shall be as determined by the mix design submitted by the asphalt-rubber supplier. During membrane placement, the granulated rubber percentage shall not fluctuate by more than one (1) percent by weight of total asphalt-rubber mixture.

The temperature of the asphalt cement shall be between 350 and 425 degrees F at the addition of the granulated rubber. The asphalt and rubber shall be combined and mixed together in the asphalt-rubber blending unit and reacted in the distributor for a period of time as required by the Engineer which shall be based on laboratory testing by the asphalt-rubber supplier. The temperature of the asphalt-rubber mixture shall be above 325 degrees F during the reaction period.

After the reaction between asphalt cement and granulated rubber has occurred, the viscosity of the hot asphalt-rubber mixture may be adjusted for spraying and/or better "wetting" of the cover material by the addition of a diluent. The diluent shall comply with the requirements of Section 2.2.3 herein and shall not exceed 7.5 percent by volume of the hot asphalt-rubber mixture.

When a job delay occurs after full reaction, the asphalt-rubber may be

allowed to cool. The asphalt-rubber shall be reheated slowly just prior to application but not to a temperature exceeding 350 degrees F. And additional quantity of diluent not exceeding 3 percent by volume of the hot asphalt-rubber mixture may be added after reheating.

Application of Asphalt-Rubber Material: Placement of the asphalt-rubber will be permitted only under the following conditions:

- ▶ The pavement surface temperature is 60 degrees F and rising.
- ▶ The pavement surface is clean and absolutely dry.
- ▶ The wind conditions are not excessive.
- ▶ All construction equipment such as asphalt-rubber distributor, cover material spreader, haul trucks with cover material, and rollers are in position and ready to commence asphalt-rubber placement operations.

As directed by the Engineer, the asphalt-rubber mixture shall be applied at a temperature of 290 to 340 degrees F at a rate of 0.50 to 0.55 gallons per square yard for the cape seal and the second lift of double cape seal, and at a rate of 0.70 gallons per square yard for the first lift of the double cape seal.

Transverse joints shall be constructed by placing building paper across and over the end of the previous asphalt-rubber application. Once the spraying has progressed beyond the paper, the paper shall be removed immediately and disposed of as directed by the Engineer. All longitudinal joints shall not exceed a four inch overlap.

The asphalt-rubber shall not be applied until sufficient screenings are on hand for immediate cover.

The asphalt-rubber shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one application.

The asphalt-rubber shall not be spread a greater distance than can be immediately covered by aggregate screenings, unless otherwise permitted by the Engineer.

Spreading of Screened Aggregate: Cover material shall be spread immediately and uniformly over the asphalt-rubber at a spreading rate of 30 to 34 pounds per square yard.

At the time of application to the asphalt-rubber, cover material shall be surface dry so as to gain proper adhesion to the asphalt-rubber material.

The joint between adjacent applications of aggregate shall coincide with the line between designated traffic lanes.

Operating the aggregate-spreading equipment at speeds which cause the chips to roll over after striking the asphalt-rubber surface will not be permitted.

The transverse cut off of screenings shall be complete and any excess screenings shall be removed from the surface prior to resuming operations.

Stockpiling of aggregate prior to precoating will be permitted; however, any contamination resulting from storage or reloading will be cause for rejection. No stockpiling of precoated aggregate will be permitted.

Finishing: After the screenings have been spread upon the asphalt-rubber, any piles, ridges, or uneven aggregate distribution shall be carefully removed to insure against permanent ridges, bumps or depressions in the completed surface before the surface is rolled. Additional screenings shall be spread in whatever quantities necessary to prevent picking up by the rollers or traffic.

At least 3 operational pneumatic-tired rollers complying with the requirements of Section 3.2.4 shall be provided to accomplish the required embedment of the cover material. At some project locations, or where production rates dictate, 2 operational pneumatic-tired rollers may be utilized as directed by the Engineer.

Sufficient rollers shall be used for the initial rolling to cover the width of the aggregate spread with one pass. The first pass shall be made immediately behind the cover material spreader, and if the spreading is stopped for an extended period, the cover material spreader shall be moved ahead or off the side, so that all cover material may be immediately rolled. Four complete passes with rollers shall be made with all rolling completed within one hour after the application of the cover material.

Sweeping of loose cover material can begin a minimum of one (1) hour after placement and shall be completed no later than twenty-four (24) hours after placement.

Excess screenings which in the opinion of the Engineer are not salvageable and which interfere with drainage shall be removed and disposed of by the Contractor at the Contractor's expense. The removed screenings shall be

disposed of as directed by the Engineer.

The completed surface shall present a uniform appearance and shall be thoroughly compacted and free from ruts, humps, depressions, and irregularities due to an uneven distribution of asphalt-rubber or aggregate screenings.

The second asphalt-rubber lift shall be applied a minimum of twenty-four (24) hours after the cover aggregate for the first lift is placed. All loose cover material shall be swept prior to the application of the second asphalt-rubber lift.

Pavement Markers: For the cape seal, pavement marker masking shall be removed and the markers cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

Set and Cure Time: Except when it is necessary that hauling equipment must travel on the newly applied membrane, traffic of all types shall be kept off the membrane until it has had time to set properly. The speed of all hauling equipment shall not exceed 15 miles per hour when traveling over a membrane which is not adequately set. The minimum traffic-free period shall not be less than one (1) hour.

For optimum results, the asphalt-rubber chip seal (single and double applications) should be allowed to cure for a minimum of one (1) week prior to the application of the emulsified asphalt slurry seal.

### 10-5.5.3 Slurry Seal

Mixing Slurry: The mixing of slurry shall be sufficient to produce a uniform mixture of the desired consistency in accordance with the JMF. Under no circumstances shall the emulsion content be changed to control the consistency of the mix. If breaking, hardening, segregation, balling, or lumping occurs during the mixing process, the batch shall be discarded. All aggregate particles shall be uniformly coated with asphalt.

Slurry Seal Application: The surface shall be fogged with water directly preceding the spreader at a rate of 0.03 to 0.05 gallons per square yard.

The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. The water content shall be adjusted to maintain the proper consistency at the point of application.

A sufficient amount of slurry shall be carried in all parts of the spreader

at all times so that complete coverage is obtained.

**Pavement Markers:** Upon completion of the slurry seal application for the cape seal, pavement marker masking shall be removed and the markers cleaned, as needed and by means approved by the Engineer, to ensure proper reflectivity.

**Sweeping:** All pavements shall be vacuum swept before striping, or two (2) weeks after slurry seal placement, whichever is sooner.

**Adjustment of Utility and Manhole Covers:** For the double cape seal, the Contractor shall adjust all manhole and utility covers (and all other similar structures) to finished grade in accordance with the provisions of Section 301-1.6 and Section 302-5.7 of the Standard Specifications, except as modified herein.

The Contractor shall locate and tie out all manholes, valve covers, and survey monuments prior to construction.

All manholes, survey monuments and water valve covers shall be thoroughly cleaned of any construction debris resulting from the Contractor's operations.

Survey monument covers shall be adjusted as directed by the Engineer. The survey monument shall be protected in place by the Contractor. For monuments requiring resetting, the work shall be performed by a licensed land surveyor and all costs shall be at the Contractor's expense.

Manholes, meters and valve covers not owned by the City shall be adjusted to grade by the utility owner involved and at the utility company's expense. It shall be the responsibility of the Contractor to notify affected utility companies.

**10-5.5.4 Measurement and Payment** — Payment for the cape seal and the double cape seal shall be made at the contract unit price per square yard in the Bid Schedule and shall be based on as placed field measurements. The contract unit price shall include full compensation for all labor, equipment, and materials necessary to complete the cape and double cape seal applications, including mobilization, pavement cleaning, posting of notices, masking and cleaning of pavement markers (cape seal only), adjusting utility and manhole covers (double cape seal only), and all other incidental work.

### **10-5.5 Testing**

**10-5.5.1 General** — Samples of the component materials and slurry mixture to be

incorporated in the work shall be taken by the Engineer at the point of application. Testing of materials shall be done at the discretion of the Engineer.

The Contractor will be notified within five (5) working days of the results of any tests performed.

10-5.5.2 Rubberized Chip Seal — Samples of component materials shall include asphalt cement, asphalt-rubber, and aggregate screenings.

10-5.5.3 Slurry Mixture — Each sample of slurry mixture shall be tested for conformance to the JMF. The following tests shall be performed:

- ▶ Water content as percent of dry weight of slurry before extraction.
- ▶ Residual asphalt content as percent of dry weight of aggregate shall be determined in accordance with ASTM D2172.
- ▶ Gradation of extracted aggregate shall be determined in accordance with ASTM C136.
- ▶ Percent of emulsified asphalt in slurry mixture based on weight of dry aggregates shall be calculated.
- ▶ Wet track abrasion in accordance with ASTM D3910.

10-5.5.4 Tolerances — Tolerances for individual materials, as well as the slurry seal mixture, are as follows:

After the designed residual point asphalt content is determined, a  $\pm$  one (1) percentage point variation will be permitted.

The percent of aggregate passing each sieve shall not vary more than  $\pm$  4.0% from the JMF.

The percent of aggregate passing shall not go from the high end to the low of the specified range of any two successive sieves.

The slurry consistency shall not vary more than  $\pm$  0.5 cm from the JMF after field adjustments.



# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 11

#### Hot Surface Recycling

**11-1 General** — The work covered by this section of the specifications consists of furnishing all labor, equipment and materials and performing all operations in connection with heating, scarifying, leveling, compacting, and applying a recycling agent.

**11-2 Cleaning** — Prior to commencing heater scarifying operations, the pavement shall be cleaned of all loose material and vegetation. Power brooms shall be supplemented when necessary by hand brooming and such other tools as required to bring the surface to a clean, suitable condition, free of deleterious material. Any required failed area repair shall be completed prior to beginning the process. The locations of required repair will be marked in the field by the Engineer. Intruding concrete and asphalt concrete ramps in the street shall be removed as approved by the Engineer.

**11-3 Equipment** — The equipment used to heat and scarify asphalt surfaces shall fully meet State and Local Air Pollution Standards. The combustion chamber shall be insulated and totally enclosed to provide sufficient heat to the pavement in order to achieve specified performance. The machine shall be equipped with multiple rows of spring equalized scarifier to insure a viscous shearing of the heated asphalt and to provide uninterrupted scarification contiguous to rigid structures. A competent operating crew shall be provided.

The equipment used to distribute and level the scarified material shall be an approved paving machine equipped with a heated tamping or vibratory screed. The contractor may furnish another type screed if approved by the Engineer. The machine must be capable of screeding the full width of scarified material. A competent operating crew shall be provided.

One twelve (12) ton or greater pneumatic-tired roller and operator shall be furnished to compact the scarified material.

On cab-controlled, liquid spreader with operator shall be furnished to distribute the asphalt recycling agent.

**11-4 Construction Methods** — Contractor shall heater-scarify from the gutters toward the center of streets in a manner as approved by the Engineer. A minimum of two heater units will be utilized in tandem so that the heat emitted and the rate of travel will achieve specified requirements.

The number of additional heater units shall be determined by the contractor; however, only the scarifier rake on the final heater unit of the series shall scarify.

The existing asphalt surface shall be heated from 6 to 12 inches wider than the width to be processed. The temperature of the scarified material shall be a minimum of 220°F and shall not exceed 300°F when measured with a stick thermometer immediately behind the scarifier.

The weight of existing asphalt surface has been estimated to be approximately 144 pounds per cubic foot. On this basis, a minimum of nine pounds per square foot of existing surface shall be scarified to obtain a depth of not less than 0.07 feet. IF the tests indicate that the material weighs either less than 137 or more than 151 pounds per cubic foot, the weight per square foot requirement will be adjusted accordingly by the Engineer.

Scarification will be deemed acceptable when the moving average of three consecutive random weight tests per hour indicates that the required depth has been scarified. The weight of the existing asphalt surface will be determined in accordance with the requirements of AASHTO T-166 from scarified material compacted in accordance with requirements of AASHTO T-245, with the exception that the compaction temperature shall be a minimum of 260°F.

The scarified material shall be distributed and leveled only for the width processed and rolled immediately while it possesses sufficient heat to be properly compacted. The specified grade of recycling agent shall be applied diluted 2 parts recycling agent, preferably within 30 minutes, but in no event more than 8 hours after compaction. The rate of application shall be determined by the Engineer based on preconstruction laboratory analysis and adjustments for varying field conditions.

It is the contractor's responsibility to notify and arrange with utility companies for the protection and modification of their improvements in hot surface recycling areas, and to protect all City-owned utility covers, of no expense to the City.

The asphalt recycling agent shall be composed of a petroleum base resin uniformly emulsified with water and shall conform to the following physical and chemical requirements:

## GUIDELINES FOR ASPHALT RECYCLING AGENTS

|  | Test Method                |                           | Requirements |      |              |      |
|--|----------------------------|---------------------------|--------------|------|--------------|------|
|  |                            |                           | Light Grade  |      | Medium Grade |      |
|  | ASTM                       | AASHTO                    | Min.         | Max. | Min.         | Max. |
| <b>Test on Emulsion:</b>   |                            |                           |              |      |              |      |
| Viscosity @ 25°C, SFS  | D244-77                    | T59-74                    | 15           | 85   | 15           | 85   |
| Residue, %   | D244-77 (Mod) <sup>1</sup> | T59-74 (Mod) <sup>1</sup> | 60           | —    | 60           | —    |
| Cement Mixing Test, %  | D255-77                    | T59-74                    | —            | 2.0  | —            | 2.0  |
| Sieve Test, %  | D244-77 (Mod) <sup>2</sup> | T59-74 (Mod) <sup>2</sup> | —            | 0.1  | —            | 0.1  |
| Particle Charge Test   | D244-77                    | T59-74                    | Positive     |      | Positive     |      |
| <b>Test on Base Oil<sup>3</sup>:</b>   |                            |                           |              |      |              |      |
| Original   |                            |                           |              |      |              |      |
| Viscosity @ 60°C, cST  | D2170-76                   | T201-74                   | 80           | 500  | 1000         | 4000 |
| Flash Point, COC, °C   | D92-78                     | T48-74                    | 204          | —    | 210          | —    |
| Saturates, % <sup>4</sup>  | D2007-75                   | —                         | —            | 30   | —            | 2.5  |
| Asphaltenes, %   | D2006-70                   | —                         | —            | 1.5  | —            | 9.0  |
| PC/S Ratio <sup>5</sup>  | D2006-70                   | —                         | 0.5          | —    | 0.5          | —    |
| Maltenes Distribution Ratio<br>(PC+A <sub>2</sub> )/(S+A <sub>2</sub> ) <sup>5</sup> | D2006-70                   | —                         | 0.2          | 1.0  | 0.2          | 1.2  |
| <b>Test on Residue From<br/>RTF-C Oven Test @ 163°C</b>                              |                            |                           |              |      |              |      |
| Viscosity Ratio <sup>6</sup>   | D2170-76                   | T201-74                   | —            | 3.0  | —            | 2.5  |
| RTF-C Oven Wt. Change, %   | D2872-77                   | T240-73                   | —            | 6.5  | —            | 2.0  |

<sup>1</sup>ASTM D244 Modified Evaporation Test for percent residue is made by heating a 50 gram sample to 149°C until foaming ceases, then cool immediately and calculate results.

<sup>2</sup>Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2% sodium oleate solution.

<sup>3</sup>Values obtained on the emulsion's residue may vary slightly from the base oil.

<sup>4</sup>ASTM D2006-70 can be used for the determination of saturates.

<sup>5</sup>In the Maltenes Distribution Ratio Test by ASTM Method D2006-70

PC = Polar Compounds

A<sub>1</sub> = First Acidaffins

A<sub>2</sub> = Second Acidaffins

S = Saturates

<sup>6</sup>Viscosity Ratio =

$$\frac{\text{RTC-C Viscosity @ 60°C, cST}}{\text{Original Viscosity @ 60°C, cST}}$$

**11-5 Prequalification Clause** — The Engineer shall require the successful bidder to submit a list of five comparable size projects performed using the equipment and techniques specified. Said list shall include the agency, name, address and telephone number of Engineers in charge.

In lieu of the above, the Contractor may qualify his equipment by a demonstration on this or comparable work to the satisfaction of the Engineer. Equipment not approved by the Engineer shall be removed from the project and acceptable machines supplied. The cost of this demonstration shall be borne by the supplier.

Street trees and plants in the parking strip area shall be sprayed with water to protect from heat and flame immediately prior to heater scarifying operation.

**11-6 Air Quality Preservation** — The machine shall be operated in compliance with standards of the Bay Area Air Quality Control District.

**11-7 Application of overlay** — Asphalt concrete surfacing in accordance with Section 9 of these specifications shall be done immediately after hot surface recycling. The Contractor shall clean the surface of the area to be paved prior to the paving operation.

**11-8 Measurement** — Heating, scarifying, leveling and compacting of the pavement shall be paid for at the contract unit price per square yard.

**11-9 Payment** — The contract unit price paid per square yard of hot surface recycling shall include full compensation for furnishing all labor, materials, tools, recycling agent and equipment, and doing all other incidental work involved in recycling the existing asphalt concrete surface as specified, and no additional payment should be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 12

#### Asphalt Concrete Leveling Course & Crack Fill Repairs

##### 12-1 Asphalt Concrete Leveling Course

**12-1.1** — Asphalt leveling course shall be placed in areas designated by the Engineer prior to placing any designated asphalt seal coat, interlayer or asphalt concrete overlay.

The area to be leveled shall be well cleaned, loose material removed and a tack coat applied.

**12-1.2 Tack Coat** — Tack coat shall be asphalt grade RSW-1 in accordance with Section 94 of the State Standard Specifications. It shall be applied at the rate of 0.02 to 0.10 gallons per square yard; the exact rate of application shall be as approved by the Engineer and shall provide a thorough coating of the area to receive asphalt concrete leveling course.

**12-1.3 Material for Leveling Course** — The asphalt concrete leveling course shall be of such aggregate gradation to ensure a smooth conform with the existing pavement surface can be achieved. The maximum size aggregate shall be  $\frac{3}{8}$ -inch.

**12-1.4 Placement** — The asphalt leveling course shall be placed in areas as marked by the Engineer. The material shall be placed and compacted in such a manner as to ensure a uniform cross section is achieved with the adjacent existing surface.

In place density of the leveling course shall not be less than as specified by Section 9-6 of the Technical Provisions.

**12-1.5 Measurement** — The quantity of asphalt concrete leveling course will be measured on a square foot basis or tonnage basis as indicated in the bid proposal. Final quantities for payment purposes must be agreed upon by the Engineer prior to placing any subsequent seal coat, interlayer or asphalt paving.

**12-1.6 Payment** — The contract unit price paid for placing asphalt concrete leveling course shall be at unit price.

## **12-2 Crack Fill Repair**

**12-2.1 General** — This work shall consist of placing asphalt concrete and/or asphalt rubber crack sealant in pavement cracks as directed by the Engineer.

**12-2.2 Preparation** — Cracks designated to be repaired shall be cleaned to a minimum depth of  $\frac{3}{4}$ -inch by blast cleaning or hand methods, followed by high pressure air jets, to remove all vegetation, residue, moisture and foreign matter. Cracks from which vegetation is removed shall receive an application of a nonpetroleum-based weed killer.

Cracks wider than one (1) inch and greater than three (3) inches in depth shall be filled to within one (1) inch of surface grade with sand and hand tamped. The sand shall be  $\pm 1$  percent saturated surface dry at the time it is placed and compacted. Cleaned cracks shall receive a tack coat in accordance with Section 12-1.2.

Cracks designated to be repaired with an average clear opening of  $\frac{1}{8}$ -inch or more in width and less than  $\frac{3}{8}$ -inch in width shall be routed to provide a minimum sealant reservoir of 1 inch wide by  $\frac{3}{4}$ -inch deep. Cracks having an average clear opening width of  $\frac{3}{8}$ -inch or greater need not be routed, but shall be cleaned to a minimum depth of  $\frac{3}{4}$ -inch. Cracks less than  $\frac{1}{8}$ -inch clear opening width will not be sealed.

**12-2.3 Asphalt Repairs** — Cracks greater than one (1) inch in width and three (3) inches in depth shall receive a one (1) inch thick application of hand compacted asphalt concrete, after placing the sand backfill as specified in Section 12-2.2.

The maximum gradation of aggregate for the asphalt concrete for crack repairs shall be  $\frac{3}{8}$ -inch.

The asphalt concrete crack repair shall be placed and compacted in such a manner as to provide a finish surface flush with the surrounding pavement.

**12-2.4 Asphalt Rubber Crack Sealant** — The sealant shall consist of a mixture of paving grade asphalt and vulcanized granulated crumb rubber. The mixture shall contain not less than 25 percent granulated reclaimed rubber, by weight. Rubber gradation shall conform to the following requirements:

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

The sealant shall conform to the following requirements:

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

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

Modifiers may be used to facilitate blending.

Each lot of sealant shipped to the job site shall be accompanied by a Certificate of Compliance.

Exposed surfaces shall be dry at the time the sealant is applied.

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

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

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

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

**12-2.5 Measurement** — Crack filling shall be measured on a per foot basis for the type of repair.

**12-2.6 Payment** — The contract unit price paid for the type of crack repair shall be considered as including full compensation for all labor, tools, material, equipment, including but not limited to preparation and tack coat and no additional compensation shall be made therefor.

If there is no bid item in the “Bid Proposal” form, then compensation for crack repairs designated by the City shall be paid for as extra work.



# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 13

#### Cold Planing

**13-1 General** — The work to be accomplished under these specifications includes such equipment, personnel, materials and skill as may be necessary to complete all operations associated with planing an existing bituminous pavement in accordance with these specifications.

As referenced in these specifications, the term “cold plane” is defined as milling the existing asphaltic concrete surface to a uniform depth of two (2) inches, except adjacent to existing curbs where the depth shall be one (1) inch.

**13-2 Surface Preparation** — Prior to commencing work, the existing pavement shall be cleaned of all loose material and all interfering pavement markers shall be removed. Power brooms shall be supplemented, when necessary, by hand brooming in order to bring the surface to a clean, suitable condition, free of deleterious material, acceptable to the Engineer.

#### **13-3 Equipment**

**13-3.1 General** — Only equipment conforming to these specifications shall be used and all such equipment shall be maintained in safe and satisfactory working condition at all times.

**13-3.2 Planer** — The equipment for removing the asphaltic concrete pavement shall be a commercially designed and manufactured machine capable of performing the work in a manner satisfactory to the Engineer.

The machine shall be power-operated and self-propelled, and shall have sufficient power, traction and stability to remove a thickness of bituminous surface to a specified depth, and provide a uniform profile and cross slope. The machine shall be capable of accurately and automatically establishing profile grades (within  $\pm 1/8$  inch) along each edge of the machine by referencing from the existing pavement by means of a ski or matching shoe, or from an independent grade line. The machine shall have an automatic system for controlling grade elevation and

cross slope. The machine shall be equipped with a means to effectively control dust generated by the cutting operation.

**13-4 Planing Operation** — The nature and condition of the planer and the manner in which the work is performed shall be such that the pavement is not torn, gouged, shoved, broken, or otherwise damaged by the planing operation. The surface resulting from the cold planing operation shall be characterized by uniform, discontinuous longitudinal striations or other uniform pattern.

The Contractor shall furnish one or more planing machines and an experienced operator for each machine.

Removal shall consist of planing and cutting the pavement to form a keyway header cut or full width regrading, and removing the loosened material. If required by the Engineer, a one-inch minimum header shall be cut along structures to eliminate feathering and permit new asphalt concrete to be laid in full thickness.

Sufficient passes or cuts shall be made so that all irregularities and high spots are eliminated to the satisfaction of the Engineer.

Asphaltic concrete that cannot be removed by cold planing equipment because of physical or geometrical restraints will be removed by other methods acceptable to the Engineer.

The surface tolerance produced shall be such that a ten-foot straight edge laid laterally will indicate variances of less than 1/4 inch.

Before opening the milled surface to traffic, all loose material shall be removed from the milled surface and the surface swept with a power broom.

If the road is to remain open to traffic, longitudinal and vertical drop-offs in excess of two (2) inches at a lane line or at centerline shall not be left unattended.

Transverse faces existing at the end of a work period should be tapered in a manner approved by the Engineer to avoid a hazard for traffic.

No aggregate shall remain on the project at the end of each work day. Aggregate material loosened and designated for removal shall become the property of the Contractor and shall be disposed off site, or may be incorporated as trench backfill or material in compliance with other applicable provisions of these Specifications.

**13-5 Material Disposal** — The Contractor shall remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up of spillage will be at the Contractor's expense.

All material removed from the site shall be disposed of at the Contractor's expense at a site designated and approved by the Engineer.

**13-6 Measurement and Payment** — Asphalt planing performed and completed in accordance with these specifications shall be paid for by the measured square yardage, regardless of depth as measured on site by the Engineer.

The contract unit price shall be full compensation for furnishing all labor, materials, equipment, tools and incidentals to complete the work specified, including but not limited to the hauling of milled material, replacement of vehicle detector loops, working around existing surface improvements and protecting adjacent improvements from damage, and no additional compensation shall be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 14

#### Pavement Reinforcing Fabric

**14-1 General** — Pavement reinforcing fabric shall be placed on existing pavement to be surfaced or between layers of asphalt concrete when such work is shown on the plans, or specified in the special provisions, or ordered by the Engineer.

**14-2 Materials** — Pavement reinforcing fabric shall be manufactured from polyester, polypropylene, or polypropylenenylon material. The fabric shall be nonwoven, and shall conform to the following:

|  |            |
|--|------------|
| Weight, ounces per square yard                   |            |
| ASTM Designation: D 1910 . . . . .               | 3.0 to 8.0 |
| Grab tensile strength (1-inch grip), pounds min. |            |
| ASTM Designation: D 1117 . . . . .               | 90         |
| Elongation at break, percent min.                |            |
| ASTM Designation: D 1117 . . . . .               | 40         |
| Fabric thickness, mils.                          |            |
| ASTM Designation: D 461 . . . . .                | 12 to 100  |

The following fabrics have been found to meet the requirements of these specifications: Amoco, Amopave, Petromat, Fibretex AO, or approved equal designed specifically for asphalt overlays. When these materials are used, a mill certificate or affidavit indicating that the material to be installed is the same material as one of those named above, and that the fabric does meet the specifications, shall be submitted to the Engineer.

**14-3 Surface Preparation** — Before placing the pavement reinforcing fabric, a binder of paving asphalt shall be applied to the surface to receive the pavement reinforcing fabric at an approximate rate of 0.25-gallon per square yard of surface covered. The exact rate will be determined by the Engineer. The binder shall be applied to a width equal to the width of the fabric mat plus 3 inches on each side.

The temperature of the asphalt binder shall be greater than 300 degrees F when applied, but shall not exceed 325 degrees F when the fabric is placed. The width of the sprayed application shall be no more than 6 inches and no less than 2 inches wider than the fabric width.

Before applying binder, large cracks, spalls and chuckholes in existing pavement shall be repaired as directed by the Engineer, and such repair work will be paid for provided by Section 5, "Street Failed Area Repair," and Section 9, "Asphalt Concrete," of these specifications.

**14-4 Placing** — The fabric shall be stretched, aligned, and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric is 1/2 inch or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. Lap in excess of 2 inches shall be removed.

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

If manual laydown methods are used, the fabric shall be unrolled, stretched, aligned, and placed in increments of approximately 30 feet.

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

Seating of the fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicle shall be gradual and kept to a minimum to avoid damage.

A small quantity of asphalt concrete, to be determined by the Engineer, may be spread over the fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being picked up by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric, except that public cross traffic shall be allowed to cross the fabric, under traffic control, after the Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of the fabric with rolling equipment. If necessary, exposed binder material shall be covered lightly with sand.

**14-5 Measurement** — Pavement reinforcing fabric will be paid by the square

yard of horizontal surface area covered. Overlaps and materials wasted by the Contractor will not be measured for the purpose of payment.

**14-6 Payment** — The contract unit price paid for pavement reinforcing fabric shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work in finishing and placing pavement reinforcing fabric, as specified and no additional payment shall be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 15

#### Pavement Delineation

**15-1 General** — The Contractor shall apply all traffic striping, markings and all other directional information or pavement delineation on the surfaces of streets, detour roads, parking lots, median strips and curbing in accordance with the plans, Special Provisions and as specified herein, in conformance with the applicable provisions of the State Specifications and California Vehicle Code. Where no plans for pavement delineation have been provided and the existing delineation is to be covered or obliterated by the Contractor's work, the existing delineation shall be restored. Restoration shall conform to the requirements specified herein. When part of a pavement marking has been removed or obliterated, the entire marking shall be restored.

Unless otherwise specified in the plans or Special Provisions, all replacement delineation shall be thermoplastic.

**15-2 Layout, Alignment and Spottings** — All layouts, spotting and tracking required shall be performed by and at the expense of the Contractor, and approved by the Engineer prior to placement of pavement striping or markings.

When no previously applied figures, markings, or traffic striping are available to serve as a guide, suitable layouts shall be spotted in advance of the permanent paint application by any means satisfactory to the Engineer.

The Contractor shall mark or otherwise delineate the traffic lane in the new roadway or portion of roadway, or detour before opening it to traffic.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the pavement delineation.

The Contractor shall furnish all equipment, materials, labor and supervision necessary for installing pavement striping and markings in accordance with the contract plans or temporary detours required for the safe control of traffic through and/or around the project.

**15-3 Pavement Markers** — Pavement markers shall be installed in accordance with Section 85 of the State of California Standard Specifications, and as specified herein and in the Special Provisions.

Should the Contractor elect to alter the existing traffic stripes and markings, or to divert the flow of traffic on construction projects for his own convenience and there are no special pavement markings or delineations shown on the plans or in the Special Provisions, he shall, at no expense to the City, provide the necessary temporary striping in accordance with the State Traffic Manual, unless otherwise directed by the Engineer. Removal of such striping shall be at the Contractor's expense. The Contractor shall remove all existing or temporary detour striping or marking that may confuse the public. When temporary detour striping or markings are no longer required, they shall be removed prior to applying the new traffic stripes or markings.

Standard word markings, letters, numerals and symbols shall be as shown on the plans. In the absence of such information, all stencils and templates shall be identical with those used by the City. The Contractor shall provide stencils for all required legends.

Unless otherwise specified in the Special Provisions or contract plans, all pavement striping and markings, including restoration (except temporary), shall be thermoplastic.

**15-4 Removal of Existing Markings** — Existing striping and pavement markings that will be in conflict with the finish traffic circulation shall be removed as directed by the Engineer in accordance with Section 15-2.02 of the State Standard Specifications.

**15-5 Thermoplastic Striping** — The installation of thermoplastic striping and marking shall conform to Section 84-2 and 84-3 of the State Standard Specifications.

**15-6 Painted Striping and Markings** — General: Paint for pavement striping and markings, if such are required, shall conform to State Specifications 721-80-97 with color required and as specified herein.

**15-7 Red Curb Painting** — Red curb painting shall be applied as shown on the plans and as directed by the Engineer. Red curb painting shall include the application of two coats of traffic paint with glass beads incorporated in the second coat. Top and face of curb shall be painted.

**15-8 Glass Beads** — All traffic stripes, except the black separation line, shall be beaded.

**15-8.1 General** — Glass beads shall be applied directly and uniformly to the traffic



line with a bead dispenser machine, placed the proper distance behind the paint spray nozzle.

Glass beads shall be applied to pavement marking and crosswalks by a special paint spray gun developed for this purpose.

### **15-8.2 Application Rate**

#### **Broken Stripe**

##### **First Painting**

New Surface, first coat: 4 to 5 gallons per mile

Second Coat: 7 to 7.4 gallons per mile

Restriping: 7 to 7.4 gallons per mile

Glass Beads: 42 pounds per mile

#### **Solid Stripe**

##### **First Painting**

New Surface, first coat: 12 to 14 gallons per mile

Second Coat: 16 to 18 gallons per mile

Glass Beads with second coat: 110± pounds per mile

Restriping: 16 to 18 gallons per mile

Glass Beads: approximately 110 pounds per mile

Black Traffic paint: approximately 8 gallons per mile

#### **Pavement Markings**

First Painting: light application to seal pavement

Second Coat: 1 gallon per 100 square feet

Glass Beads: 6 pounds per gallon of paint

Restriping: 1 gallon per 100 square feet

Glass Beads: 6 pounds per gallon of paint

### **15-9 Raised Bars**

**15-9.1 General Description** — These specifications apply to pre-cast, cast-in-place or extruded raised bars intended to be used as traffic delineators or bumper stops. This work consists of furnishing and installing pre-cast, cast-in-place or extruded raised bars at the locations shown on the plans or directed by the Engineer and

to the requirements specified in these specifications and the Special Provisions.

Raised bars shall conform to the details and dimensions shown on the plans.

**15-9.2 Classification Types** — Raised bars are classified by type in accordance with the minimum supportive strength of the bar. The types are as follows:

Type A — 400 pounds minimum load

Type B — 150 pounds minimum load

The type of bar to be used shall be as shown on the plans or specified in the Special Provisions. If the type designation of the bar is not shown on the plans or specified in the Special Provisions, Type A will be used.

Type A raised bars may be either pre-cast, cast-in-place, or extruded, at the option of the Contractor. Type B raised bars shall be pre-cast.

### **15-9.3 Materials**

**Pre-cast Raised Bars** — Pre-cast raised bars shall be constructed of 560-D-3000 concrete. Other materials such as glass fiber and wood chips may be substituted for the aggregate in raised bars provided the portland cement content is adjusted to such materials and such use of other materials is approved by the Engineer.

**Cast-in-Place Raised Bars** — Concrete used in cast-in-place raised bars shall be 560-D-3000 concrete containing calcium chloride at the rate of 2 pounds per 100 pounds of cement. The slump of the concrete shall be not less than ½ inch and not greater than 1½ inches and within these limits the consistency shall be regulated as necessary to provide a dense bar having the shape shown on the plans.

Concrete used in forming bars by the extrusion process shall consist of a homogeneous mixture of portland cement, aggregate, and water in which an air-entraining agent may be incorporated.

Cast-in-place or extruded raised bars in place, represented by test bars that do not comply with the strength requirement at the end of 72 hours, shall be removed from the work and be replaced with acceptable bars by the Contractor at his expense. No payment will be made for bars so replaced.

Each pre-cast bar shall be properly cured and, at the time of shipment, shall be capable of supporting the minimum load for each type as specified. Pre-cast bars shall be tested as described above.

Pre-cast bars shall be marked with the date of manufacture and the identifying mark of the manufacturer.

The manufacturer of pre-cast raised bars shall establish the necessary quality control and inspection practice to assure compliance with these specifications.

**15-9.4 Extruded Raised Bars Equipment** — The machine used for extrusion shall be capable of forming bars of the dimensions shown on the plans. Raised bars shall be extruded onto a previously placed adhesive.

The extrusion machine shall be so operated as to produce a well compacted mass free from large torn areas in the surface. If minor surface pits or small torn areas are formed, the surface of the bar shall be worked with a template type trowel until defects have been eliminated. The ends of the bars while plastic shall be formed to the shape and angle shown on the plans. When bars are placed over an open joint or crack, an open joint shall be formed through the bar at that point.

**15-10 Measurement** — The quantity of paint of traffic striping and markings shall be measured by one or more of the following methods: lineal footage, the area in square feet, or one lump sum item as provided in the bid proposal.

**15-11 Payment** — The contract lump sum or unit prices paid for the various types of pavement striping and markers shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in striping and markings, complete in place, as shown on the plans, as specified in these specifications and the Special Provisions, and as directed by the Engineer, and no additional payment shall be made therefor.

Where the bid proposal contains no item for pavement delineation or restoration, full payment shall be considered as included in the various contract items of work and no additional payment shall be made therefor.

**CITY OF ALBANY**

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**Section 16**

**Traffic Signs**

**16-1 General** — Any permanent traffic control sign as required on the plans or in the specifications shall conform with the provisions of Section 56 of the State of California Standard Specifications and the manual on Uniform Traffic Control Devices for Streets and Highways, and the following provisions.

**16-2 Base Metal** — The base metal shall be new sheet aluminum of alloys conforming to State Specifications Section 56. The thickness of the aluminum sheet shall be .080 gauge unless otherwise specified. The material shall be subject to inspection prior to installation.

The fabrication of all signs shall be accomplished in a uniform and workmanlike manner. The sign panels are to be cut as shown on the size specification sheets. The dimensional tolerance of the panels shall be plus or minus one-sixteenth (1/16") inch. Metal panels shall be cut to size and shape and shall be free of buckles, wrap, dents, cockles, burrs, sharp edges and any other defects resulting from fabrication.

All possible fabrication, including shearing, cutting and punching of holes, shall be completed prior to the base metal preparation.

**16-3 Base Metal Preparation** — The aluminum base metal shall be thoroughly cleaned and anodized as per State Standard Specifications.

**16-4 Reflective Sheeting** — Reflective sheeting shall be Scotchlite brand high intensity grade or equal unless otherwise indicated on the plans.

Vendors shall present proof that the type of reflective sheeting they intend to use in the manufacture of the signs has been used on highway signs located on California highways for period of at least two (2) years and has proven entirely satisfactory.

The surface of the reflective sheeting shall be of a flexible, transparent plastic material and shall be smooth. The backing medium shall be of synthetic sheet resin or other suitable non-cellulosic material. The bonding adhesive shall have no staining effect

and shall be mildew resistant. The sheeting shall permit cutting and color processing at temperatures of 60 to 100°F and a relative humidity of twenty (20) to eight (80) percent. The sheeting shall be heat resistant and permit force curing of unapplied sheeting at temperatures up to 150°F and up to 200°F on applied sheeting. The sheeting surface shall be solvent resistant to gasoline, naphtha, mineral spirits, turpentine and methanol.

The reflective sheeting shall be applied to the face of the sign by an approved vacuum applicator using a combination of vacuum and heat, as recommended by the reflective sheeting manufacturer. After aging for forty-eight (48) hours, the adhesive shall produce a durable bond equal to or greater than the strength of the reflective sheeting. No air pocket or bubbles shall exist between the sheeting and the base material.

Repairs to damaged reflective sheeting due to poor workmanship or defective material will not be allowed. Defective items shall be replaced at no expense to the City.

Reflective sheeting screening coats shall be oven cured as recommended by the reflective sheeting manufacturer.

**15-5 Splices** — Vacuum applied sheeting: there shall be no splices in the reflective sheeting on panels with a minor dimension of forty-eight (48) inches or less. On all rectangular signs with a minor dimension or more than forty-eight (48) inches, the splice shall be horizontal.

No finished sign shall have more than one splice and no splice shall fall within two (2) inches of the sign edge. When splices do occur, the adjoining reflective sheeting shall be color matched under both incident and reflected light.

**16-6 Edge Sealing** — The edges of each completed reflective sheeting sign face and of all cutout letters, numbers, arrows, symbols and borders shall be sealed in a manner and with a sealing solution as recommended by the manufacturer of the reflective sheeting.

**16-7 Finish** — The finished sign shall be flat within a ratio of 0.04 inches per linear foot when measured across the plane of each panel from the opposite corners, or at any location on the panel. All finished signs shall have smooth flat surfaces without defects or objectionable marks of any kind on either the front or back faces.

All letters and designs shall be clearly cut and sharply defined, meeting State Standard Specifications.

**16-8 Legend** — The legend shall be of high intensity cutout reflective sheeting applied in the same manner as the reflective sheeting specified herein.

**16-9 Manufacturer's Identification** — The manufacturer's identification shall be according to the State of California Standard Specifications unless otherwise directed by the Engineer.

**16-10 Sign Posts** — Except as shown on the plans, all traffic signs shall be mounted on green coated, Unisident posts, or equal, at a mounting height meeting State Specifications and traffic code standards and as shown on the plans.

Signs to be located in existing sidewalk area may be placed by drilling a hole in the sidewalk one inch (1") larger than the pole.

**16-11 Inspection** — All materials and finished signs are subject to inspection by the Public Works Department and shall be subject to final inspection by the Engineer. The finished signs shall be clean and free from all router chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting and aluminum marks. Signs with any defects or damage that would affect their appearance or serviceability will not be acceptable. No repairs shall be made to the face sheet without the approval of the City. All signs not conforming in all respects to the requirements of these specifications will be rejected and replaced at Contractor's cost.

**16-12 Removal and Relocation of Existing Signs** — Traffic control signs are to be removed or relocated as shown on the plans.

Existing mountings may be used; however, the Contractor shall furnish, at his expense, additional mountings necessary to complete the reinstallation.

Any damage to an existing traffic control sign during removal and reinstallation shall be repaired by the Contractor at his expense.

**16-13 City Identification** — All traffic signs shall have the date of manufacture and the "City of Albany, CA" stamped on the back side of the sign as follows:

|                               |
|-------------------------------|
| City of Albany } 1/2"         |
| X _____ 5" _____ X            |
| Date: (Month-Day-Year) } 1/4" |
| X _____ 2-1/2" _____ X        |

**16-14 Measurement** — The quantity of each type of sign shown in the bid proposal will be measured in units determined from actual count in place.

**16-15 Payment** — The contract unit prices paid for the types of traffic signs shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in furnishing and placing signs complete in place, including adhesives, backing, bolts, frames, posts, caps, cement and all other costs as shown on the plans as specified in these specifications and the special provisions, and as directed by the Engineer and no additional payment shall be made therefor.

# CITY OF ALBANY

## Standard Specifications Technical Provisions

### Section 17

#### Concrete Construction

##### 17-1 Portland Cement Concrete Materials

##### 17-1.1 General Requirements

17-1.1.1 General — Concrete shall consist of portland cement, concrete aggregates, water, and admixture when approved for use, in accordance with these provisions. Concrete will be specified by class or by compressive strength. When specified by class, the concrete will be designated by a symbol consisting of a number, a letter and a number. The first number is the weight of cement in pounds per cubic yard, the letter is the combined aggregate gradation and the last number is the minimum compressive strength of 28 days. The concrete class used shall be in accordance with Subsection 17-1.1.2, unless otherwise specified. Concrete specified by compressive strength shall be designed by the Contractor in accordance with Subsection 17-1.1.3.

Approved admixtures shall be in accordance with Subsection 17-1.2.4. Additional cement is permitted to obtain high early strength in concrete, except that total cement shall not exceed 700 pounds of cement per cubic yard (420 kg/m<sup>3</sup>) unless otherwise approved by the Engineer. Type III cement (High Early Strength) may be used in lieu of Type II cement in the same batch quantities as specified or approved for Type II cement.

Where Type V cement is specified, a combination of Type II cement with a minimum of 25 percent by weight Class F fly ash may be substituted provided the other provisions of Subsection 17-1.2.5 are satisfied.

17-1.1.2 Concrete Specified by Class — The concrete class and maximum slump for the various types of construction shall be as designated in the following table. The exact proportions of aggregates and water to be used in the concrete will be determined by the Engineer from test of the material to be used.



## Concrete Class Use Table

| Construction  | Concrete                | Maximum Slump |     |
|---|-------------------------|---------------|-----|
|   | Class                   | Inches        | mm  |
| <b>Street Surface Improvements</b>  |                         |               |     |
| Concrete Pavement (not integral with curb)  | 520-A-2500              | 3             | 75  |
| Curb, Integral Curb and Pavement, Gutter, Walk, Alley Aprons                                      | 520-C-2500              | 4             | 100 |
| Extruded Curb, Curb & Gutter  | 520-C-2500              | 2             | 50  |
|   | 520-D-2500              | 2             | 50  |
| <b>Sewer and Storm Drainage Facilities</b>  |                         |               |     |
| Pipe Collars, Beam Support for Pipe, Pre-Cast Manhole Components, Catch Basins, Sidewalk Culverts | 560-C-3250 <sup>2</sup> | 5             | 125 |
| Sidehill Surface Drainage Facilities  | 500-C-2500              | 3             | 75  |
| Pipe Bedding and Encasement, <sup>1</sup>   |                         |               |     |
| Anchors and Thrust Blocks,  |                         |               |     |
| Wall support for Pipe   | 420-C-2000 <sup>2</sup> | 4             | 100 |
| Tunnel Backfill   | 480-C-2000              | 5             | 125 |
| Trench Backfill Slurry  | 100-E-100               | 5             | 125 |
| <b>Reinforced Structures</b>  |                         |               |     |
| Bridges, Buildings, Retaining Walls   | 560-C-3250 <sup>2</sup> | 4             | 100 |
| Cast-In-Place Piles   | 560-C-3250 <sup>2</sup> | 4             | 100 |
| Channels and Boxes  |                         |               |     |
| Invert  | 560-B-3250              | 4             | 100 |
| Walls and deck  | 560-C-3250              | 5             | 125 |
| <b>Miscellaneous</b>  |                         |               |     |
| Street Light and Traffic Signal   |                         |               |     |
| Foundations, Survey Monuments   | 560-C-3250              | 4             | 100 |
| Fence and Guardrail   |                         |               |     |
| Post Foundations  | 500-C-2500              | 5             | 125 |
| Concrete not Otherwise Specified  | 560-C-3250              | 5             | 125 |
| Air Placed Concrete, Method B   | 600-E-3250              | 4             | 100 |

1. Use limited to bedding concrete over which backfill will be placed not less than 40 hours after placement. For backfill after 24 hours, add 3 pints (1.4L) of calcium chloride. For backfill after 16 hours and removal of sheeting after 18 hours, use 660-C-3750 with 3 pints (1.4L) calcium chloride solution.

2. Use B Aggregate gradation when placing conditions permit.

**17-1.1.3 Concrete Specified by Compressive Strength** — When so specified, the Contractor shall determine the mix proportions of concrete specified on the Plans by its 28-day compressive strength within the minimum cement, maximum size coarse aggregate, and admixtures limitations designed herein or in the Specifications. The concrete shall contain not less than 560 pounds of cement or cement and fly ash per cubic yard (330 kg/m<sup>3</sup>) for concrete strengths of 3250 psi (22 MPa) or greater.

Calcium chloride may be used only with the approval of the Engineer. Admixtures proposed for use shall be evaluated in accordance with Subsection 17-1.2.4.

The proposed mix design shall be evaluated from field tests of a trial batch conforming to the size of load, materials, proportions, slump, mixing and placing equipment and procedures to be used in the actual work. The trial batch procedure herein may be waived when test data of prior performance of the proposed mix design is presented by the Contractor and approved by the Engineer. The Contractor may utilize any strength data on file with the Agency for this purpose.

When approved by the Engineer, trial batches may be placed in the Work at designated locations where concrete of a lower quality is specified. Concrete so placed will be considered for purpose of payment to be of the type of concrete specified at that location.

Test cylinders, when required by the Engineer, shall be molded from the trial batch containing the maximum water content indicated by the mix design. Fifty percent of the cylinders shall be tested at 7 days in order to establish 7-day average compressive strength information. The remaining cylinders shall be tested at no more than 28 days after molding and the average compressive strength of the five cylinders shall be at least 600 psi (4MPa) greater than the specified strength. The minimum strength of any one cylinder shall not be less than the specified strength.

The placing of concrete specified by compressive strength shall not begin until the mix design has qualified in accordance with the aforesaid test criteria. Should the source of materials or establish procedures change, new trial batches may be required.

**17-1.1.4 Test for Portland Cement Concrete** — Portland cement concrete shall be sampled and tested, when required by the Engineer, in accordance with the following ASTM and California Tests:

|  |                 |
|--|-----------------|
| 1) Sampling Fresh Concrete               | C 172           |
| 2) Obtaining Drilled Cores               | C 42            |
| 3) Molding and Curing Specimens          | C 31            |
| 4) Compressive Strength                  | C 39            |
| 5) Flexural Strength                     | C 78            |
| 6) Slump                                 | C 143           |
| 7) Air Content                           | C 173 or C 231  |
| 8) Unit Weight Yield                     | C 138           |
| 9) Setting of Mortar                     | C 191 or C 266  |
| 10) Mortar Cube Test                     | Calif. Test 515 |
| 11) Drying Shrinkage<br>(with admixture) | Calif. Test 530 |

A compressive strength test shall consist of the average strength of two cylinders fabricated from a single load of concrete except that, if any cylinder should show evidence of improper handling, molding, or testing, said cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

The frequency of sampling will be determined by the Engineer. The Contractor shall afford the engineer all reasonable access, without charge, for the procurement of samples of fresh concrete at time of placement.

Concrete specified by class under Subsection 17-1.1.2 shall attain the minimum 28-day strength designated.

Concrete specified by compressive strength under Subsection 17-1.1.3 shall attain the following 28-day strength: the average of any three consecutive strength tests shall be equal to or greater than the specified 28-day strength. Not more than 10 percent of the tests shall be less than specified 28-day strength. No test shall be less than 85 percent of the specified 28-day strength.

### **17-1.2 Materials**

**17-1.2.1 Portland Cement** -- All cement to be used or furnished shall be Type II low alkali portland cement conforming to ASTM C 150, or Type IP (MS) portland-pozzolan cement conforming to ASTM C 595, unless otherwise specified. Either cement shall conform to the low alkali requirements of Table IA of ASTM C 150. Type IP (MS) cement shall contain no more than 20 percent pozzolan, which shall be inter-ground with the clinker.

The Contractor shall furnish a Certificate of Compliance signed by the manufacturer identifying the cement and stating that the cement complies with

these requirements. Supporting test data shall be furnished when required by the Engineer.

Whenever suitable facilities approved by the Engineer are available for handling and weighing bulk cement, such facilities shall be used. Otherwise, the cement shall be delivered in original unopened sacks that have been filled by the manufacturer. They shall be plainly marked with the manufacturer's name or brand, cement type and weight.

Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling, and suitably protected against contamination or moisture. Should any cement delivered show evidence of contamination or be otherwise unsuitable, the Engineer may reject it and require that it be removed from the site.

All portland cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

17-1.2.2 Aggregates — Aggregates shall conform to the requirements prescribed in Section 8 and shall be approved by the Engineer prior to use. Aggregate shall be of such character that it will be possible to produce workable concrete within the limits of slump and water content in Subsections 17-1.1.2 and 17-1.3.3.

Methods of handling materials resulting in segregation, degradation or the combining of materials which results in failure to meet specifications shall not be permitted. The free moisture content of sand shall not exceed 8 percent at the time of batching.

Aggregates shall be nonreactive when tested in accordance with ASTM C 289 and evaluated in accordance with Appendix A-1 of ASTM C 33. Aggregates found to be potentially reactive may be used only upon written approval of the Engineer.

17-1.2.3 Water — Water used for concrete shall not contain deleterious substances. Water shall not contain an amount of impurities that will cause a change in the time of setting of portland cement of more than 25 percent nor a reduction in relative mortar strength at 7 and 28 days of more than 10 percent compared to results obtained with distilled water.

In conventionally reinforced concrete work, water shall not contain more than 1,000 ppm (mg/L) of chlorides calculated as Cl<sub>1</sub>, nor more than 1,000 ppm (mg/L) of sulfates calculated as SO<sub>4</sub>.

In prestressed concrete work, water shall not contain more than 650 ppm

(mg/L) of chlorides calculated as Cl, nor more than 800 ppm (mg/L) of sulfates calculated as SO<sub>4</sub>.

In nonreinforced concrete work, water shall not contain more than 2,000 ppm (mg/L) of chlorides calculated as Cl, nor more than 1,500 ppm (mg/L) of sulfates calculated as SO<sub>4</sub>.

#### 17-1.2.4 Admixtures

- a) General Requirements. Admixtures shall be used as specified or approved by the Engineer. The admixture shall be measured into each batch or load in liquid form by a mechanical dispensing device and method approved by the Engineer. The quantity dispensed shall not vary more than 5 percent from the quantity specified. If more than one admixture is used, each shall be dispensed by separate equipment in liquid form. Calcium chloride shall not be used in prestressed concrete. Admixtures containing chloride ions in excess of 1 percent by weight of admixtures shall not be used in prestressed concrete. Calcium chloride may be used in reinforced concrete only upon approval of the Engineer. Admixtures to be used in grouting ducts in prestressed units shall not contain chloride ions in excess of 0.25 percent by weight of admixture.

Samples of the admixture proposed for use shall be submitted by the Contractor to the Engineer sufficiently in advance of their intended use to determine compliance with specified requirements. Approval to use an admixture shall not relieve the Contractor of the designated concrete strength requirements.

- b) Air-entraining Admixtures. Air-entraining admixtures shall conform to ASTM C 260. Tests by an approved laboratory shall provide sufficient data to determine the time-strength characteristics of the concrete mix with the admixture.

When the air-entraining agent consists of a vinsol resin-water solution that has been neutralized with caustic soda (sodium hydroxide), the Contractor may use such air-entraining admixtures without presentation of test data. In lieu of test data, the Contractor shall furnish a certificate signed by the manufacturer attesting to this fact and stating the ratio of sodium hydroxide to vinsol resin, the percentage of solids based on the residue dried at 105°C, and that no other additive or chemical agent is present in this solution.

The concentration of dilution of the admixture shall be such that it is dispensed into each batch of concrete at a rate of not less than ½ fluid ounce per 100 lbs. (0.33mL/kg) of cement.

Adjustments shall be made in the weights of the aggregates used per batch to compensate for changes in yield due to air-entrainment.

If the Contractor elects to use an air-entraining admixture, the Engineer may require that additional cement be added to the concrete mixture when the air content exceeds 4 percent. In no case shall air content exceed 6 percent.

The air content shall not deviate from the percentage specified or permitted by more than 2½ percentage points.

- c) Water Reducing, Set Retarding and Accelerating Admixtures — Water reducing, set retarding, and accelerating admixtures other than calcium chloride shall conform to ASTM C 494, and shall not be used in greater dosages than those recommended by the manufacturer, or permitted by the Engineer. The permitted dosage of the admixture shall not exceed that which will result in an increase in the drying shrinkage of the concrete in excess of 20 percent when used in precast and pre-stressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount proposed shall, at the age of 48 hours and longer, be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the Engineer.
- d) Calcium Chloride — When calcium chloride is permitted or required to accelerate setting time and to reduce the time necessary for the concrete to reach its specified strength, it may be processed from either a brine solution or flake. If prepared from flake it shall conform to ASTM D 98. The calcium chloride solution shall contain not less than 32 percent of anhydrous calcium chloride and the hydrogen ion concentration (pH) shall be not more than 10.4 nor less than 6.0. Calcium chloride solution shall be used at the rate of not more than 3 pints per 100 pounds (30mL/kg) of cement.

#### 17-1.2.5 Fly Ash

- a) General — Class C or Class F fly ash may be used as a substitute for part of the required Type II portland cement in a concrete mix when approved by the Engineer. The amount of Type II portland cement replaced shall be based upon trial batches in accordance with Subsection 17-1.1.3. At least an equal weight of fly ash is required as a substitute for the replaced portland cement. The maximum amount of portland cement replaced shall not exceed 30 percent by weight. Fly ash shall not be used with Type IP (MS) or Type III portland cement.

The Contractor shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ash complies with ASTM C 618 and these Specifications. Supporting test data shall be furnished when requested by the Engineer. All testing and sampling procedures shall conform with ASTM C 311.

Separate silo storage facilities shall be provided. Suitable facilities shall be provided to discharge the fly ash into the cement hopper in accordance with Subsection 17-1.3.1. Fly ash shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling and be suitably protected against contamination or moisture. Should any fly ash show evidence of contamination or moisture or be otherwise unsuitable, the Engineer may reject it and require that it be removed from the site.

All fly ash used in concrete for any individual project shall be from the same source and of the same class, unless otherwise approved by the Engineer.

- b) Class F Fly Ash — Class F fly ash shall conform to ASTM C 618 and the following specifications:

|  |              |
|--|--------------|
| Loss on ignition   | 4% maximum   |
| SO <sub>3</sub> content                                    | 3% maximum   |
| Moisture content   | 1% maximum   |
| R-Factor* (only required where Type V cement is specified) | 0.75 maximum |

$$*R = \frac{(\% \text{ CaO-5})}{\% \text{ Fe}_2\text{O}_3} \quad \text{from fly ash oxide analysis}$$

- c) Class C Fly Ash — Class C fly ash shall conform to ASTM C 618 and the following specifications:

|                         |            |
|-------------------------|------------|
| Loss of ignition        | 2% maximum |
| SO <sub>3</sub> content | 4% maximum |
| Moisture content        | 1% maximum |

### 17-1.3 Proportioning

17-1.3.1 General — Aggregates and cement shall be proportioned by weight except that when the amount of concrete required for any one contract is 10 cubic yards (8m<sup>3</sup>) or less, the materials may be measured by volume. Materials that are proportioned by volume shall be measured in containers of known capacity.

Weight hoppers shall be charged from bins located directly over them or from conveyor belts. When conveyor belts are used, there shall be a separate belt for each size aggregate. There shall be a moisture meter installed, accurate within 1 percent of the actual moisture content, to indicate the moisture in the sand.

Bulk cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge. The cement hopper shall be attached to a separate scale for individual weighing.

The amount of water to be added to the mixture shall be measured into the mixing drum through a valve with a positive cutoff. When water is measured by weight, it shall be weighed on a separate scale.

Whenever a portable batch plant is set up at a new location, the scale assemblies shall be inspected and certified regardless of the date the scales were last tested.

Scales utilized in proportioning shall be either springless dial, multiple beam type, or solid-state digital strain gage transducer type. Scale graduations shall be no greater than the following:

|                  |         |         |
|------------------|---------|---------|
| Aggregate Scales | 25 lbs. | (10 kg) |
| Cement Scales    | 5 lbs.  | ( 2 kg) |
| Water Scales     | 5 lbs.  | ( 2 kg) |

If a multiple beam type scale is used, the scale shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or under weight. The indicator shall be so designed that it will operate during the addition of the last 400 lbs. (180kg) of any weighing. The over travel of the indicator hand shall be at least one-third of the loading travel. Indicators shall be enclosed against moisture and dust.

Weighing equipment shall be insulated against vibration and movement of other operating equipment in the plant. When the entire plant is running, the scale reading at cutoff shall not vary from the weight designated by more than 1 percent for cement, 1 percent for water, 1½ percent for any size of aggregate, nor 1 percent for the total aggregate in any batch.

17-1.3.2 Combined Aggregate Gradings — The combined aggregates shall conform to the gradings specified in the following table:



| Combined Gradings for Portland Cement Concrete<br>Percentage Passing Sieves |              |              |              |              |           |
|---|--------------|--------------|--------------|--------------|-----------|
| Sieve Size  | Grading<br>A | Grading<br>B | Grading<br>C | Grading<br>D | Grading E |
| 2" (50mm)   | 100          | 100          |              |              |           |
| 1½" (38mm)  | 95-100       | 95-100       | 100          |              |           |
| 1" (25mm)   | 64-80        | 80-96        | 95-100       |              |           |
| ¾" (19mm)   | 55-71        | 64-80        | 77-93        | 100          | 100       |
| ⅝" (10mm)   | 37-53        | 40-52        | 50-70        | 92-100       | 90-100    |
| No. 4   | 32-42        | 35-45        | 39-51        | 42-60        | 60-80     |
| No. 8   | 25-35        | 28-38        | 31-41        | 33-47        | 50-70     |
| No. 16  | 18-28        | 21-31        | 22-32        | 22-38        | 33-53     |
| No. 30  | 10-18        | 10-20        | 12-22        | 17-25        | 19-35     |
| No. 50  | 3-9          | 3-9          | 3-9          | 6-12         | 5-15      |
| No. 100   | 0-3          | 0-3          | 0-3          | 1-5          | 2-6       |
| No. 200   | 0-2          | 0-2          | 0-2          | 0-2          | 0-2       |

**17-1.3.3 Concrete Consistency** — The amount of water added at the mixer shall be regulated to take into account the free water in the aggregates. Free water is defined as the total water minus the water absorbed by the aggregate in a saturated surface-dry condition.

The amount of water used in the mixture shall not exceed the amount necessary to permit practical placement and consolidation of the concrete. Total free water in the mixture shall not exceed an amount producing the maximum slump specified in Subsection 17-1.1.2, and shall not exceed amounts shown in the following table:

| Maximum Free Water   |  |          |          |          |          |
|----------------------|--|----------|----------|----------|----------|
| Aggregate<br>Grading | POUNDS PER CUBIC YARD (Kg/m <sup>3</sup> ) of concrete<br>Slump in inches (mm) |          |          |          |          |
|                      | 1(25)  | 2(50)    | 3(75)    | 4(100)   | 5(125)   |
| A                    | 270(160)   | 280(166) | 290(172) | 300(178) | 310(184) |
| B                    | 275(163)   | 285(169) | 295(175) | 305(181) | 315(187) |
| C                    | 290(172)   | 300(178) | 310(184) | 320(190) | 330(196) |
| D                    | 320(190)   | 335(199) | 350(208) | 365(216) | 375(222) |
| E                    | 335(199)   | 350(208) | 365(216) | 380(225) | 395(234) |

When adverse or difficult conditions affect the placement of concrete, the

Engineer may authorize a greater slump to be used, provided the cement is increased. Water shall be added at a ratio not to exceed 32 percent of added cement per cubic yard of concrete, and such additional water and cement shall be at the Contractor's expense.

#### **17-1.4 Mixing**

**17-1.4.1 General** — Machine mixing will be required in all cases other than those in which it would obviously prove to be impractical, in which event hand mixing will be permitted. Mixing shall be commenced as soon as possible after the cement is placed in contact with the aggregates, but in no event shall the intervening period exceed 30 minutes.

All concrete mixers shall be of such design and construction and so operated as to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed. Mixers shall be maintained in proper and serviceable working condition and any part or portion thereof that is out of order, or becomes worn to such extent as to detrimentally affect the quality of mixing, shall be promptly repaired or replaced. Mixers shall not have any aluminum parts which will have direct contact with concrete.

**17-1.4.2 Paving and Stationary Mixers** — Paving and stationary mixers shall be equipped with an accurate automatic timing device so designed and constructed as to lock the discharge lever before aggregate and cement enter the drum, and release such lever only after the specified mixing time has elapsed. The regulation of the setting of said device shall be under the supervision of the Engineer. Water control equipment shall also be provided with each concrete mixer.

The proper proportions of aggregate, cement, and water for each batch of concrete shall be placed in the mixer, and shall be mixed for a period of not less than 1 minute after all such materials are in the drum. The minimum mixing time per batch for reinforced concrete, however, shall not be less than 1½ minutes.

The rotating speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

The total volume of materials mixed in any one batch shall exceed neither the water level capacity of the mixer nor the manufacturer's guaranteed capacity of the mixer.

**17-1.4.3 Transit Mixers** — The type, capacity, and manner of operation of the mixing and transporting equipment for ready-mix concrete shall conform to the current "*Standards for Operation of Truck Mixers and Agitators of the*

*National Ready-Mixed Concrete Association*” and the *“Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers Bureau.”* Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate or plates, installed by the manufacturer on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer shall not exceed the manufacturer’s guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced.

The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than 70 nor more than 100 revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as agitating speed. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum.

When concrete is being placed for pavement or concrete structures, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For all other work, the mixer shall be empty or may carry 10 gallons of water in the drum. Adequate control of ready-mixed concrete will normally require that additional water be added and mixed into the batch at the point of discharge. Water so added shall be mixed into the load for a minimum of 30 revolutions at the rated mixing speed. Water shall not be added to the load during transit.

The total elapsed time between the addition of water at the batch plant and discharging the completed mix shall not exceed 90 minutes. Under conditions contributing to quick setting, the total elapsed time permitted may be reduced by the Engineer.

The Engineer shall be provided with a legible certified weighmaster certificate. When mix proportions have been designated for a project and are identified by number, the Engineer may accept a legible certified weighmaster certificate which shall contain the following information:

- 1) Name of Vendor
- 2) Name of Contractor
- 3) Project Location
- 4) Number of cubic yards in the load
- 5) Mix designation number
- 6) Amount of water added at the plant (including water in aggregates)
- 7) Maximum allowable water
- 8) Time and date of batching

When the mix proportions are not designated by number, or when required by the Engineer, the certificate shall contain the following additional information:

- 1) Actual weights of cement and of each size of aggregate
- 2) Brand and type of cement
- 3) Brand, type, and amount of admixture

Space shall be provided on the certificate so that amount of water added on the job may be indicated.

**17-1.4.4 Hand Mixing** — Hand mixing will be permitted when the amount of concrete required for any one job is one cubic yard (0.8m<sup>3</sup>) or less. Hand mixed concrete shall be mixed on a watertight platform or in a mortar box in batches not to exceed ½ cubic yards (0.3m<sup>3</sup>) each. The aggregates shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained. Methods of hand mixing which allow the loss of mixing water will not be permitted.

**17-1.5 Transporting Batched Materials and Mixed Concrete** — The compartments of trucks or other equipment used for the purpose of transporting proportioned dry aggregate and cement, or mixed concrete, shall be suitably constructed to adequately protect and prevent loss or leakage of the contents during charging, transit or discharging.

## **17-2 Steel Reinforcement for Concrete**

**17-2.1 General** — Bar, wire and wire mesh reinforcement shall conform accurately to the dimensions and details indicated on the plans or otherwise prescribed. Before being placed in any concrete work, it shall be cleaned thoroughly of all rust, mill scale, mortar, oil, dirt, or coating of any character which would be likely to destroy, reduce, or impair its proper bonding with the concrete.

**17-2.2 Reinforcing Steel** — unless otherwise specified, reinforcing steel shall be either Grade 40 or grade 60 billet steel conforming to ASTM A 615.

Steel bending processes shall conform to the requirements of the *Manual of Standard Practice of the Concrete Reinforcing Steel Institute*.

Bending or straightening shall be accomplished so that the steel will not be damaged. Kinked bars shall not be used.

**17-2.3 Wire Reinforcement** — Wire reinforcement shall in all respects fulfill requirement prescribed in ASTM A 82.

**17-2.4 Wire Mesh Reinforcement** — Mesh reinforcement shall conform to ASTM A 185. The gage of the wire and the dimensions of the mesh shall be as shown on the Plans or in the Specifications. The wire mesh reinforcement shall be so constructed as to retain its original shape and form during the necessary handling. The effective cross-sectional area of the wire shall be equal to that specified or indicated on the Plans.

#### **17-2.5 Samples for Testing**

**17-2.5.1 General** — No reinforcing steel will be accepted until it has been approved by the Engineer. When required by the Engineer, samples shall be taken from bars selected by the Engineer and cut in the Engineer's presence. The Contractor shall furnish a certified mill test report for each heat or size of steel when required by the Engineer.

**17-2.5.2 Reinforcing Steel Bars** — When required by the Engineer, two sample bars, each 3 feet (0.9m) long and cut from different bars, shall be taken from each bar size delivered to the job site on a cumulative tonnage basis in accordance with the following schedule:

| Bar Sizes<br>(Number) | Cumulative Weight of Steel per<br>Bar Size Delivered to Job Site |         |
|-----------------------|--|---------|
|                       | Tons   | kg      |
| 2                     | 1/2  | ( 450)  |
| 3                     | 1  | ( 900)  |
| 4                     | 2  | ( 1800) |
| 5                     | 3  | ( 2700) |
| 6                     | 4  | ( 3600) |
| 7                     | 5  | ( 4500) |
| 8                     | 7  | ( 6300) |
| 9                     | 9  | ( 8100) |
| 10                    | 11   | (10000) |
| 11                    | 13   | (12000) |
| 14                    | 20   | (18000) |
| 18                    | 35   | (32000) |

Note: At least two sample bars shall be taken from each bar size.

**17-2.5.3 Wire Reinforcement** — When required by the Engineer, one sample consisting of two pieces, each 3 feet (0.9m) long, shall be taken from each 2-ton (1800kg) lot or less of each size of wire delivered to the job site.

**17-2.5.4 Wire Mesh Reinforcement** — When required by the Engineer, two samples of a size suitable for testing shall be taken from each 3,000 square feet (280m<sup>2</sup>) of fabric or fraction thereof.

### **17-3 Expansion Joint Filler and Joint Sealants**

**17-3.1 General** — This section specifies joint fillers and sealants to be used for treating joints in portland cement concrete.

All joints which are to be sealed shall be formed with filler. The filler shall be placed in correct position before concrete is placed against it. Holes or joints in the filler shall be filled with mastic to prevent the passage of mortar or concrete from one side of the joint to the other.

**17-3.2 Premolded Joint Filler** — Premolded joint filler material shall consist of premolded strips of a durable resilient material.

Unless otherwise specified, premolded joint filler shall be one of the following types:

Preformed Expansion Joint Filler (Bituminous Type)  
ASTM D 994

Nonextruding and Resilient Filler (Bituminous Type)  
ASTM D 1751

Nonextruding and Resilient Filler (Non-bituminous Type)  
ASTM D 1752

## **17-4 Concrete Curing Compound**

**17-4.1 General** — Curing compound shall consist of a liquid which, when applied to fresh concrete by means of a spray gun, will form an impervious membrane over the exposed surfaces of the concrete.

The membrane may be either asphaltic or paraffin derivatives to which other waterproofing materials may have been added. Concrete curing compounds shall be designated by type as follows:

Type 1—Clear or translucent with red fugitive dye.

Type 2—White pigmented.

Type 3—Light gray pigmented.

Type 4—Black pigmented.

All compounds shall be furnished by the Contractor and shall be delivered ready-mixed in sealed original containers bearing the manufacturer's name and product identification. At the time of use, pigmented curing compounds shall be thoroughly mixed, with the pigment uniformly dispersed throughout the mixture.

The rate of application shall be such that the compound forms a continuous, unbroken film when applied to the work. The Engineer will determine the permissible rate of coverage of a curing compound.

Unless otherwise specified, Type 1 curing compound shall be used.

**17-4.2 Test Requirements** — Curing compounds shall be tested in accordance with ASTM C 309.

## **17-5 Cement Mortar**

**17-5.1 General** — Cement mortar shall consist of a mixture of portland cement, sand and water. Cement and sand shall first be combined in the proper proportions, and then thoroughly mixed with the required amount of water.

Cement mortar shall be designated by class and proportioned by loose volume as follows:

| Mortar Designation Class | Proportions  |            |
|--------------------------|--------------|------------|
|                          | Parts Cement | Parts Sand |
| A                        | 1            | 1          |
| B                        | 1            | 1½         |
| C                        | 1            | 2          |
| D                        | 1            | 2½         |
| E                        | 1            | 3          |
| F                        | 1            | 3½         |

The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixture sufficiently workable for the purpose intended.

Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Retempering of mortar will not be permitted.

**17-5.2 Cement** — Cement shall conform to the requirements of Subsection 17-1.2.1.

**17-5.3 Sand** — Sand shall conform to the requirements of Subsection 17-1.5.3. In proportioning the sand, it shall be measured loose (without shaking or compacting) in measuring boxes or other suitable containers of known capacity.

**17-5.4 Water** — Water shall conform to the requirements of Subsection 17-1.2.3.

**17-5.5 Admixtures** — No admixture shall be used in mortar unless otherwise specified or approved by the Engineer.

**17-5.6 Quick Setting Grout** — Quick setting grout shall be a high strength, non-staining grout approved by the Engineer prior to use. It shall reach an initial set within 90 minutes at 70°F (21°C) and shall reach minimum compressive strength of 2,500 psi (17mPa) within 24 hours. Shrinkage shall be less than 0.1 percent when tested, using the test procedures of ASTM C 596. The grout shall be mixed, handled, and placed in accordance with the manufacturer's instructions.

## **17-6 Concrete Structures**

**17-6.1 General** — Concrete bridges, culverts, catch basins, retaining walls, abutments, piers, footings, foundations and similar structures shall be constructed in conformity with the Plans and Specifications. Concrete for use in work



constructed under this section shall conform to the requirements of Subsection 17-1.

Safe and suitable ladders shall be provided to permit access to all portions of the work.

The compressive strength of the concrete referred to in this section will be based on the results of concrete test cylinders made and tested by the Engineer. The cylinders shall be cured under conditions similar to those affecting the structure.

When plastic-lined concrete structures are required by the Plans, the plastic liner materials shall comply with Subsection 17-2 and the installation of the liner shall be in accordance with Subsection 311-1 of the Standard Specifications for Public Works Construction.

**17-6.2 Subgrade for Concrete Structures** — Earth subgrade upon which concrete is placed shall be firm and free from water. Groundwater shall be kept below subgrade until the concrete has set. When the subgrade is in dry earth, it shall be thoroughly dampened with water to ensure that no moisture will be absorbed from the fresh concrete.

When the design details for the project provide for the construction of filter or drain material consisting of gravel (or combination of gravel and sand), which material will be subgrade for concrete, the placing of steel reinforcement and placement of concrete shall follow the installation of the filter or drain material as closely as practical. The filter or drain material shall be kept dewatered to the extent necessary to prevent any portion of concrete materials being deposited in water. No payment will be made for dewatering other than that which may be included in the prices bid for various items of work or when an item for dewatering is provided.

When the concrete is to be deposited on rock, the rock shall be fully uncovered, cleaned, and its surface shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled off or cut to approximately horizontal and vertical steps. Seams in the rock shall be grouted under pressure or otherwise treated as the Engineer may direct. Grouting seams in rock or otherwise treating them will be paid for as provided in the Specifications.

**17-6.3 Forms** — forms shall be of suitable material and of a type, size, shape, quality, and strength to ensure construction as designed. The forms shall be true to line and grade, mortar-tight, and sufficiently rigid to resist deflection during placing of the concrete. The responsibility for their adequacy shall rest with the Contractor. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and

holes that would deface the finished surfaces. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent which will leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete.

Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber, or material which will provide a surface at least equal to surfaced lumber or plywood. Any lumber or material which becomes badly checked or warped, prior to placing concrete, shall not be used.

Forms for all exposed surfaces of bridges, viaducts, over-crossings and similar structures shall be constructed of plywood or an approved equal. Plywood for forms shall be of the grade "Exterior B-B (concrete form)," conforming to the latest Product Standard for Soft Plywood, Construction and Industrial, of the national Bureau of Standards. Plywood shall be furnished and placed in 48-inch (1.2m) widths and in uniform lengths of not less than 96 inches (2.4m), except where the dimension of the member formed is less than the specified panel dimension. Plywood shall be placed with the grain of the outer plies in the direction of the span. Where plywood is attached directly to the studs or joists, the panels shall be not less than  $\frac{5}{8}$ -inch (16mm) thick, and the studs or joists shall be spaced not more than 12-inches (300mm), center to center. Plywood less than  $\frac{5}{8}$ -inch (16mm) thick, otherwise conforming to the requirements specified herein, may be used with a continuous backing of  $\frac{3}{4}$ -inch (19mm) sheeting. All form panels shall be placed in a neat, symmetrical pattern with the horizontal joints level and continuous. All joints shall be filled with an approved quick-setting compound and finished flush with the interior of the form.

Wooden forms for copings and curbs shall have a thickness of not less than  $1\frac{5}{8}$  inches (41mm) and a width of not less than the full depth of coping or curb.

Unless otherwise shown on the Plans, all sharp edges shall be chamfered with  $\frac{3}{4}$ -inch by  $\frac{3}{4}$ -inch (19mm by 19mm) triangular fillets. Forms for curved surfaces shall be so constructed and placed that the finished surface will not deviated from the arc of the curve.

Forms shall be so constructed that portions, where finishing is required, may be removed without disturbing portions of forms to remain in place.

Joists and stringers supporting slabs and overhangs shall be considered as falsework and designed in accordance with Subsection 303-1.6 of the Standard Specification for Public Works Construction.

Forms for girders and slabs shall be cambered as may be required by the Engineer.

Forms shall, as far as practicable, be so constructed that the form marks will conform to the general lines of the structure.

Form clamps or bolts, approved by the engineer, shall be used to fasten forms. The use of twisted-wire loop ties to hold forms in position will not be permitted, nor shall wooden spreaders be used unless authorized by the Engineer. Clamps or bolts shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back 1 inch (25mm) inside the finished surface of the concrete. All forms for outside surfaces shall be constructed with stiff wales at right angles to the studs, and all form clamps or bolts shall extend through and fasten such wales.

Forms for cast-in-place concrete drain conduit or sewer structures will not be required for concrete to be placed directly against the sides of the excavation or sheeting, provided the following conditions are met:

- 1) If concrete is placed directly against the faces of the excavation, the faces must be firm, compact, able to stand without sloughing, and must be outside the concrete lines shown on the Plans at all points. The entire faces of excavation, against which concrete is to be placed without the use of outside forms, shall be gunited to sufficient thickness to prevent raveling of the exposed earth faces during the placing of reinforcing steel, forms and concrete.
- 2) If concrete is placed against sheeting, such sheeting shall be closely fitted and all points shall be outside the concrete lines shown on the Plans. Those surfaces against which the concrete is to be placed shall be faced with building paper. except as otherwise specified herein, all sheeting shall be removed, but not until at least 7 days after placing concrete, or until the concrete has attained strength in compression of 2,000 pounds per square inch (14 MPa).

Care shall be used in removing sheeting so as to avoid damaging the concrete. Voids left by the removal of sheeting, piles or similar sheeting components shall be backfilled with material having a sand equivalent of not less than 30 and consolidated by jetting as approved by the Engineer. When field conditions or the type of sheeting or methods of construction used by the Contractor are such as to make the removal of sheeting impracticable, that portion of the sheeting against which concrete has been placed may be left in place.

- 3) The reinforcing steel shall be set accurately and firmly in place.
- 4) The Contractor shall assume all risks of damage to the Work or to existing

improvements that may be attributable to this method of construction.

- 5) Should this method of construction prove unsatisfactory, the Contractor shall discontinue this method and construct the conduit by using outside forms.
- 6) No direct payment will be made for building paper, sheeting, guniting, for concrete placed outside of concrete lines shown on the Plans, or for cement used in such guniting and concrete. The cost thereof shall be included in the prices bid for the various items of work.

#### **17-6.4 Removal of Forms**

**17-6.4.1 General** — The periods of time for form removal set forth herein are permissive only and subject to the Contractor assuming all risks that may be involved. The time periods are minimum with no allowance therein for external loads. At times of low temperature, or other adverse conditions, the Engineer may require the forms to be kept in place for longer periods of time.

The time periods are predicated on the use of concrete to which no admixtures have been added for the purpose of obtaining a high early strength, and upon the use of the same type of cement throughout the structure. The Engineer may permit the use of admixtures, additional cement, or different types of cement in accordance with Subsection 17-1.2.4. If such permission is granted, the minimum time periods for stripping forms will be established by the Engineer in accordance with the materials, methods to be used, and the stresses to which the structure may be subjected.

When the Contractor elects to use Type IP (MS) cement in accordance with Subsection 17-1.2.1, minimum form removal times may be longer than indicated in the following subsections.

Forms and falsework supporting the bottom slab of the superstructure of box girder structures shall remain in place 14 days after placing the deck of the superstructure. Forms for the webs of box girders shall be removed before the deck slab is placed. Forms for the upper deck slab which are to remain in place shall be supported by bolts through the girder webs or some equally satisfactory method that will prevent the transfer of any load to the lower deck slab. Forms supporting the concrete deck slab of box girders may be left in place. All interior forms in box girders except those permitted to remain in place, shall be removed completely and the inside of the box girder cleaned of all loose material.

Side forms for beams, girders, columns, railings, or other members in which the forms do not resist dead load bending, may be removed within a period of 2 to 5 days, as authorized by the Engineer, provided that satisfactory

arrangements are made to cure and protect the concrete thus exposed.

Side forms for arch rings, columns, and piers shall be removed before the members of the structure which they support are cast so that the quality of the previously placed concrete may be inspected. Such forms shall be so constructed that they may be removed without disturbing other forms which support direct load or resist bending stress.

17-6.4.2 Miscellaneous Structures — The periods of time set forth herein are based on the use of Type II cement.

Forms for concrete members (except bridges) subject to bending stresses, where the member relies upon forms for vertical support, may be removed 7 days after concrete is placed.

Curb forms shall not be removed until the concrete has set sufficiently to hold its shape but shall be removed in time to permit proper finishing.

Stairway forms shall be removed and the finish of the steps completed on the day the concrete is placed. Metal stairway treads, if required by the drawings, shall be installed immediately after the steps have been poured.

17-6.4.3 Standard Structures

- a) General — Except as otherwise stipulated, the periods of time set forth herein for removal of forms are based on the use of Types II, III, IV, or V portland cement.
- b) Standard Catch Basins
  - 1) Outside forms and inside wall forms which do not support the top slab forms—16 hours.
  - 2) Top slab forms—48 hours if Type II or V cement is used; 24 hours if Type III cement is used.
- c) Standard Transition Structures
  - 1) Outside forms and inside wall forms which do not support the top slab form—16 hours.
  - 2) Top slab forms—as specified for box section slab forms.