

PART 200
EARTHWORK

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CLEARING AND GRUBBING

201.1 DESCRIPTION:

This work shall consist of removing objectionable material from the right-of-way, easements and such other areas as may be specified in the special provisions. Clearing and grubbing shall be performed in advance of grading operations.

201.2 PRESERVATION OF PROPERTY:

Existing improvements, adjacent property, utilities and other facilities, and trees and plants not to be removed, shall be protected from injury or damage resulting from the Contractor's operations, see Section 107.

201.3 CONSTRUCTION METHODS:

The construction site and areas on each side of the roadway from centerline to the toe of an embankment, the top of a cut slope, the slope rounding limit or to a line 10 feet outside the edge of the surfaced area, whichever is greater, but not beyond the limits of the right-of-way, shall be cleared of all trees, stumps, brush, roots, rubbish, debris and other objectionable matter, except as follows.

All trees and shrubs found suitable for improvement and beautification, which will not interfere with excavation or embankment or cause disintegration of the improvements shall not be disturbed. In any event, the Contractor shall avoid, as far as practicable, injury to shrubbery, vines, plants, grasses and other vegetation growing outside of the clearing limits. The dragging and the piling of materials of various kinds and the performing of other work which may be injurious to vegetation shall, insofar as practicable, be confined to areas which have no vegetation or which will be covered by embankment or disturbed by excavation during grading operations.

For the full width of all water courses within the right-of-way lines, no stump, root or other obstruction shall be left higher than the natural stream bed.

From excavated areas, all stumps, roots and other obstructions 3 inches or over in diameter shall be grubbed to a depth of not less than 18 inches below finish grade.

In embankment areas or other areas to be cleared outside the road prism slope lines, all stumps, roots and other obstructions shall not be left higher than specified in Table 201-1.

TABLE 201-1	
EMBANKMENT CLEARING AND GRUBBING	
Height of Embankment Over Stump	Height of Clearing and Grubbing
0 Feet to 2 Feet	All stumps or roots 6 inches or over in diameter shall be grubbed to 18 inches below original grade. All others shall be cut flush with the ground.
2 Feet to 3 Feet	All stumps 1 foot and over in diameter shall be grubbed to 18 inches below original grade. All others shall be cut flush with the ground.
Over 3 Feet	No stumps shall be left higher than the stump top diameter, and in no case more than 18 inches.

Cavities left below subgrade elevation by removal of stumps or roots shall be carefully backfilled and compacted.

Tree branches extending over the roadway, which hang within 12 feet of the profile grade or that restrict sight distance shall be cut off close to the trunk or stem of the tree in a neat and workmanlike manner. The Contractor shall remove additional tree branches under the direction of the Engineer, in such a manner that the tree will present a balanced appearance. Scars resulting from the removal of branches shall be treated with a heavy coat of an approved tree sealant.

All tree trunks, stumps, brush, limbs, roots, vegetation and other debris removed in clearing and grubbing shall be removed to

locations outside of and out of sight of the right-of-way, or otherwise disposed of so as to leave the construction site and adjacent areas in a neat and finished condition, free from unsightly debris.

201.4 REMOVAL AND DISPOSAL OF SALVAGEABLE ITEMS:

Items and materials of salvage value as determined by the Engineer, unless incorporated in the new work, shall remain the property of the Contracting Agency and shall be stored in adjacent areas as directed by the Engineer. Such items and materials shall be carefully removed and in such a manner as to permit reuse.

201.5 PAYMENT, CLEARING AND GRUBBING:

Unless otherwise provided in the special provisions or bid proposal, no payment will be made for clearing and grubbing as such; the cost thereof shall be included in the bid price for the construction or installation of the items to which said clearing and grubbing are incidental or appurtenant.

201.6 MEASUREMENT, REMOVAL AND DISPOSAL OF TREES:

If the proposal includes separate estimates of quantities for the removal of trees, the tree will be classified by size as follows:

(A) Trees 12 inches or less in diameter at 1-foot above the original ground surface will be included in the bid price for clearing and grubbing or excavation and no additional compensation will be allowed therefore.

(B) Trees more than 12 inches in diameter at 1-foot above the original ground will be included as separate bid item and payment will be made at the unit bid price quoted in the proposal.

201.7 PAYMENT, REMOVAL AND DISPOSAL OF TREES:

Payment for removal of trees will be on a unit price for each tree measured and removed, in accordance with the above classifications, at the unit price stipulated in the proposal.

Municipality	Supplements
MC	<p>Add this Section</p> <p style="text-align: center;">Part 200 add the following new Section:</p> <p style="text-align: center;">SECTION 202</p> <p style="text-align: center;">REMOVAL OF STRUCTURES</p> <p>202.1 DESCRIPTION:</p> <p>The work under this Section shall consist of the removal, wholly or in part, and satisfactory disposal of all structures within the right-of-way which have not been designated on the project Plans or specified in the Special Provisions to remain, except for those structures which are to be removed and disposed of under other items of work in the contract. The work shall also include salvaging of designated materials and backfilling the resulting cavities.</p> <p>Existing structures, and other existing improvements which are to become an integral part of the planned improvements shall remain even though not specifically noted.</p> <p>Materials removed and not designated to be salvaged or incorporated into the work shall become the property of the Contractor.</p> <p>202.2 BLANK</p>

202.3 CONSTRUCTION REQUIREMENTS:

202.3.1 General:

Bridges, culverts, retaining walls, and other structures in use by or facilitating traffic shall not be removed until satisfactory arrangements have been made to accommodate the traffic.

Blasting or other operations necessary for the removal of an existing structure, which may damage new construction, shall be completed prior to commencing the new work.

Items designated to be salvaged shall be carefully stockpiled or stored by the Contractor at locations designated in the Special Provisions or as requested by the Engineer.

Items which are to be salvaged or reused in the new construction, that are damaged or destroyed as a result of the Contractor's operations, shall be repaired or replaced by the Contractor at no additional cost to the County.

Holes, cavities, trenches and depressions resulting from the removal of major structures, except in areas to be excavated, shall be backfilled with suitable material which shall be compacted to a density of not less than 95 percent of maximum density, as requested and approved by the Engineer.

202.3.2 Removal of Bridges:

The removal of existing bridges, either wholly or in part, shall be as shown on the project plans or as described in the Special Provisions. Bridge removal operations shall be conducted in such a manner as to cause the least interference to public traffic.

At least ten days before beginning bridge removal over or adjacent to public traffic or railroad property, the Contractor shall submit to the Engineer details of the removal operations showing the methods and sequence of removal and equipment to be used.

When total bridge removal is specified, all materials designated for salvage, such as structural steel, structural steel members, timber and other reusable materials shall be carefully dismantled, removed and salvaged in accordance with the requirements of Section 202.3.1. Steel members shall be match marked as requested by the Engineer.

Piling, piers, abutments, footings and pedestals shall be removed to at least 1.0 foot below ground line or 5 feet below finished subgrade elevation unless specified otherwise in the Special Provisions or on the project Plans.

When partial bridge removal is specified or alteration of an existing bridge requires removal of portions of the existing structure, such removal shall be performed with sufficient care as to leave the remaining portion of the structure undamaged.

In case of damage to the existing bridge structure, the Contractor shall make necessary repairs at no additional cost to the County. Reinforcing steel extending from the remaining portion of the structure shall be protected, cleaned and incorporated in the new portion of the structure in accordance with the details shown on the project plans or as requested by the Engineer.

Flame cutting and saw cutting may be used for removing, widening, or modifying bridges, provided the Contractor complies with all protection, safety and damage requirements.

Explosives shall not be used in bridge removal operations unless approved by the Engineer.

Before beginning concrete removal operations involving the removal of a portion of a monolithic concrete element, a saw cut a minimum of 1 inch deep shall be made to a true line along the limits

of removal on all faces of the element which will be visible in the completed work.

Removed concrete shall be disposed of as provided in Section 350.

202.3.3 Removal of Minor Structures and Miscellaneous Structural Concrete:

Minor structures and miscellaneous structural concrete shall be defined as all or portions of minor retaining walls, spillways, drainage structures, concrete box culverts, foundations, footings and all other Portland cement concrete construction, except bridges. All existing miscellaneous concrete shall be removed to a depth of at least 5 feet below finished subgrade elevation, unless otherwise specified in the Special Provisions or on the project plans.

Where new concrete is to join existing concrete, the existing concrete shall be saw cut to a true line with straight planar edges free from irregularities.

Concrete removal operations shall be performed without damage to any portion that is to remain in place. All damage to the existing concrete which is to remain in place shall be repaired to a condition equal to that existing concrete damaged by the Contractor's operations shall be at no additional cost to the County.

Existing reinforcement that is to be incorporated in new work shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

Removed concrete shall be disposed of as provided in Section 350.

The floors of concrete basements, pits, and structures not required to be removed, and which are located within the roadway, shall be broken in a manner that will prevent the entrapment of water.

202.3.4 METHOD OF MEASUREMENT:

Removal of structures will be measured on a lump sum basis except, that when the bidding schedule contains specific items under this section on a unit basis, measurement will be made by the units designated in the bidding schedule.

202.5 BASIS OF PAYMENT:

Payment for the accepted quantities of removal of structures will be made by lump sum, or by specific removal items, or by a combination of both. Payment for removal of structures and obstructions not listed in the bidding schedule, but necessary to perform the construction operations designated on the project plans or specified in the Special Provisions, shall be considered as included in the prices of contract items.

The prices shall include all excavation and subsequent backfill related to the removals, and the salvaging, hauling, storing and disposing of all materials as provided herein.

ROADWAY EXCAVATION

205.1 DESCRIPTION:

Roadway excavation shall consist of excavation involved in the grading and construction of roadways, except structure excavation, trench excavation and any other excavation separately designated.

Municipality	Supplements
MC	Section 205.1 Description add the following: Roadway excavation shall also consist of the placement and compaction of excavated material in embankments as provided under Section 211 Fill Construction

205.2 UNSUITABLE MATERIAL:

Material shall be considered unsuitable for fill, subgrade, shoulders and other uses if it contains organic matter, soft spongy earth, or other matter of such nature that compaction to the specified density is unobtainable.

Material that is unsuitable for the intended use, shall be excavated and removed from the site or otherwise disposed of as directed by the Engineer.

The removal and disposal of such unsuitable material will be paid for as roadway excavation.

205.3 OVERSHOOTING:

Material outside the authorized cross section which may be shattered or loosened because of blasting shall be removed by the Contractor at no additional cost to the Contracting Agency. The Contractor shall discontinue any method of blasting which in the opinion of the Engineer leads to excessive overshooting or is dangerous to the public or destructive to property or to natural features.

205.4 SLIDES AND SLIPOUTS:

Material outside the planned roadway or ditch slopes which in the opinion of the Engineer is unstable and constitutes potential slides, material which has come into the roadway or ditch, and material which has slipped out of new or old embankments shall be excavated to designated lines or slopes either by benching or in such manner as directed by the Engineer. Such material shall be used in the construction of the embankments or disposed of as directed by the Engineer.

The removal and disposal of slide and slipout material as specified above, not resulting from overshooting as specified above, will be paid for at the contract prices for roadway excavation; however, if due to 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 provided the Contractor requests in writing such payment prior to performing any such work.

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

205.5 SLOPES:

Excavation slopes shall be finished in conformance with the lines and grades shown on the plans. 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, except 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.

Tops of excavation slopes and ends of excavations shall be rounded as shown on the plans and these quantities will not be included in the quantities of excavation to be paid for. This work will be considered as a part of finishing slopes and no

additional compensation will be allowed therefore.

Embankment slopes shall be finished in conformance with lines and grades shown on the plans. When completed the average plane of slopes shall conform to 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.

205.6 SURPLUS MATERIAL:

Unless otherwise shown on the plans, specified in the special provisions, or approved by the Engineer, no surplus excavated material shall be disposed of within the right-of-way. The Contractor shall make all arrangements for disposal of the material at off-site locations as may be approved by the Engineer, and shall upon request file with the Engineer the written consent of the owner of the property upon which he intends to dispose of such material.

If the quantity of surplus material is shown on the plans or specified in the special provisions, the quantity shown or specified is 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 inside or outside the right-of-way. Any shortage of material caused by premature disposal of surplus material by the Contractor, shall be replaced by him and no compensation will be allowed the Contractor for such replacement.

205.7 MEASUREMENT:

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 material when shown on the plans or specified in the special provisions; excavating 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 ditches and excavating borrow.

The Engineer will compute the quantities of material excavated by a method which in his opinion is best suited to obtain an accurate determination.

Excavation in excess of the planned or authorized cross section will not be paid for, except as provided above. The Contractor shall backfill and compact unauthorized excavated areas to the original ground elevation of authorized section at no additional cost to the Contracting Agency.

Material resulting from excavating ditches or channels may be used to construct roadway embankments, dikes, or for other purposes, or disposed of, as directed by the Engineer.

Care shall be exercised to prevent excavating below the grade for the bottom of the ditch and areas excavated below grade shall be filled with suitable material and compacted by the Contractor at no additional cost to the Contracting Agency.

205.8 PAYMENT:

Quantities of roadway excavation will be paid for at the contract unit price per cubic yard. Such price shall include excavating, sloping, rounding tops and ends of excavations, loading, depositing, conditioning, spreading, and compacting the material complete in place and disposal of surplus material.

When the proposal does not include a pay item for roadway excavation the cost thereof shall be considered as being included in the price bid for the construction or installation of the items to which such roadway excavation is incidental or appurtenant.

STRUCTURE EXCAVATION AND BACKFILL

206.1 DESCRIPTION:

Structure excavation shall consist of the removal of material for the construction of foundations for bridges, manholes, retaining walls, box culverts, head walls for culverts, 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 material, if necessary, and placing and compacting backfill material around structures to the lines designated on the plans or specified or directed by the Engineer.

Structure excavation and structure backfill shall include the furnishing of all materials and equipment and the providing of other facilities which may be necessary to perform the excavations and place and compact the backfill, and the subsequent removal of these facilities, except where they are required or permitted by the plans, special provisions or Engineer to remain in place.

206.2 FOUNDATION MATERIAL 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 Engineer 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 Engineer, excavation below grade shall be replaced with the same class of concrete specified for the structure or with 1 1/2 sack controlled low strength material as specified in Section 728. When the replacement material is structural concrete, the material shall be placed at the same time as the structure material, placement of the material shall be per Section 604 which will require a time lag between the material and the structural concrete. The placement of the additional material shall be at no cost to the Agency.

The excavation for structures 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 area to the grade of the bottom of the footing as shown on the plans with structure backfill material.

206.3 INSPECTION:

When any structure excavation is completed, the Contractor shall notify the Engineer who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the Engineer.

206.4 STRUCTURE BACKFILL:

Backfilling operations shall conform to the following requirements: Structure backfill shall not be placed until the structure footings or other portions of the structure or facility have been inspected by the Engineer and approved for backfilling. No backfill material shall be deposited against the back of concrete abutments, concrete retaining walls, or the outside walls of cast-in-place concrete box culverts until the concrete has developed a strength of not less than 2500 psi in compression as specified in Section 725.

All structural backfill in any existing or proposed street and where any portion of the backfill is within 2 feet of the surface shall be compacted to the minimum density specified in Table 601-2, for Type I or shall be filled with 1/2 sack or 1 sack controlled low strength material as specified in Sections 604 and 728. All other structural backfill shall be compacted to the minimum density specified in Table 601-2, for Type II or Type III or shall be filled with 1/2 sack or 1 sack controlled low strength material as specified in Sections 604 and 728.

Municipality	Supplements
MC	<p>206.4.1 Prior to the placement of Structure Backfill in accordance with the requirements of this Section, the Contractor shall remove all loose, unstable materials from the sides of the structure excavation. The Contractor shall then compact the bottom of the remaining open structure excavation to a uniform density of not less than 95 percent maximum dry density. With the approval of the compaction of the bottom of the open structure excavation by the Engineer, the Contractor may start the placement of the Structure Backfill, in accordance with the applicable requirements of Sections 206.4.2 through 206.4.5.</p> <p>206.4.2 Structure Backfill to be placed against concrete structures designed to retain earth loads, such as bridge abutment backwalls and wingwalls, box culvert outside walls and wingwalls, and retaining walls:</p> <ol style="list-style-type: none"> (1) Shall conform to the material requirements of Section 701.2.1 Crushed Rock, and the gradation requirements for Select Material, Type A or B in Table 702-1, both of the Uniform Standard Specifications. (2) Shall not be placed until the concrete has reached its full design strength. (3) Shall be placed in layers not more than 8 inches in depth before compaction, when compacted by pneumatic or mechanical tamping devices. (4) Shall be uniformly compacted to at least 95 percent of maximum density. <p>206.4.3 Structure Backfill placed against concrete structures not designed to retain earth loads:</p> <ol style="list-style-type: none"> (1) Shall conform to the requirements for Select Material, Type A or B, of Section 702.2 Crushed Aggregate. (2) Shall not be placed until the concrete has attained a minimum compressive strength of 2500 psi and in no case less than 72 hours after casting. (3) Shall be uniformly compacted to at least 90 percent of maximum density. <p>206.4.4 Where a structure is located within a paved area:</p> <ol style="list-style-type: none"> (1) All backfill material above the finished subgrade elevation of the pavement structure shall conform to the requirements of the typical pavement structure and roadway prism at that location. (2) All Structure Backfill below the finished subgrade elevation shall be uniformly compacted to the density requirements for pavement subgrade. <p>206.4.5 Minor structures, as defined in Section 505.1.1, when furnished as precast structures, shall be placed on a layer of Structure Backfill at least 6 inches in depth. The Structure Backfill shall conform to the material requirements of Section 206.4.3. The layer shall have been shaped to fit the bottom surface of the precast unit and compacted to not less than 100 percent maximum density. The Structure Backfill shall be at or near optimum moisture content, as approved by the Engineer. After the unit has been initially set in place and checked for line and grade, it shall be removed, and any defects in its bearing area shall be corrected by trimming and by placing and compacting similarly moistened Structure Backfill. The process of removal, correction and replacement shall continue until the imprint of the unit on the bearing area indicates essentially uniform contact, and the unit is in reasonable conformity with the lines and grades shown on the project plans.</p>

206.5 PAYMENT:

Unless otherwise provided in the special provisions or proposal, no payment will be made for structure excavation and backfill as such; the cost thereof shall be included in the price bid for the construction or installation of the items to which such excavation and backfill are incidental or appurtenant.

Municipality	Supplements
MC	<p>206.5 Payment:</p> <p>When the Special Provisions identify Structure Excavation and/or Structure Backfill as pay items, they shall be paid for on the basis of accepted, measured volume(s), the following methods of measurement and payment shall be used:</p> <p>206.5.1(A) Measurement – Structure Excavation: Structure Excavation will be measured for payment by the cubic yard, based on the volumes calculated from the measurement/pay limits shown on the Project Plans. If no limits are shown, the measurement for Structure Excavation shall be in accordance with the applicable details shown on the current Arizona Department of Transportation (ADOT) Standard Drawings B-19.30 and/or B-19.50.</p> <p>No reduction in measurement for payment will be made when the Contractor elects to not excavate all material between the limits of the actual structure, and the pay limits shown on the Project Plans and/or the above referenced ADOT Standard Drawings.</p> <p>No additional measurement for payment will be made for excavation resulting from lack of side support for structure excavations, nor due to carelessness of the Contractor.</p> <p>206.5.1(B) Measurement – Structure Backfill: Structure Backfill will be measured for payment by the cubic yard, based on the volumes calculated from the measurement/pay limits shown on the Project Plans. If no limits are shown, the measurement for Structure Backfill shall be in accordance with the applicable details shown on the current ADOT Standard Drawings B-19.40 and/or B-19.50.</p> <p>206.5.2 Payment – Structure Excavation and Structure Backfill: Payment will be based on the accepted quantities of Structure Excavation and Structure Backfill, and will be paid for at their respective contract unit prices.</p> <p>Full compensation for hauling, placing, and compacting surplus Structure Excavation in embankments, or otherwise disposing of the material, shall be considered as included in the contract price paid for Structure Excavation.</p> <p>Payment for additional Structure Excavation, where it is found necessary to excavate to a depth greater than three feet below the elevation shown on the Project Plans to remove unsuitable material in accordance with the requirements of Section 206.2, payment will be made in accordance with the provisions of Section 104.2.</p>

BORROW EXCAVATION

210.1 LOCAL BORROW:

Local borrow shall consist of material excavated and used in the construction of fills or for use as selected material or for other construction purposes. Local borrow shall be obtained by widening cuts or by excavating from other sources outside the planned or authorized cross section within the right-of-way and within the limits of the project. Local borrow shall be excavated to the lines and grades established by the Engineer.

210.2 IMPORTED BORROW:

Imported borrow shall consist of material required for construction and unless otherwise designated in the special provisions, the Contractor shall make his own arrangements for obtaining imported borrow and he shall pay all costs involved. Imported borrow shall be obtained from sources indicated on the plans, designated in the special provisions, or approved by the Engineer.

The material shall be free from wood, vegetation, or other deleterious matter. The maximum size of this material shall not be greater than 2/3 the compacted thickness of the course placed in the subgrade.

The Contractor shall notify the Engineer sufficiently in advance of opening any material sites so that cross section elevations and measurements of the ground surface after stripping may be taken and sufficient time for testing and material will be allowed.

Borrow pits shall be excavated to regular lines to permit accurate measurement; depth of excavation throughout the area of borrow pits shall be as uniform as practicable and the side slope shall be dressed to such slope as may be directed, leaving the borrow pit area in a clean and safe condition.

Municipality	Supplements
MC	<p>210.2 IMPORTED BORROW</p> <p style="text-align: center;">Add the following:</p> <p style="text-align: center;">Borrow material for fill construction shall meet the following requirements:</p> <p style="text-align: center;">The Plasticity Index (PI) (AASHTO T90) and the percent passing the Minus 200 sieve (ASTM C136) when used in the equation below, shall give a value of X that does not exceed 62.</p> <p style="text-align: center;">$X = (\text{Minus } 200) + 2.83 (\text{PI})$</p>

210.3 PLACING AND COMPACTING:

Local borrow and imported borrow shall be placed and compacted as specified in Section 211.

The Contractor shall satisfy himself that there is sufficient space available in fill locations for placing any excavated material, before placing borrow. Any excess excavation which develops as a result of placing borrow in advance of completing excavations shall be disposed of by the Contractor at no additional cost to the Contracting Agency in accordance with the provisions in Section 205 and a corresponding reduction in the quantity of borrow to be paid for will be made, for which the Contractor will have no claim for compensation.

210.4 MEASUREMENT:

Quantities of borrow will be measured as specified for roadway excavation in Section 205.

Material excavated at the borrow site and not used on the work will be deducted from the computed quantities and will not be paid for.

210.5 PAYMENT:

Quantities of borrow excavation will be paid for at the contract unit price per cubic yard. Such price shall include excavating, sloping and cleaning of borrow area, hauling, depositing, spreading and compacting the material complete in place, and disposal of surplus material, unless an alternate basis of payment is stipulated in the proposal.

FILL CONSTRUCTION

211.1 DESCRIPTION:

Fill construction shall consist of constructing embankments except as may otherwise be specified, including the preparation of the areas upon which they are to be placed; the construction of 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 other depressions.

211.2 PLACING:

Rocks, broken concrete, or other solid material, which are larger than 4 inches in greatest dimension shall not be placed in fill areas where piles are to be placed or driven.

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 1/2 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 ever the vertical cut of the next lower bench intersects the existing ground. Material thus cut out shall be recompacted along with the new embankment material by the Contractor at no additional cost to the Contracting Agency, unless the width of the bench required 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 dimension shall be broken up before compacting the material in embankment, except as provided in the following paragraph:

When the fill material includes large rocky material, or hard lumps, such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the fill. Sufficient earth or other fine material shall be placed around the larger material as it is deposited so as to fill the interstices and produce a dense, compact fill. However, such material shall not be placed within 2 feet of the finished grade of the fill.

211.3 COMPACTING:

Fill 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 fills 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 successive loads of suitable materials in a uniformly distributed layer of thickness not greater than that necessary to support the equipment while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

Unless specified herein, or in the special provisions, the construction of dikes, the placing and compacting of approved material within the right-of-way where unsuitable material has been removed, and the filling of holes, pits and other depressions within the right-of-way, shall conform to all of the requirements herein specified for compacting fills. Trenches, holes, depressions and pits outside of areas where fills are to be constructed shall be graded to provide a presentable and well-drained area.

Areas over which fills are to be placed shall be cleared and scarified to a depth of 6 inches to provide a bond between the existing ground and the material to be deposited thereon. Unless otherwise specified, the original ground area upon which fills are to be constructed shall be compacted to a uniform density of not less than 95 percent.

The loose thickness off each layer of fill material before compacting shall not exceed 8 inches, except as provided in the following paragraph for rocky material. Each layer shall be compacted in accordance with the following requirements to a uniform density of not less than 90 percent, except that where a new or widened roadway and appurtenances are required, density of the upper 2 feet and when the fill is within 2 feet of the above shall be not less than 95 percent.

When fill material contains by volume over 25 percent of rock larger than 6 inches in greatest dimension, the fill below a plane 3 feet below 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 other fine material and compacted. Broken portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the fill with the following limitation:

- (A) The maximum dimension of any piece used shall be 6 inches.
- (B) Pieces larger than 4 inches shall not be placed within 12 inches of any structure.
- (C) Pieces larger than 2 1/2 inches shall not be placed within 12 inches of the subgrade for paving.
- (D) Nesting of pieces will not be permitted.

At the time of compaction, the moisture content of fill material shall be such that the specified relative compaction will be obtained and the fill be firm and unyielding. Fill 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 fill material to the required moisture content shall be considered as included in the contract price paid and no additional compensation will be allowed therefore.

Embankments shall be constructed so that each layer shall have a cross fall of at least 2 percent but no more than 5 percent.

211.4 TESTS:

Unless otherwise provided in the plans or special provisions the fill shall be thoroughly compacted to not less than the stated densities when tested and determined by AASHTO T-99, Method A, and T-191 or ASTM D-2922 and D-3017 with the percent of density adjusted in accordance with the rock correction procedure for maximum density determination, standard detail, to compensate for the rock content larger than that which will pass a No. 4 sieve.

211.5 MEASUREMENT:

The quantities of fill construction used to construct embankments or dikes will be those of the complete bid item, in place, within the limits of dimensions shown on the plans.

The Engineer will compute the quantities of fill by a method which in his opinion is best suited to obtain an accurate determination.

211.6 PAYMENT:

Quantities of fill construction will be paid for at the contract unit price per cubic yard of fill as stipulated in the proposal. Such price shall include placing and compaction and all related work as specified above, unless an alternate basis of payment is stipulated in the proposal.

Unless otherwise provided in the special provisions, no payment will be made for fill construction to replace unsuitable material or for fill for holes, pits, and other depressions. The cost thereof shall be included in the price bid for the construction of the items to which such fill is incidental or appurtenant.

Municipality	Supplements
MC	<p>Part 200 add the following new Section:</p> <p style="text-align: center;">SECTION 212</p> <p style="text-align: center;">ROADWAY OBLITERATION</p>

	<p>The work under this section shall consist of obliterating existing roadway to the satisfaction of the Engineer and in accordance to the Special Provisions.</p> <p>Obliteration is defined as restoring the abandoned segments of roads to as near natural contours as possible by forming natural rounded slopes.</p> <p>The Contractor shall scarify existing pavement and dispose of it in fill areas approved by the Engineer. Fill material in excess of construction requirements shall be placed in the area of the old roadway and shaped to blend with natural contours according to the obliteration detail or specified grades, to the satisfaction of the Engineer. Care shall be taken to insure proper drainage. The area shall be seeded in accordance with Section 430 Landscaping and Planting.</p> <p>Measurement for pavement removal will be by the square yard prior to removal.</p> <p>Payment for pavement removal will be by the square yard.</p>
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Municipality	Supplements
MC	<p>Part 200 add the following new Section:</p> <p style="text-align: center;">SECTION 213</p> <p style="text-align: center;">DEWATERING</p> <p>213.1 DESCRIPTION:</p> <p>The work under this Section consists of furnishing all necessary labor and materials, installing and maintaining all necessary pumps, piping and other equipment for removing water from various locations, and maintaining excavations free of water as required for construction.</p> <p>213.2 AUTHORIZATION:</p> <p>If high groundwater levels are encountered, the Engineer will determine whether to implement:</p> <ol style="list-style-type: none"> a) Dewatering, as specified herein, or b) Demobilization and remobilization, with a contract time extension in accordance with Section 108.7 of the Specifications. <p>213.3 CONSTRUCTION REQUIREMENTS:</p> <p>213.3.1 General Excavation</p> <p>Prior to starting any work on removal of water from excavations, the Contractor shall have an approved Groundwater and Surface Water Handling Plan. The Plan shall include the Contractor’s proposed method of removing water from excavations. The Plan may be placed into operation upon approval of the Engineer, but nothing in this section will relieve the Contractor from full responsibility for the adequacy of the water control.</p> <p>Contractor shall furnish to the Engineer one set of dewatering calculations as part of the dewatering plan. These calculations shall include determination of well spacing, header sizing, pump selection, pump rating curves, typical well point cross-sections and depth of screened section. They shall include sketches and figures of sufficient detail to illustrate the layout of the dewatering system for the different portions or phases of the dewatering for the work areas. The Contractor shall furnish a listing of all equipment, including model numbers, vendors and suppliers, and catalogue cuts.</p>

	<p>The dewatering calculations shall be prepared by a Professional Engineer or Professional Geologist.</p> <p>The Contractor's Plan shall conform to all local, state and federal requirements. Any groundwater, stormwater or surface water encountered during construction shall be disposed of in such a manner that will not cause damage to public or private property or constitute a nuisance or menace to the public.</p>
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213.3.2 Soil – Cement Construction

Where excavation for the soil-cement construction extends below the water table, the portions below the water table shall be dewatered in advance of excavation. The dewatering shall be accomplished in a manner that will prevent the loss of fines, maintain stability of the slopes and bottom of the excavation, and result in construction operations being performed under reasonably dry conditions.

During placement and compaction of the concrete, the water level at every point of the excavation shall be maintained a minimum of three (3) feet below the placement level until the soil-cement has been in place a minimum of 48 hours.

213.4 PAYMENT:

Payment for Dewatering or demobilization and remobilization will be based upon approved time and material invoices, in accordance with Section 109.5 in an amount not to exceed the ALLOWANCE shown in the Bidding Schedule under Item DEWATERING, for approved work performed for the project.

EARTHWORK FOR OPEN CHANNELS

215.1 DESCRIPTION:

Earthwork for open channels shall consist of clearing, stripping, excavation, fill, backfill, grading and disposal of excavated and removed material. Open channels for the purpose of this section shall mean open rectangular concrete channels and lined or unlined trapezoidal channels.

215.2 STRIPPING:

When stripping is indicated on the plans or specified in the special provisions, the Contractor shall strip the soil from the designated areas to the depths shown or specified or as directed by the Engineer.

The material obtained from stripping operations shall be disposed of away from the site unless otherwise specified, shown on the plans or authorized by the Engineer.

Soil loosened below the stripping depth specified or designated by the Engineer, shall be compacted. Soil removed below stripping depth shall be replaced with approved material and compacted up to the designated grade. All such filling and compacting shall be done by the Contractor at no additional cost to the Contracting Agency.

215.3 EXCAVATION:

Excavation in open cut for lined channels may be made so as to place concrete directly against the excavated surfaces providing the faces of the excavation are firm and unyielding; are such as will stand or can be made to stand without sloughing and are, at all points outside the concrete lines shown on the plans.

Excavation to provide a subgrade for lined channels, or subdrainage material, shall be to the lines indicated on the plans; and, excavation made below subgrade shall be backfilled and compacted to a uniform density of not less than 90 percent or, if approved by the Engineer, with concrete or other materials being placed. However, no payment will be made for such over-excavation or material used for such backfill.

Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, the voids remaining after the removal of such boulders or interfering objects shall be backfilled as specified below, or as otherwise approved by the Engineer.

(A) When the void is below the subgrade for reinforced concrete channel, it shall be filled with suitable material, as approved by the Engineer, and compacted to a uniform density of not less than 90 percent. With the approval of the Engineer, concrete of the same mix as used in the concrete channel, may be used.

(B) When the void is in the side of the excavation, it shall be filled with suitable material as approved by the Engineer, placed in the manner and to the same uniform density as the backfill in the vicinity of the void. With the approval of the Engineer, concrete of the same mix as used in the concrete channel may be used. If concrete is placed prior to lining, a lower grade concrete may be used only if approved by the Engineer.

It shall be understood that the removal of boulders or other interfering objects and the backfilling of voids caused by such removals shall be done by the Contractor at no additional cost to the Contracting Agency. The cost of such work shall be included in the prices bid for the various items of work.

If during the progress of excavation, material is encountered, which, in the opinion of the Engineer, is unsuitable for subgrade for the channel to be constructed on, the Engineer may direct the Contractor to excavate beyond the pay lines shown on the plans. However, the suitability of subgrade shall be determined by the Engineer on the basis of its ability to withstand the load of the proposed channel and not upon the capacity to withstand the loads which may be placed upon it by the Contractor's equipment. Should the Contractor be directed to excavate beyond the pay lines shown on the plans, said pay lines will be extended to include such ordered excavation; and the pay lines for subdrainage material, if used, will be adjusted accordingly.

Materials used or work performed by the Contractor, to stabilize the subgrade so it will withstand loads which may be placed upon it by his equipment shall be accomplished by the Contractor at no additional cost to the Contracting Agency.

215.4 FILL AND BACKFILL:

Unless otherwise specified in the special provisions, material obtained from the project excavations may be presumed to be suitable for use as fill or backfill provided that all organic material, rubbish, debris, and other objectionable material is first removed. However, stone, broken portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the backfill or fill with the limitations as specified in Section 211.

Unless otherwise specified in the special provisions, the density of fills and backfills shall be at least 90 percent.

215.5 GRADING:

Grading of unlined channels, levees and access roads shall conform to the following tolerances:

(A) A vertical tolerance of none above and 3 inches below the specified grade will be allowed on:

- (1) Channel bottom
- (2) Channel side slopes in both cut and fill
- (3) Levee and access road side slopes in cut

(B) A vertical tolerance of none below and 3 inches above the specified grade will be allowed on:

- (1) Top surface of levee and access road in both cut and fill
- (2) Levee and access road side slopes in fill

Regardless of the construction tolerances specified, excavation and grading shall be performed so that finished surfaces are in uniform planes with no abrupt breaks in the surface.

Construction tolerances specified above for grading are solely for purposes of field control.

215.6 TESTS:

Density tests shall be made in accordance with Section 211.

215.7 MEASUREMENT:

If compensation for stripping is included in the price paid for other items of work the Contractor shall notify the Engineer sufficiently in advance of excavation or other work so that cross section elevations and measurements of the ground surface may be taken upon completion of stripping.

The Engineer will compute the quantity of excavation by a method which in his opinion is best suited to obtain an accurate determination.

Municipality	Supplements
MC	The second paragraph of this Section is revised to read: Quantities will be computed by the average end area method.

215.8 PAYMENT:

Earthwork for open channels will be paid for on a lump sum basis or at the contract unit price per cubic yard of excavation as stipulated in the proposal. Such price shall include clearing, stripping, excavation, fill, backfill, compaction, grading, hauling, removal and disposal of excess excavated material and debris unless an alternate method of payment is stipulated in the proposal.

RIPRAP CONSTRUCTION

220.1 DESCRIPTION:

The construction of riprap shall consist of furnishing and placing stone, with or without grout, or sacked concrete riprap. The depth and type of riprap shall be as shown on the plans or specified in the special provisions.

220.2 MATERIALS:

Materials furnished for riprap shall conform to the requirements of Section 703.

220.3 PREPARATION OF GROUND SURFACES:

The bed for the riprap shall be shaped and trimmed to provide even surfaces. A footing trench shall be excavated along the toe of the slope as shown on the plans.

220.4 PLAIN RIPRAP:

When the required riprap is less than 20 inches in depth, stone shall be placed by hand. Stone shall be placed to provide a minimum of voids. The larger stone shall be placed in the toe trench, foundation course, and on the outer surface of the riprap. Stones shall be placed with their longitudinal axis normal to the face of the embankment and so arranged that each stone above the foundation course has at least a 3 point bearing on the underlying stones. Bearing on smaller stones used to chink voids will not be acceptable. Interstices between stones shall be chinked with small stones and spalls. The finished surface shall be even and tight and shall not vary from the planned surface by more than 3 inches per foot of depth.

When the required riprap is 20 inches or more in depth, the stone may be placed by dumping and spread in layers by bulldozers or other suitable equipment.

220.5 GROUTED RIPRAP:

Riprap shall be placed as specified and grouted with portland cement mortar. The grout shall consist of 1 part cement and 3 parts by volume or aggregate. The portland cement shall be Type II as specified in Section 725 and the aggregate shall be 2 parts sand and 1 part gravel passing a 3/8 inch square mesh screen. The quality of the sand and gravel shall be as specified in Section 701.

The amount of water shall be such as to permit gravity flow into the interstices with limited spading and brooming. The consistency of the grout shall be as approved by the Engineer.

Except when hand mixing is permitted by the Engineer, grout shall be mixed in an approved machine mixer for not less than 1 1/2 minutes. Should hand mixing be permitted, the cement and aggregate shall be thoroughly mixed in a clean, tight mortar box until the mixture is of uniform color after which clean water shall be added in such quantity as to provide a grout of the specified consistency.

220.6 SACKED CONCRETE RIPRAP:

Slopes on which the sacked concrete riprap is to be placed shall be finished within 0.2 foot of the designated grades. The first course shall be a double row of stretchers laid in a neatly trimmed trench. The second course shall be a single row of headers. The third and remaining courses shall be stretchers or headers as shown on the plans or specified in the special provisions and shall be placed so that joints between courses are staggered. Dirt and debris shall be removed from the tops of sacks before the next course is laid thereon. Headers shall be placed with the folds upward. Not more than 4 vertical courses shall be placed in any tier until the initial set has taken place in the first course of any such tier.

When, in the opinion of the Engineer, there will not be proper bearing or bond due to delays in placing succeeding layers of the hampering of work by storm, mud or for any cause, a small trench shall be excavated back of the row of sacks already in place and this trench filled with fresh concrete before more sacks are placed. Payment for excavating the trenches shall be considered as included in the payment for the concrete in the trench.

Sacked concrete riprap shall be cured by sprinkling with a fine spray of water every 2 hours during daylight for not less than 3 days.

220.7 MEASUREMENT:

The quantities of riprap construction shall be those of the completed bid item, in place, within the limits of dimensions shown on the plans.

The Engineer will compute the quantities of riprap by a method which, in his opinion, is best suited to obtain an accurate determination.

220.8 PAYMENT:

Payment for riprap will be made for the number of cubic yards of riprap in place, on the basis of unit prices stipulated in the proposal and shall include preparation of ground surfaces and trenching, unless an alternate basis for payment is stipulated in the proposal.

Municipality	Supplements								
MC	<p>Part 200 add the following new Section:</p> <p style="text-align: center;">SECTION 222</p> <p style="text-align: center;">CEMENT STABILIZED ALLUVIUM BANK PROTECTION</p> <p>222.1 DESCRIPTION:</p> <p>The work under this section consists of constructing cement stabilized alluvium (CSA) bank protection at the locations shown on the plans and in accordance with these specifications, including excavating, backfilling and grading the river bed and banks to the lines, grades and cross sections shown on the plans or established by the Engineer; furnishing, processing and mixing aggregate, cement, fly ash and water; spreading and compacting the mixture; and placement of curing seal.</p> <p>222.2 MATERIALS:</p> <p>222.2.1 Aggregate shall be clean, sound, durable, uniform in quality and free of any soft, friable material, organic matter, oil, alkali or other deleterious substances. Aggregate shall conform to the following requirements when tested in accordance with Section 701.1 of the Uniform Standard Specifications.</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Aggregate Size</th> <th style="text-align: center;">Percent Passing</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3 inch</td> <td style="text-align: center;">100</td> </tr> <tr> <td style="text-align: center;">No. 4</td> <td style="text-align: center;">30-65</td> </tr> <tr> <td style="text-align: center;">No. 200</td> <td style="text-align: center;">0-8</td> </tr> </tbody> </table> <p>The plasticity index shall be no greater than 10 in accordance with the requirements of AASHTO T-90. Clay lumps larger than one inch shall be screened out of the raw soil prior to mixing.</p> <p style="text-align: center;">Before placing aggregates upon the stockpile site, the site shall be cleared of vegetation,</p>	Aggregate Size	Percent Passing	3 inch	100	No. 4	30-65	No. 200	0-8
Aggregate Size	Percent Passing								
3 inch	100								
No. 4	30-65								
No. 200	0-8								

trees, stumps, brush, rocks and other debris, and the ground leveled to a smooth, firm, uniform surface.

Stockpiles shall be constructed upon prepared sites. The piles when completed shall be neat and regular in shape. The stockpile height shall be limited to a maximum of 13 feet.

Stockpiles in excess of 200 cubic yards shall be built up in layers not more than 4 feet in depth. Stockpile layers shall be constructed by trucks, "clamshells", or other methods approved by the Engineer. Pushing aggregates into a pile by a bulldozer will not be permitted. Each layer shall be completed over the entire layer of the pile before depositing aggregates in the next layer.

The aggregate shall not be dumped so that any part of it runs down and over the lower layers in the stockpile. The method of dropping from a bucket or spout in one location so as to form a cone shaped pile will not be permitted. Any method of placing aggregates in stockpiles, which, in the opinion of the Engineer, segregates, breaks, degrades or otherwise damages the aggregates will not be permitted.

Only pneumatic tired equipment shall be used on the processed or manufactured aggregates in constructing the stockpiles. When removing materials from the face of the stockpile, the equipment shall be operated in such a manner as to face-load from the floor to the top of the stockpile to obtain maximum homogeneity of materials.

Stockpiles shall not be constructed where traffic, vehicles or Contractor's equipment will either run over or through the stockpile, or cause foreign matter to be mixed with the aggregates.

222.2.2 Cement shall conform to the requirements of Section 725.2 of the Uniform Standard Specifications for low alkali, Type II Portland Cement.

222.2.3 Fly ash shall conform to the requirements of Section 725.2.1 of the Uniform Standard Specifications for pozzolonic materials.

222.2.4 Water used for mixing shall be potable and free from oil, vegetable matter and any other deleterious matter; and shall conform to Section 725.5.5 of the Uniform Standard Specifications

222.2.5 CSA shall have a minimum compressive strength of 0.75 ksi at seven days, determined in accordance with the requirements of Arizona Test Method 241 (Modification of AASHTO T-134). At least one test (two cylinders) shall be made for each 1,300 cubic yards of CSA placed.

222.2.6 Bedding Mortar shall consist of broomable, high Portland cement/fly ash content, heavily sanded mortar, with a compressive strength of 2.9 ksi at 28 days, and shall have a slump of approximately 8.0 to 9.0 inches. The sand shall satisfy Section 701.3 of the Uniform Standard Specifications and the following gradation:

Aggregate Size	Percent Passing
3/8 inch	100
No. 4	95-100
No. 16	45-80
No. 50	0-30
No. 140	0-10
No. 200	0-4

222.2.7 Exterior Concrete shall be Class B, conforming to Section 725.1 of the Uniform Standard Specifications.

222.2.8 Forms shall be mortar tight and designed, constructed, braced and maintained so that the finished concrete will be true to line and elevation; and will conform to the required dimensions

and contours. They shall be designed to withstand the pressure of concrete, use of set-retarding admixtures or pozzolonic materials in the concrete, effects of vibration as the concrete is being placed and all loads related to the construction operations, without distortion or displacement.

All forms shall be treated with an approved release agent before concrete is placed. Any material that will adhere to or discolor the concrete shall not be used.

222.3 CONSTRUCTION REQUIREMENTS:

222.3.1 Mix Design: Contractor shall determine the mix proportions of the aggregate, cement, fly ash and water; and shall furnish CSA conforming to the requirements specified herein. The job-mix design with supporting test results shall be submitted to the Engineer for review. The Engineer's approval shall be obtained prior to incorporating any material into the work.

The mix design objective is to provide the minimum cement plus fly ash content (C+P), W/C ratio and mix proportions to meet the specified strength, plus 2% additional cementitious materials (same C+P content) for durability and material variations. At the same time, the mix shall be dry (stiff) enough to support heavy placement and compaction equipment, yet wet enough to permit effective consolidation by adequate distribution of the paste binder throughout the CSA mass, during the mixing and placing process. The C+P content during CSA production shall not be decreased nor increased from that of the approved job-mix design unless approved by the Engineer. Actual mix designs, used on this project, shall be determined from the Contractor's laboratory tests from material stockpiled after construction of the stockpiles is completed.

The mix design shall be performed in accordance with Arizona Test Method 220 (Determination of Cement Content Required for Cement Treated Mixtures, a modification of AASHTO T-144) to determine the cementitious (C+P) content necessary for the strength required for CSA.

Determination of the optimum moisture content for compaction of the CSA mixture, including the additional 2% cementitious material for durability, shall be in accordance with AASHTO T-134, Method B. The additional 2% cementitious materials shall be a mixture of cement and fly ash in the same proportions as utilized in the mix design to meet the strength requirement. The total weight of cement replaced by fly ash shall not exceed 15%.

The Contractor shall follow the general provisions in accordance with Arizona Test Method 220 and AASHTO T-99, Method D, with the following exceptions.

The AASHTO T-99, Method D, shall be used in determining maximum dry density, modified to the extent that a rock correction will be calculated to correct for aggregate passing the 3.0-inch and retained on the 5/8 inch sieves. No correction will be used in determining the optimum moisture content.

Included in the job-mix design data shall be the grade of cement, brand of fly ash, and source of aggregate. A new mix design shall be submitted for approval at least two weeks prior to use, any time the Contractor requests a change in materials or proportioning of the materials from that given in the approved mix design.

222.3.2 Preparation of Subgrade: CSA shall be placed on a prepared subgrade shaped to the lines and grades shown on the plans, or be placed on existing CSA. The subgrade shall be compacted to a minimum of 95% of the maximum density in accordance with Section 301.3 of the Uniform Standard Specifications. When the embankment material is composed predominately of rock such that these compaction procedures will not achieve the required density, the Engineer will determine the amount of compaction required and the adequacy of equipment used to obtain the required compaction.

Immediately prior to placement of the CSA, the subgrade shall be uniformly moistened and

maintained in an acceptable condition throughout the placement operation. Soft or yielding subgrade shall be corrected and made stable before construction proceeds. Saturated or submerged subgrade shall remain dewatered a minimum of 48 hours after placement of the CSA.

When CSA is to rest on rock, the rock shall be fully uncovered. The surface of the rock shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled or cut to approximate horizontal and vertical steps. Seams in the rock shall be grouted where determined by the Engineer.

When placed on existing CSA, the surface receiving the new CSA shall be cleaned to the satisfaction of the Engineer in the following manner:

After exposing the CSA structure, the surface shall be thoroughly cleaned of all loose materials foreign to the CSA. The surface shall be cleaned by sand-blast or hydro-blast (2.0 ksi maximum) to remove all foreign or loosened particles and hand scaled, if necessary, to provide a clean rough surface, free of loose materials, satisfactory to the Engineer.

The old CSA surface shall be moist at the time of placement and a ¼ inch layer of broomable bedding mortar (2.9 ksi) shall be used between the old and new CSA. A set retarding admixture shall be used in the mortar during hot weather placement.

222.3.3 Mixing, General Requirements: Aggregate, fly ash and cement shall be proportioned and mixed in a central mixing plant, unless otherwise permitted by the Engineer. The plant shall be either the batch mixing type (using revolving blade or rotary drum), or the continuous mixing type. The aggregate fly ash and cement shall be proportioned by weight. Certification for each shipment of cement or fly ash shall be provided to the Engineer.

The fly ash and cement shall be added in such a manner so that they are uniformly distributed throughout the mixing operation.

There shall be safe, convenient facilities for sampling the cement and fly ash in the supply line to the weight hopper or pugmill. The charge in the batch mixer or continuous mixer shall not exceed that which will permit complete mixing of the materials.

The water shall be proportioned by weight or volume and there shall be some means to enable the Engineer to verify the amount of water in each batch or the rate of water flow for continuous mixing. The time of the addition of water or the points where it is introduced into the mixer shall be as approved by the Engineer.

Control of water content in the field shall be accomplished in two ways:

(1) The moisture-density relationship for the CSA shall be determined in accordance with AASHTO T-134, Method B, on a routine basis, or when any significant shift in the gradation or rock content occurs.

(2) The actual moisture content of the mixture at the time of compaction, or shortly thereafter, shall be determined in accordance with ASTM D2216 (oven dry) or AASHTO T-0239 (nuclear densimeter), to determine if the optimum moisture content as determined by AASHTO T-134, Method B, is being maintained.

Water content in the aggregates is to be continuously monitored and the mixing water shall be adjusted as necessary to maintain proper moisture.

222.3.4 Batch Mixing: The mixer shall be equipped with a sufficient number of paddles of a type and arrangement to produce a uniformly mixed batch. The mixer shall be equipped with a timing device which will indicate, by a definite audible or visual signal, the expiration of the mixing period. The device shall be accurate to within two seconds. The time of mixing shall begin after all the ingredients are in the mixer and shall end when the mixer is half emptied. The allowable tolerance for weight batching of aggregates and cementitious material will be 2.0% and 0.5%, respectively, for each batch.

The batch mixing plant shall provide sampling facilities that are satisfactory to the Engineer and which will allow representative samples of the CSA to be obtained easily and safely.

222.3.5 Continuous Mixing: A control system shall be provided that will automatically close down the plant when the material in any storage facility approaches the strike-off capacity of the feed gate. The plant will not be permitted to operate unless this automatic control system is in good working condition.

The feeder for the aggregate shall be mechanically or electrically driven.

Aggregate shall be drawn from the stockpile by a feeder or feeders that will continuously supply the correct amount of aggregate.

The cement/fly ash and aggregate feeders shall be equipped with devices that can accurately determine the rate of feed while the plant is in full operation.

Continuous mix plants shall provide sampling facilities which are satisfactory to the Engineer, and that allow representative samples of the aggregate and CSA mixture to be obtained easily and safely.

222.3.6 Transporting/Spreading: Mixed materials shall be transported from the plant to the construction site in vehicles and spread on the prepared subgrade or previously completed CSA. Spreading shall be accomplished by the use of approved motor graders or crawler type equipment. The compacted lifts of CSA shall not exceed 8.0 inch or be less than 4.0 inch in thickness.

CS Aggregate shall not be mixed or placed when the air temperature is below 45° F in the shade, unless the air temperature is at least 45° F in the next 24 hours. CSA shall not be mixed or placed when the air temperature is greater than 109° F in the shade.

222.3.7 Compacting/Finishing: All completed CSA surfaces that will be covered with succeeding layers of CSA shall be kept continuously moist by fog spraying until placement of next lift.

CSA shall be uniformly compacted to a minimum of 98%, with an average of 100%, of maximum density as monitored by nuclear density tests in accordance with AASHTO T-238 and T-239. Maximum density shall be determined in the lab in accordance with the requirements of AASHTO T-99, Method D, for minus 0.75 inch material only, with rock correction at each density test location according to AASHTO T-224, Section 2.2.2. At least one density test shall be taken for each 460 cubic yards of CSA.

At the start of compaction of each lift, the mixture shall be in uniform, loose condition throughout its full depth. The moisture content shall be as previously specified herein. No section shall be left undisturbed for longer than thirty minutes during compaction operations. Compaction of each lift shall be accomplished in such a manner as to produce a dense surface, free of compaction planes, and shall be completed within one (1) hour from the time water is added to the mixture.

After compaction, CSA shall be shaped to the required grades, cross sections and rolled to a reasonably smooth surface. Whenever the Contractor's operation is interrupted for more than two hours, the top surface of the completed layer, if smooth, shall be scarified to a depth of at least 1 inch with a spike-tooth instrument prior to placement of the next lift. The surface, after scarifying, shall be swept using a power broom or other method approved by the Engineer, to completely free the surface of all loose material prior to the placement of the next lift.

At the time of compaction, the moisture content shall not be more than one percent (1%) below optimum and shall not be more than one percent (1%) above optimum when the mean air temperature during construction hours does not exceed 90° F.

When the mean air temperature does exceed 90° F, or there is a breeze or wind which promotes rapid drying of the CSA mixture, the moisture content shall be increased as needed, at the direction of the Engineer, but shall be less than the amount that will cause the CSA to become unstable during compaction and finishing operations.

Backfill shall not be placed within 40 inches of the top of the CSA surface. Construction joints shall be provided at the end of each day's work or when work is halted for two hours or more. The joints shall be trimmed to a straight line and vertical to the full depth of the lift. Before resuming placement of new material, the joints shall be roughened and loose material removed by power broom or compressed air.

Compaction equipment shall be capable of obtaining specified requirements without detrimentally affecting the compacted material. The equipment shall be modern, efficient compacting units approved by the Engineer. The units shall be of a type that is capable of compacting each lift of material as specified, and meet the minimum requirements as contained herein:

Self-propelled drum drive vibratory roller shall be of a type that will transmit dynamic impact to the surface to be compacted through a steel drum by means of revolving weights, eccentric shaft or other methods. The compactor shall have a gross mass of not less than 23,000 lbs. and shall produce a dynamic force of at least 13 lbs. per inch of drum width when operated at 2,400 cycles per minute (cpm). The dynamic force is defined as the force developed by revolving the eccentric weight at 2,400 cpm. The roller shall have a smooth drum or drums and the drum diameter shall be between 48 inches and 70 inches, and the width shall be between 28 inches and 100 inches. The frequency of vibration during operation shall be 2,400 cpm. The roller shall be operated at speeds not to exceed 15 mph in the forward direction. The engine driving the eccentric mass shall have a rating of not less than 90 kilowatts. Variation in speed, frequency and method of operation will be determined when found necessary to secure maximum compaction of materials.

Heavier compacting units may be required to achieve the required density.

222.3.8 Bedding Mortar shall be used between CSA that has been in place more than seven (7) days and the new CSA after the existing CSA has been properly cleaned. The bedding mortar is to be used for achieving bond between the old and new CSA layers and to eliminate and prevent segregation or voids along the margins of CSA placements. Adjustment to the mix design may be required by the Engineer.

222.3.9 Control Strips: A control strip shall be constructed at the beginning of work on the CSA to be compacted. The control strip construction will be required to establish procedures necessary to obtain densities for the specific course plus use of portable nuclear moisture/density testing equipment to determine in-place densities.

Each control strip, constructed to acceptable density and surface tolerances shall remain in place and become a section of the completed CSA. Unacceptable control strips shall be

corrected or removed and replaced at the Contractor's expense. A control strip shall cover an area of approximately 420 square yards and be of the same dimensions specified for the CSA course.

The materials used in construction of the control strip shall conform to the specification requirements. They shall be furnished from the same source and be of the same type as used in the CSA. The underlying surface for the control strip shall have prior approval of the Engineer.

The equipment used in the control strip shall be of the same type and weight as used for the CSA.

Compaction of control strips shall start immediately after the course has been placed to the specified thickness, and shall be continuous and uniform over the entire surface. Compaction of the strip shall continue until no discernable increase in density can be obtained by additional effort.

Upon completion of compaction, the mean density of the control strip will be determined by averaging the results of ten density tests taken at random sites within the strip. If the mean density of the control strip is less than 98% of the laboratory compacted specimens as determined by testing procedures appropriate for the material being placed, the Engineer may order the construction of another control strip.

A new control strip may be ordered by the Engineer, or requested by the Contractor when:

(1) A change in material or mix design.

(2) There is reason to believe that the control strip density is not representative for the material being placed.

(3) Ten days of production have passed without a new control strip.

222.3.10 Power Tampers and Small Vibratory Rollers: Small vibratory rollers that are capable of operating within a few millimeters of a vertical face shall be used for compaction adjacent to guide banks, next to utilities and drainage conduit, at transitions to previously constructed levee protection and at other areas where larger vibratory rollers cannot maneuver. The dynamic force produced by the small vibratory rollers shall be at least 140 lbs. per inch of drum width. Tampers shall be a type capable of developing a force per blow of at least 1390 lbs. The amount of rolling and tamping required shall be whatever is necessary for the particular equipment to provide the same degree of compaction as would be obtained by four passes of the large self-propelled vibratory roller. Standby replacement equipment shall be available within one hour if needed.

222.3.11 Curing: Temporarily exposed surfaces shall be kept continuously moist. Care must be exercised to ensure that no curing material other than water is applied to the surface that will be in contact with succeeding layers.

Permanently exposed surfaces shall be kept in a moist condition for seven days, or they may be covered with bituminous or other suitable curing material, subject to the Engineer's approval. Any damage to the protective covering within the seven days shall be repaired to the satisfaction of the Engineer.

Regardless of the curing material used, any permanently exposed surface shall be kept moist until the protective cover is applied. This protective cover is to be applied as soon as practical, with a maximum time limit of twenty-four hours between the finishing of the surface and the application of the protective cover.

222.3.12 Maintenance: The Contractor will be required, within the limits of the contract, to maintain the CSA and curing seal in good condition until the work is completed and accepted. Maintenance shall include repairs to any defects that may occur. This work will be done at the Contractor's expense and repeated as often as necessary. Faulty work shall be replaced for the full depth of the layer.

222.4 METHOD OF MEASUREMENT:

The work will be measured by the cubic yard of completed CSA bank protection constructed to the lines, grades and cross-sections shown on the plans.

The maximum limit for the placement of CSA due to over excavation or sloughing of existing soils shall be 4 inches. Any placement beyond these limits will not be included in the pay quantity.

222.5 BASIS OF PAYMENT:

The accepted quantities of CSA will be paid for at the bid price per cubic yard for CSA Bank Protection, subject to the following penalties for failure to achieve the required strength requirements:

Percent of Specified Strength	Percent of Contract Unit Price
≥100	100
97-99	92
94-96	85
90-94	77
85-89	68
80-84	60
75-79	50
<75	See Note

Note: Material represented by lots attaining seven day compressive strengths with a mean value less than 75% of the specified compressive strength will be evaluated as to acceptance. The Engineer will determine if the material can be left in place or removed and replaced at the Contractor's expense.

Municipality	Supplements
MC	<ul style="list-style-type: none"> ▪ MC: Part 200 add the following new Section: <p style="text-align: center;">SECTION 224</p> <p style="text-align: center;">RIPRAP CONSTRUCTION WITH HIGH SURVIVABILITY FILTER FABRIC</p>

224.1 DESCRIPTION

The work under this Section consists of furnishing all materials and constructing plain riprap with high survivability filter fabric.

224.2 MATERIALS

224.2.1 Plain Riprap: Riprap stone shall be angular and conform to Sections 703.1 STONE and 701.4 QUARRY STONE. Waste concrete and sacked concrete shall not be used for riprap. The stone sizes shall be as indicated on the plans or special provisions.

224.2.2 Bedding Material: The bedding material for the Plain Riprap shall consist of processed natural material conforming to the requirements of Section 702.3. The material gradation shall conform to Select Material Type A or B or Aggregate Base as specified in Table 702-1.

224.2.3 Filter Fabric: Filter Fabric shall be a woven or non-woven high survivability filter fabric meeting the following requirements.

Non-woven:

Property	Requirement	Test Method
Grab Tensile Strength lbs	200	ASTM D 4632
Grab Elongation at Break %	15 minimum 115 maximum	ASTM D 4632
Puncture Strength lbs	80	ASTM D 4833
Burst Strength psi	320	ASTM D 3786
Trapezoidal Tear lbs	50	ASTM D 4533
Permittivity second ⁻¹	0.50 minimum	ARIZ 730
Apparent Opening Size Sieve Size (U.S. Standard)	30-140	ASTM D 4751
Ultraviolet Stability %	70	ASTM D 4355

Woven:

Woven fabric shall meet the physical requirements listed above for nonwoven fabric except that the grab elongation at break, percent, shall be 13 minimum, 115 maximum.

Certificate of compliance for the fabric is required prior to installation.

224.3 CONSTRUCTION REQUIREMENTS:

224.3.1 Filter Fabric: The identification, packaging, handling, and storage of the geotextile fabric shall be in accordance with ASTM D 4873. Fabric rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, date of manufacture, shipping date, and the project number and name to which it is assigned. Rolls will be stored on the site or at another identified storage location in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof, light colored, opaque cover. At no time shall the fabric be exposed to sunlight for a period exceeding 14 days.

Fabric shall be placed in the manner and at the locations shown on the project plans. The surface to receive the fabric shall be free of obstructions, depressions, and debris. The fabric shall be loosely laid and not placed in a stretched condition.

The fabric strips shall be placed to provide a minimum 24-inch of overlap for each joint. On horizontal joints, the uphill strip shall overlap the downhill strip. On vertical joints, the upstream joint shall overlap the downstream strip.

224.3.2 Bedding Material: The Bedding Material shall be placed uniformly on the filter fabric, to the depth specified on the Project Plans, and shall be free of mounds, dips, and windrows. The Bedding Material shall not be compacted.

224.3.3 Plain Riprap: The plain riprap shall be carefully placed on the bedding material and filter fabric in such a manner as to not damage the fabric. If the Engineer determines that the placement of stone has damaged or displaced the filter fabric to the extent that it cannot function as intended, the Contractor shall remove the placed riprap stone and properly correct the damage to, and/or the displacement of, the filter fabric. Such correction may include the removal and subsequent replacement of the bedding material and fabric, and re-grading the affected area, each as determined by the Engineer.

The plain riprap shall be placed in a manner which will produce a reasonably well-graded mass without segregation and with a minimum amount of voids, with the larger stone evenly distributed through the riprap mass. The individual placement of larger riprap stones may be required to obtain a uniform distribution of stone size. The riprap placement shall be supplemented by such hand methods as are required to obtain a uniform finished surface. Allowable tolerance from the slope lines and grades shown for the finished riprap surfaces shall not exceed a distance equal to $0.67 \times D_{50}$ above or $0.33 \times D_{50}$ below the design surfaces. Special care shall be exercised in placing riprap within 3 feet of structures to avoid damage to such structures.

224.4 MEASUREMENT:

The measured quantities of Plain Riprap with Filter Fabric shall be the completed item, in place to the limits of the dimensions shown on the plans or as required by the Engineer. Measurement will be in cubic yards rounded to the nearest cubic yard. Measurement shall extend from the filter fabric to the top of the riprap. Quantities will be computed by the average end area method.

No separate measurement will be made for Filter Fabric or Bedding Material.

224.5 PAYMENT:

Payment for Plain Riprap with Filter Fabric will be at the contract unit price bid for each designated plain riprap gradation. The price shall be full compensation for furnishing all material, labor and equipment for installation of Plain Riprap With Filter Fabric, COMPLETE IN PLACE, including excavation, ground surface preparation, filter fabric, bedding material, plain riprap, and backfilling.

WATERING

225.1 DESCRIPTION:

Water for compacting embankments, constructing subgrade, placement of screened gravel and crushed surfacing, and for laying dust caused from grading operations or public travel, shall be applied in the amounts and places as directed by the Engineer.

225.2 WATER SUPPLY:

Water shall consist of providing a water supply sufficient for the needs of the project and the hauling and applying of all water required.

The Contractor shall make arrangements for and provide all necessary water for his construction operation and domestic use at his own expense.

If the Contractor purchases water from a water utility at a fire hydrant on or near the project, all arrangements shall be made by him at his own expense and payment made direct to the water utility as agreed upon.

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

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

225.3 CONSTRUCTION EQUIPMENT:

The tank truck and/or trailer shall meet all safety and licensing regulations and the water shall be applied by sprinkling with tank trucks equipped with spray bars and suitable apparatus.

225.4 MEASUREMENT:

No measurement will be made of water, unless otherwise provided for in the special provisions or proposal.

225.5 PAYMENT:

The cost of watering will be included in the price bid for the construction operation to which such watering is incidental or appurtenant, unless otherwise provided for in the special provisions or proposal.

DUST PALLIATIVE APPLICATION

230.1 DESCRIPTION:

This section shall govern the application of dust control palliatives (agents) on unpaved roads, traffic surfaces, vacant lots, construction sites and road shoulders. Dust palliatives may also be used to protect erosion of slopes, embankments, sediment control and re-vegetated areas.

Dust palliatives may be applied as topical treatments to penetrate an undisturbed surface, or may be applied to larger areas using mixing methods that blend the product with surface material and then compact the mixture to provide a stabilized, dust resistant, surface course.

230.2 MATERIALS:

Materials to be used as dust palliatives shall conform to the requirements of Section 792. The specific dust palliative to be used shall be as shown on the plans or as directed by the Engineer.

Water used for diluting dust palliatives and for pre-wetting of treated subgrade shall be either potable or from a source compatible with dust palliative ingredients.

230.3 EQUIPMENT:

The Contractor shall provide all equipment necessary to complete the work. The equipment may include but not be limited to motorized graders, distribution trucks, mixing and pulverizing equipment, pneumatic-tired rollers, sprinkler systems, etc. All equipment used for this work is subject to approval by the Engineer. Equipment that does not perform satisfactorily shall be removed from the job.

Distributor trucks shall be pressure type with a computer-controlled applicator. Spray bars and extensions on distribution trucks shall be of the full circulating type. The spray bar shall be adjustable to permit varying height above the surface to be treated.

230.4 PREPARATION OF SURFACE:

All surface preparation shall be in conformance with Maricopa County Rule 310 and 310.01 as applicable.

230.4.1 Topical Preparation: Prior to the application of the dust palliative, the surface shall be graded to provide drainage.

Unless otherwise stated in the manufacturer's technical data, all areas to receive the dust palliative shall be uniformly moistened. Moisture must be maintained on the surface until the time of the application. Dust palliatives shall not be applied when the surface is excessively wet or saturated.

230.4.2 Surface Course Preparation: Areas to receive dust palliative shall be graded and scarified to at least the minimum depth and width shown on the plans. The material shall be damp at time of scarification to reduce dust and aid in pulverization. Soil clods shall be pulverized until all material, exclusive of gravel or stone, will pass a 1 1/2 inch sieve.

All debris, weeds, organic material, stone larger than 4 inches, etc. shall be removed from the site. Surface gravel or stones shall be removed or thoroughly mixed with the surrounding soils to obtain a homogeneous mixture.

If pre-wetting is required, ample amount of water shall be added and mixed with the in-place material to obtain a moisture content near optimum. This moisture content shall be established prior to and maintained until the application of the dust palliative. The methods to establish and maintain the moisture shall be done in accordance with manufacturer's recommendations. The moisture must be uniformly distributed throughout the surface course and over the underlying undisturbed soil. Dust palliatives shall not be applied when the soil is excessively wet or saturated. Moisture content shall be determined in accordance with either ASTM D 2922, D 3017 or D 4944.

230.5 APPLICATION:

230.5.1 General: The dust palliative shall be applied by a pressure type distributor truck. Spray bars and extensions shall be of the full circulating type. Valves which control the flow from nozzles shall be of a positive active design so as to provide a uniform, unbroken spread of dust palliative on the surface.

Corners or surface that cannot be accessed by the distributor truck shall be hand sprayed by means of hoses or bars pressurized by a gear pump or air tanks.

The distributor shall be equipped with certified meter or weight tickets and calibration charts relating to the specific gravity of the concentrate and/or dilution to provide for accurate, rapid determination and control of the amount of dust palliative being applied. The spreading equipment shall be designed so that uniform application of a dust palliative can be applied in controlled amounts ranging from 0.05 to 2.00 gallons per square yard.

The dust palliative shall be applied at the dilution ratio and application rate specified in accordance with Section 792, unless otherwise directed by the Engineer. Products may be applied in multiple passes at reduced application rates to meet the total application rate specified and/or assure uniform coverage.

230.5.2 Topical Application: Topical applications shall be rolled only when recommended by the manufacturer. Complete penetration of palliative will be required prior to the surface rolling. Complete penetration occurs when the compaction equipment will not track or pick up the dust palliative and/or the top layer of the surface material.

230.5.3 Surface Course Application: Mixing shall be done in-place using mixing equipment or by motorized grader (blade mixing). The blending methods utilized shall result in a uniformly treated mixture of soil and dust palliative at or near optimum moisture content (minus any post-compaction dust palliative top coat application quantity). The dilution ratio may be adjusted to bring the mixture to the desired moisture content. The amount of area treated each day shall be limited to that which the Contractor can thoroughly mix and compact within that work day.

Complete penetration of palliative will be required prior to compaction. Complete penetration occurs when the compaction equipment will not track or pick up the blended material.

The blended material shall be shaped to the required grade line and cross section shown on the plans and be compacted at least 95% of maximum density in accordance with ASTM D 698, unless otherwise directed by the Engineer. The final surface shall be rolled to a smooth and even grade. Immediately after the compaction, a top coat of dust palliative shall be applied.

230.6 CURING:

No equipment or traffic will be permitted on the treated surface for 24 hours unless otherwise approved by the Engineer.

230.7 WEATHER CONDITIONS:

Dust palliatives shall be applied only when the ambient temperature is above 40 °F and there is no possibility of rainfall during or within 24 hours after placement. Application during high wind should be avoided.

230.8 MEASUREMENT:

Dust palliative surface course application shall be measured by the square yard [meter], in place, treated, compacted, to the proper depth and accepted.

Dust palliative materials will be measured by the ton of undiluted material. Any conversion from volumetric quantities shall be done with Contractor-supplied calibration charts relating to the specific gravity of the concentrate and/or dilution.

230.9 PAYMENT:

Payment will be made for the applicable items at the Contract unit prices bid in the proposal, and shall constitute full compensation for the item completed, as herein described and specified.

