SPECIFICATIONS FOR THE CONSTRUCTION OF

BULLDOG FLOODWAY

AND

APACHE JUNCTION

F.R.S.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ARIZONA

UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE

FLOOD CONTROL DISTRICT
MARICOPA COUNTY
1958

CONSTRUCTION SPECIFICATION

2. CLEARING AND GRUBBING

1. SCOPE

The work shall consist of the clearing and grubbing of designated areas by removal and disposal of trees, snags, logs, stumps, shrubs and rubbish.

2. MARKING

The limits of the areas to be cleared and grubbed will be marked by means of stakes, flags, tree markings or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six feet above the ground surface.

3. REMOVAL

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs and rubbish shall be removed from within the limits of the marked areas. Unless otherwise specified, all stumps, roots and root clusters having a diameter of one inch or larger shall be grubbed out to a depth of at least two feet below subgrade elevation for concrete structures and one foot below the ground surface at embankment sites and other designated areas.

4. DISPOSAL

All materials removed from the cleared and grubbed areas shall be burned or buried at location shown on the drawings or as specified in Section 6 of this specification.

5. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the cleared and grubbed area will be measured to the nearest 0.1 acre. Payment for clearing and grubbing will be made for the total area within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the length of the cleared and grubbed area will be measured to the nearest full station (100 feet) along the line designated on the drawings or in the specifications. Payment for clearing and grubbing will be made for the total length

within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, each tree, stump and snag having a diameter of 4 inches or greater and each log having a diameter of 4 inches or greater and a length of 10 feet will be measured prior to removal. The size of each tree and snag will be determined by measuring its trunk at breast height above the natural ground surface. The size of each log will be determined by measuring the butt and by measuring its length from butt to tip. The size of each stump will be measured at the top. Diameter shall be determined by dividing the measured circumference by 3.14.

Payment for clearing and disposal of each tree, stump and snag having a diameter of 4 inches or greater and each log having a diameter of 4 inches or greater and a length of 10 feet or greater will be made at the contract unit price for its size designation as determined by the following schedule:

Measured Diameter	Size Designation
4 inches to 8 inches	6-inch size
Over 8 inches to 12 inches	10-inch size
Over 12 inches to 24 inches	18-inch size
Over 24 inches to 36 inches	30-inch size
Over 36 inches to 60 inches	48-inch size
Over 60 inches	60-inch size

The sum of such payments shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the work of completely clearing and grubbing the designated areas, including clearing, grubbing and disposal of smaller trees, stumps, snags and logs and brush, shrubs, roots and rubbish.

Method 4 For items of work for which specific lump sum prices are established in the contract, payment for clearing and grubbing will be made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 1, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing of all areas shown on the drawings and staked in the field.

(2) If waste materials are disposed of by burying, they shall be buried with a minimum soil cover of 24 inches in the spoil disposal areas shown on the drawings. When disposal is complete, the spoil disposal areas shall be smoothed and graded to blend in to the surrounding terrain.

(3) If materials removed from the cleared and grubbed area are to be burned, burning must be carried out in accordance with Pinal and Maricopa County Health Department regulations.

(4) Section 5, Measurement and Payment, will be by Method 1 and will include Compensation for Subsidiary Item, Structure Removal.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 1, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing all areas shown on the drawings and staked in the field.

(2) The borrow area may be cleared and grubbed prior to construction of the Apache Junction FRS to allow for pre-wet.

(3) Waste materials shall be disposed of within the borrow area in the locations shown on the plans and staked in the field.

(4) Any waste materials that are burned shall be handled in accordance with Pinal County Health Department regulations.

(5) Waste materials or their residue shall be buried with a minimum of 24 inches soil cover, smoothed and blended to conform to existing terrain.

(6) Existing arroyos shall be left undisturbed as shown on sheet 1-2 of the drawings. A maximum of two (2) crossing of these undisturbed areas will be allowed for haul road construction.

(7) Section 5, Measurement and Payment, will be by Method 1 and will include compensation for Subsidiary Item, Structure Removal. The undisturbed areas shall be included in the areas paid for at the unit price for clearing and grubbing, Bid Item 1 as full compensation for all effort including survey, equipment and labor needed to maintain them and for any inefficiencies due to their existance.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 5 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications and construction details contained herein:

a. Subsidiary Item, Clearing and Grubbing, MAG Section 201

1. This item shall consist of clearing and grubbing of all areas as necessary for the construction of the bridges and approach roadways as shown on the drawings.

2. No separate payment will be made for clearing and grubbing. Compensation for this item shall be included in the contract bid price for the construction or installation of the bid items to which clearing and grubbing are incidental or appurtenant.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 1, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing of all areas shown on the drawings and staked in the field.

(2) If waste materials are disposed by burying, they shall be buried a minimum of 24 inches below the existing ground surface in the waste disposal areas shown on Drawing 1-3. When disposal is complete, the waste disposal areas shall be smoothed and graded to blend into the surrounding terrain.

(3) If materials removed from the cleared and grubbed area are to be burned, burning must be carried out in accordance with Pinal and Maricopa County Health Department regulations.

(4) Section 5, measurement and payment will be by Method 1 and will include compensation for Subsidiary Item, Structure Removal.

CONSTRUCTION SPECIFICATION

3. STRUCTURE REMOVAL

1. SCOPE

The work shall consist of the removal, salvage and disposal of structures (including fences) from the designated areas.

2. MARKING

Method 1 Each structure unit to be removed will be marked by means of stakes, flags, painted markers or other suitable methods.

Method 2 The limits of the areas from which structures must be removed will be marked by means of stakes, flags or other suitable methods. Structures to be preserved in place or salvaged will be designated by special markings.

3. REMOVAL

Method 1 All structures designated in the contract for removal shall be removed to the specified extent and depth.

Method 2 Within the areas so marked all visible structures and attachments and all buried structures located and identified by survey stakes shall be removed to the specified extent and depth.

4. SALVAGE

Structures that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly match marked with paint prior to disassembly. All pins, nuts, bolts, washers, plates and other loose parts shall be marked or tagged to indicate their proper locations in the structure and shall be fastened to the appropriate structural member or packed in suitable containers. Materials from fences designated to be salvaged shall be placed outside the work area on the property from which they were removed. Wire shall be rolled into uniform rolls of convenient size. Posts and rails shall be neatly piled.

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations shown on the drawings or as specified in Section 7 of the specification.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, payment for the removal of each structure unit, except fences, will be made at the contract unit price. Fences removed or removed and salvaged will be measured to the nearest linear foot. Payment for fence removal or removal and salvage will be made at the contract unit prices appropriate to each type and size of fence.

Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific lump sum prices are established in the contract, payment for structure removal will be made at the contract lump sum price.

Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Subsidiary Item, Structure Removal

(1) This item shall consist of the removal and salvage of fences as shown on the drawings and disposal of automobiles, bed springs, mattresses, and other debris within the area designated for clearing and grubbing.

(2) Section 2, Marking, Method 2 shall apply.

(3) In Section 3, Removal, Method 2 shall apply and wires and posts shall be removed with minimal disturbance to soil and vegetation.

(4) Waste materials shall be buried a minimum of 24 inches below the existing ground surface in the spoil areas shown on the drawings and staked in the field. When disposal is complete, the spoil sites shall be smoothed and graded to blend into the surrounding terrain.

(5) Salvaged fence shall be stored in the garage building as shown on page 1-35 of the drawings.

(6) Section 6, Measurement and Payment; no separate payment will be made for this item. Compensation for this work will be included in Bid Item 1.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and construction details are:

Subsidiary Item, Structure Removal

(1). This item shall consist of the removal and salvage of fences as shown on the drawings and disposal of automobiles, bed springs, mattresses, and other debris within the area designated for clearing and grubbing.

(2) Section 2, Marking, Method 2 shall apply.

(3) In Section 3, Removal, Method 2 shall apply and wires and posts shall be removed with minimal disturbance to soil and vegetation.

(4) Waste materials shall be buried a minimum of 24 inches below the existing ground surface in the waste areas shown on the drawings and staked in the field. When disposal is complete, the waste sites shall be smoothed and graded to blend into the surrounding terrain.

(5) Salvaged fence shall be stored in the garage building as shown on page 1-35 of the drawings.

(6) Section 6, Measurement and Payment, no separate payment will be made for this item. Compensation for this work will be included in Bid Item 1.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Section 1 through 6 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications and construction details contained herein:

a. Subsidiary Item, Removal of Existing Improvements, MAG Section 350

1. This item shall consist of removal and disposal of all existing improvements necessary for the construction of the bridges and approach roadways.

2. Waste materials shall be buried a minimum of 24 inches below existing ground surface in the spoil areas shown on the drawings for Bulldog Floodway and as staked in the field.

3. Section 350.4, Payment - no separate payment will be made for Removal of Existing Improvements. Compensation for this item shall be included in the contract bid price for the construction or installation of the bid items to which Removal of Existing Improvements are incidental or appurtenant.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Subsidiary Item, Structure Removal

(1) This item shall consist of the removal of the concrete slab, removal and salvage of the fence and removal of the existing 4 inch waterline after the installation and acceptance of the 6 inch waterline as shown on page 1-35 of the drawings.

(2) Section 2, marking, method 2 shall apply.

(3) In Section 3, removal, method 2 shall apply and items as listed in Section 1 shall be removed with minimal disturbance to soil and vegetation.

(4) Disposal of materials covered under this item shall be made to Waste Disposal Areas shown on Drawing 1-3, unless otherwise directed by the Contracting Officer.

(5) Salvaged fence shall be stored in the garage building as shown on page 1-35 of the drawings.

(6) Section 6, measurement and payment, no separate payment will be made for this item. Compensation for this work will be included in Bid Item 1.

CONSTRUCTION SPECIFICATION

5. POLLUTION CONTROL

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air during construction operations in accordance with these specifications.

2. MATERIALS

All materials furnished shall meet the requirements of the Material Specifications listed in Section 8 of this specification.

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The work and measures shall include but not be limited to the following, as shown on the drawings or as specified in Section 8 of this specification.

Staging of Earthwork Activities - The excavation and moving of soil materials shall be scheduled so that the smallest possible areas will be unprotected from erosion for the shortest time feasible.

Seeding - Seedings to protect disturbed areas shall be done as specified on the drawings or in Section 8 of this specification.

Mulching - Mulching shall be used to provide temporary protection to soil surfaces from erosion.

Diversions - Diversions shall be used to divert water away from work areas and/or to collect runoff from work areas for treatment and safe disposition.

Stream Crossings - Culverts or bridges shall be used where equipment must cross streams.

Sediment Basins - Sediment basins shall be used to settle and filter out sediment from eroding areas to protect properties and streams below the construction site.

Straw Bale Filters - Straw bale filters shall be used to trap sediment from areas of limited runoff. Bales are temporary and shall be removed when permanent measures are installed.

Waterways - Waterways shall be used for the safe disposal of runoff from fields, diversions and other structures or measures.

4. CHEMICAL POLLUTION

The Contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants (such as drained lubricating or transmission oils, greases, soaps, asphalt, etc.) produced as a by-product of the project's work. At the completion of the construction work, sumps shall be voided without causing pollution as specified in Section 8 of this specification.

Sanitary facilities such as pit toilets, chemical toilets, or septic tanks shall not be placed adjacent to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water sources. At the completion of construction work, facilities shall be disposed of without causing pollution as specified in Section 8 of this specification

5. AIR POLLUTION

Local and state regulations concerning the burning of brush or slash or disposal of other materials shall be adhered to.

Fire prevention measures shall be taken to prevent the start or the spreading of fires which result from project work. Fire breaks or guards shall be constructed at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust.

6. MAINTENANCE, REMOVAL, AND RESTORATION

All pollution control measures and works shall be adequately maintained in a functional condition as long as needed during the construction operation. All temporary measures shall be removed and the site restored to as nearly original conditions as practicable.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract each item will be measured to the nearest unit applicable. Payment for each item will be made at the contract unit price for that item. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific lump sum prices are established in the contract, payment for pollution control will be made at the contract lump sum price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items, and the items to which they are made subsidiary, are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

Subsidiary Item, Pollution Control

(1) This item shall consist of all measures required to control dust, erosion, sedimentation or any other form of pollution resulting from the Contractor's activities in constructing the work included in this bid schedule.

(2) Section 4, Chemical Pollution; prior to the completion of the job the Contractor shall provide a plan, for approval by the Contractoring Officer, to void sump areas and dispose of sanitary facilities as applicable.

(3) Section 7, Measurement and Payment, no separate payment will be made for this item. Compensation for this work will be included in the payment for Bid Items 4 through 7.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Pollution Control

(1) This item shall consist of all measures required to control dust, erosion, sedimentation or any other form of pollution resulting from the Contractor's activities in constructing the work included in this bid schedule.

(2) Section 4, Chemical Pollution, prior to the completion of the job the Contractor shall provide a plan for approval by the Contracting Officer to void sump areas and dispose of sanitary facilities as applicable.

(3) Section 7, Measurement and Payment, no separate payment will be made for this item. Compensation for this work will be included in the payment for Bid Items 4 through 8.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Pollution Control

1. This item shall consist of all measures required to control dust, erosion, sedimentation, or any other form of pollution resulting from the Contractor's activities in construction of the work included in this bid schedule.

2. Permits for earth moving may be obtained from the Bureau of Air Pollution Control, Maricopa County Department of Health Service, 1845 East Roosevelt, telephone 258-6381.

3. Section 7, Measurement and Payment, no separate payment will be made for pollution control. Compensation for this item shall be included in the contract bid price for the construction or installation of the bid items to which pollution control are incidental or appurtenant.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

Subsidiary Item, Pollution Control

(1) This item shall consist of all measures required to control dust, erosion, sedimentation or any other form of pollution resulting from the Contractor's activities in constructing the work included in this bid schedule.

(2) Section 7, measurement and payment, no separate payment will be made for this item. Compensation for this work will be included in the payment for Bid Item 4.

CONSTRUCTION SPECIFICATION

7. ENGINEERING CONSTRUCTION SURVEYS

1. SCOPE

The work consists of performing all surveys required for (1) layout of the work, (2) construction control, and (3) quantity surveys for progress payment estimates from baselines and bench marks established by the Government. It includes furnishing all the necessary equipment, labor, and materials. Not included is work required for making the original and final surveys for computing quantities.

2. EQUIPMENT AND MATERIALS

Equipment used for all construction surveys shall be of a quality and condition that provides the specified accuracy. The equipment shall be maintained in good working order and good adjustment. Records of calibration tests and adjustments shall be maintained and be available for inspection by the Government.

Materials include all the necessary field notebooks, stakes, templates, platforms, equipment, spikes, steel pins, tools, and other accessories required for layout and construction control of all of the work.

3. QUALITY OF WORK

Surveys shall be certified by a Land Surveyor or Engineer licensed by the State. The work shall be performed to the accuracy and detail appropriate for the location and type of job. Daily quantities of earthwork may be estimated from load count or equivalent measurement (within 25 percent $\pm$); measurement for progress payments should be accurate within 10 percent $\pm$.

Notes, sketches, and other data shall be complete, recorded neatly, and organized in a manner that will allow reproduction of copies for job documentation.

Differential leveling shall be third order with such precision that the error of closure (in feet) shall not exceed plus or minus 0.1 times the square root of the distance (in miles). The elevations of bench marks and temporary bench marks shall be determined and recorded to the nearest 0.01 foot.

Transit traverses shall be third order with such precision that: (1) the linear error of closure shall not exceed one foot in 3,000 feet, and (2) the angular error of closure shall not exceed 1.0 minute times the square root of the number of angles turned.

Surveys will be reviewed periodically and randomly checked by the Government to assure that the specified quality is being maintained.

4. PRIMARY CONTROL

The base lines and bench marks for primary control, which are necessary to establish the lines and grades needed for construction, will be established by the Government. They will be shown on the drawings and located on the ground before construction.

The base lines and bench marks shall be used as the origin of all surveys needed to establish lines and grades for construction.

5. CONSTRUCTION SURVEY AND MEASUREMENT RECORDS

All survey data will be recorded in fully identified, bound field notebooks. Pages shall be numbered consecutively. The required books shall be turned over to and become the property of the Government, prior to acceptance of the work or any part of this work. All entries shall be legible, reproducible, and follow the format in Soil Conservation Service TR-62, "Engineering Layout, Notes, Staking and Calculations." The bound field notebooks shall be available at all times during the progress of the work for examination and use by the Government. Copies of field book notes shall be made available to the Contracting Officer upon request. Electronically generated survey data and computations shall be bound, paginated, and referenced in the bound field notebook containing the survey control in a manner that will make all of the information intelligible and permanent. All field notes and printed data shall include the purpose or description of the work, the date the work was performed, the weather (if field work), the individual or individuals who performed and checked the work and sketches and other information pertinent to the work.

6. STAKING

The location and marking of all stakes shall be as shown in Soil Conservation Service TR-62 as supplemented below.

a. Clearing and grubbing - The boundary of the clearing and grubbing areas shall be staked or flagged at 200-foot intervals or less if needed to clearly mark the limits of work.

b. Excavation - Cut stakes shall be placed on the centerline and at the intersection of the planned side slopes and natural ground line. All slope stakes shall be marked with the required cut, horizontal distance, and slope ratio. Offset reference stakes and hubs shall be placed at full stations, on at least one side of the proposed excavation.

c. Earth Fill - Fill stakes shall be placed on the centerline and at the toes of the planned slopes and shall be marked with the fill, horizontal distance, constructed slope ratio, and stationing. Offset reference stakes and hubs shall be provided as a minimum on both sides of tne fill at full stations.

Earthwork slope stakes shall be placed as a minimum at full stations, break in the original ground surface, and at other intermediate stations as necessary to insure accurate location of construction. Slope stakes and cross sections shall be at right angles to the centerline. Distances shall be measured horizontally; rod readings shall be taken vertically and recorded to the nearest 0.1 foot.

7. MEASUREMENT AND PAYMENT

Payment will be made as the work proceeds, after receipt of invoices from the contractor showing (contractor or subcontractor) surveying costs and cost of supplies. If the total of incremental payments is less than the contract lump sum for surveys, the balance will be included in the final contract payment. Total payment will be the contract lump sum price for surveys, regardless of actual cost to the contractor.

Payment will not be made under this item for the purchase cost of materials and equipment having a residual value.

Payment of the contract lump sum price for surveys will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to complete of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item to which they are made subsidiary are identified in Section 8. of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 18, Surveys

(1) This item shall consist of furnishing personnel, equipment, materials and performing surveys required for:

(a) Construction layout

(b) Computation of quantities

(c) "As-Built" construction drawings

(2) Section 1, Scope, the last sentence does not apply.

(3) The Contractor shall provide the Contracting Officer a statement of qualifications, including specific experience of each of the survey personnel assigned to the job.

(4) The Contractor shall provide the Contracting Officer a schedule of surveys to be performed each month.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 26, Surveys

(1) This item shall consist of furnishing personnel, equipment and materials and performing surveys required for:

(a) Construction layout

(b) Computation of quantities

(c) "As-Built" construction drawings

(2) Section 1, Scope, the last sentence does not apply.

(3) The Contractor shall provide the Contracting Officer a statement of qualifications, including specific experience of each of the survey personnel assigned do the job.

(4) The Contractor shall provide the Contracting Officer a schedule of surveys to be performed each month.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 12, Survey

1. This item shall consist of furnishing personnel, equipment, materials and performing surveys required for:

   a. Construction Layout
   b. Computation of Quantities
   c. "As-Built" Construction Drawings

2. Section 1, Scope, the last sentence does not apply.

3. The Contractor shall provide the Contracting Officer a statement of qualifications, including specific experience of each of the survey personnel assigned to the job.

4. The Contractor shall provide the Contracting Officer a schedule of surveys to be performed each month.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

(a) Bid Item 10, Surveys

(1) This item shall consist of furnishing personnel, equipment, materials and performing surveys required for:

(a) Construction layout
(b) Computation of quantities
(c) "As-Built" construction drawings

(2) Section 1, Scope, the last sentence does not apply.

(3) The Contractor shall provide the Contracting Officer a statement of qualifications, including specific experience of each of the survey personnel assigned to the job.

(4) The Contractor shall provide the Contracting Officer a schedule of surveys to be performed each month.

CONSTRUCTION SPECIFICATION

8. MOBILIZATION

1. SCOPE

The work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under the contract. Mobilization will not be considered as work in fulfilling the contract requirement for commencement of work.

Mobilization shall include the cost for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities at the site not covered in specific bid items, and other preparatory work at the site. The cost of the entire amount of premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable shall be paid upon request when evidence of full payment to the surety has been provided to the Contracting Officer.

Work done under this specification shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the contract.

The specification covers mobilization for work required by the contract at the time of award. If additional mobilization costs are incurred during performance of the contract as a result of changed or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

2. PAYMENT

Payment will be made as the work proceeds, after presentation of invoices by the Contractor showing his own mobilization costs and evidence of the charges of suppliers, subcontractors, and others for mobilization work performed by them. If the total of such payments is less than the contract lump sum for mobilization, the unpaid balance will be included in the final contract payment. Total payment will be the lump sum contract price for mobilization, regardless of actual cost to the Contractor.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

Payment of the lump sum contract price for mobilization will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of the work.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 2, Mobilization

This item shall consist of the mobilization of the Contractors's equipment and forces for construction of all work required under this bid schedule.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 2, Mobilization

This item shall consist of the mobilization of the Contractor's equipment and forces for construction of all work required under this bid schedule.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 1, Mobilization

1. This item shall consist of the mobilization of the Contractor's equipment and forces required for the construction of all work required under this bid schedule.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 2, Mobilization

This item shall consist of the mobilization of the Contractor's equipment and forces for construction of all work required under this bid schedule.

CONSTRUCTION SPECIFICATION

10. WATER FOR CONSTRUCTION

1. SCOPE

The work shall consist of furnishing, transporting, and using water for construction purposes in accord with the applicable specifications.

2. FACILITIES AND EQUIPMENT

The Contractor shall build and maintain such access and haul roads as are needed, and shall furnish, operate, and maintain all pumps, piping, tanks, and other facilities needed to load, transport, and use the water as specified.

These facilities shall be equipped with meters, tanks, or other devices by which the volume of water supplied can be measured.

3. DUST ABATEMENT AND HAUL ROAD MAINTENANCE

Water for dust abatement and haul road maintenance shall be applied to haul roads and other dust-producing areas as needed to prevent excessive dust and to maintain the roads in good condition for efficient operation while they are in use.

4. EARTHFILL, DRAINFILL, ROCKFILL

Water for earthfill, drainfill, or rockfill shall be used in the fill materials as specified in the applicable construction specifications.

5. CONCRETE, MORTAR, GROUT

Water used in mixing or curing concrete, pneumatically applied mortar, or other portland cement mortar or grout shall meet the requirements of the applicable construction specifications and shall be used in conformance with those specifications. Payment for water used in these items is covered by the applicable concrete, mortar, or grout specification.

6. MEASUREMENT AND PAYMENT

For water items for which specific unit prices are established in the contract, the volume of water furnished and used in accordance with the specifications will be measured to the nearest 1000 gallons.

Except as otherwise specified, the measurement for payment will include all water needed at the construction site, except as noted in Section 5, to perform the work required under the contract in accordance with the specifications but will not include water wasted or used in excess of the amount needed. It will not include water used in concrete which is mixed elsewhere and transported to the site.

Payment for water will be made at the contract unit price. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to furnishing, transporting, and using the water.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 3, Water

(1) This item shall consist of furnishing and applying all water necessary for performance of the work included in this bid schedule.

(2) Measurement and payment will be based on metered quantity of water. Accuracy of meters shall be checked and certified to plus or minus 2 percent of actual flow within normal flow range. Certification shall be submitted to the Contracting Officer prior to their use.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 3, Water

(1) This item shall consist of furnishing and applying all water necessary for performance of the work included in this bid schedule.

(2) Measurement and payment will be based on metered quantity of water. Accuracy of meters shall be checked and certified to plus or minus 2 percent of actual flow within normal flow range. Certification shall be submitted to the Contracting Officer prior to their use.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 6 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications construction details contained herein:

a. Susidiary Item, Water, MAG Section 225

1. This item shall consist of furnishing and applying all water required for performanace of the work included in this bid schedule.

2. No separate payment will be made for this item. Compensation for this item shall be included in the contract bid price for the construction or installation of the bid items to which water is incidental or appurtenant.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 3, Water

(1) This item shall consist of furnishing and applying all work necessary for performance of the work included in this bid schedule.

(2) Measurement and payment will be based on metered quantity of water. Accuracy of meters shall be checked and certified to plus or minus 2 percent of actual flow within normal flow range. Certification shall be submitted to the Contracting Officer prior to their use.

CONSTRUCTION SPECIFICATION

11. REMOVAL OF WATER

1. SCOPE

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the specifications. It shall include (1) building and maintaining all necessary temporary impounding works, channels, and diversions, (2) furnishing, installing and operating all necessary pumps, piping and other facilities and equipment, and (3) removing all such temporary works and equipment after they have served their purposes.

2. DIVERTING SURFACE WATER

The Contractor shall build, maintain and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, a diversion must discharge into the same natural drainageway in which its headworks are located.

Unless otherwise specified, the Contractor shall furnish to the Contracting Officer in writing, his plan for diverting surface water before beginning the construction work for which the diversion is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

3. DEWATERING THE CONSTRUCTION SITE

Foundations, cutoff trenches and other parts of the construction site shall be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all drains, sumps, pumps, casings, wellpoints, and other equipment needed to perform the dewatering as specified. Dewatering methods that cause a loss of fines from foundation areas will not be permitted.

Unless otherwise specified, the Contractor shall furnish to the Contracting Officer, in writing, his plan for dewatering before beginning the construction work for which the dewatering is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

4. DEWATERING BORROW AREAS

Unless otherwise specified in Section 8, the Contractor shall maintain the borrow areas in drainable condition or otherwise provide for timely and effective removal of surface and ground waters that accumulate within the borrow areas from any source. Borrow material shall be processed as necessary to achieve proper and uniform moisture content for placement.

If pumping to dewater borrow areas is included as an item of work in the bid schedule, each pump used for this purpose shall be equipped with a water meter in the discharge line. Accuracy of the meters shall be such that the measured quantity of water is within 3 percent, plus or minus, of the true quantity. Means shall be provided by the Contractor to check the accuracy of the water meters when requested by the Contracting Officer.

5. EROSION AND POLLUTION CONTROL

Removal of water from the construction site, including the borrow areas shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

6. REMOVAL OF TEMPORARY WORKS

After the temporary works have served their purposes, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

Except as otherwise specified, pipes and casings shall be removed from temporary wells and the wells shall be filled to ground level with gravel or other suitable material approved by the Contracting Officer.

7. MEASUREMENT AND PAYMENT

Method 1 Items of work listed in the bid schedule for removal of water, diverting surface water, dewatering construction sites, and dewatering borrow areas will be paid for at the contract lump sum prices. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 Items of work listed in the bid schedule for removal of water, diverting surface water, dewatering construction sites, and dewatering borrow areas will be paid for at the contract lump sum prices. Such payment will constitute full compensation for furnishing, installing, operating, and maintaining the necessary trenches, drains, sumps, pumps, and piping, and for all labor,

equipment, tools, and all other items necessary and incidental to the completion of the work, except that additional payment for pumping to dewater borrow areas will be made as described in the following paragraph.

If pumping to dewater borrow areas is listed as an item of work in the bid schedule, payment will be made at the contract unit price which shall be the price per 1,000 gallons shown in the bid schedule. Such payment will constitute full compensation for pumping only. Compensation for equipment and preparation and for other costs associated with pumping will be included in the lump sum payment for removal of water or the lump sum payment for dewatering borrow areas. Payment will be made only for pumping that is necessary to dewater borrow areas that cannot be effectively drained by gravity or that must have the water table lowered to be usable. Pumping for other purposes will not be included for payment in this item.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

Subsidiary Item, Removal of Water

(1) This item shall consist of the removal or diversion of surface, ground and construction water, or direct rainfall from the construction area as needed to construct the work.

(2) Section 7, Measurement and Payment, no separate payment will be made for the removal of water. Compensation for this work will be included in the payment for Bid Items 4 through 7.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Removal of Water

(1) This item shall consist of the removal or diversion of surface, ground and construction water or direct rainfall from the construction area as needed to construct the work.

(2) Section 7, Measurement and Payment, no separate payment will be made for the Removal of Water. Compensation for this work will be included in the payment for Bid Items 4 through 6.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Removal of Water

1. This item shall consist of the removal or diversion of surface and ground water or direct rainfall from the construction area as needed to construct the work.

2. Section 7, Measurement and Payment, no separate payment will be made for Removal of Water. Compensation for this item shall be included in the contract bid price for the construction or installation of the bid items to which removal of water are incidental or appurtenant.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Removal of Water

(1) This item shall consist of the removal or diversion of surface, ground and construction water or direct rainfall from the construction area as needed to construct the work.

(2) Section 7, measurement and payment, no separate payment will be made for the Removal of Water. Compensation for this work will be included in the payment for Bid Items 4.

CONSTRUCTION SPECIFICATION

21. EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

2. CLASSIFICATION

Excavation will be classified as common excavation or rock excavation in accordance with the following definitions or will be designated as unclassified.

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the use of heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard and equipped with attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the character of the materials and the site conditions.

Rock excavation shall be defined as the excavation of all hard, compacted or cemented materials the accomplishment of which requires blasting or the use of excavators larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than one cubic yard in volume encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation.

Excavation will be classified according to the above definitions by the Engineer, based on his judgment of the character of the materials and the site conditions.

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

For the purpose of this classification, the following definitions shall apply:

Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a tractor having a power rating of 200-300 net horsepower (at the flywheel).

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

Pusher tractor shall be defined as a track type tractor having a power rating of 200-300 net horsepower (at the flywheel) equipped with appropriate attachments.

3. UNCLASSIFIED EXCAVATION

Items designated as "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in Section 2 of this specification shall apply.

4. BLASTING

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a person of proven experience and ability in blasting operations.

Blasting shall be done in such a way as to prevent damage to the work or unnecessary fracturing of the foundation and shall conform to any special requirements in Section 12 of this specification.

5. USE OF EXCAVATED MATERIALS

Method 1 To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent earthfill or rockfill. The suitability of materials for specific purposes will be determined by the Engineer. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

Method 2 Suitable materials from the specified excavations may be used in the construction of required earthfill or rockfill. The suitability of materials for specific purposes will be determined by the Engineer.

6. DISPOSAL OF WASTE MATERIALS

Method 1 All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown on the drawings.

Method 2 All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of by the Contractor at sites of his own choosing away from the site of the work.

7. BRACING AND SHORING

Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations. The Contractor shall furnish, place and subsequently remove such supporting installations.

8. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing and supports, as necessary, before any concrete or earthfill is placed or any piles are driven within the limits of the excavation.

9. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as directed by the Engineer.

Borrow pits shall be excavated and finally dressed in a manner to eliminate steep or unstable side slopes or other hazardous or unsightly conditions.

10. OVEREXCAVATION

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the Engineer. Concrete that will be exposed to the atmosphere when construction is completed shall contain not less than 6 sacks of cement per cubic yard of concrete. Concrete that will be permanently covered shall contain not less than 4-1/2 sacks of cement per cubic yard. The concrete shall be placed and cured as specified by the Engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earthfill, except that, if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding or drainfill.

11. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Regardless of quantities excavated, the measurement for payment will be made to the specified pay limits, except that excavation outside the specified lines and grades directed by the Engineer to remove unsuitable material will be included. Excavation required because unsuitable conditions result from the Contractor's improper construction operations, as determined by the Contracting Officer will not be included for measurement and payment.

Method 1 The pay limits shall be as designated on the drawings.

Method 2 The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.

b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

Method 3 The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.

b. The lower and lateral limits shall be the true surface of the completed excavation as directed by the Engineer.

Method 4 The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.

b. The lower limit shall be at the bottom surface of the proposed structure.

c. The lateral limits shall be 18 inches outside of the outside surfaces of the proposed structure or shall be vertical planes 18 inches outside of and parallel to the footings, whichever gives the larger pay quantity, except as provided in d, below.

d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the under side of the proposed lining or structure.

e. For the purposes of the definitions in b, c, and d, above, any specified bedding or drainfill directly beneath or beside the structure will be considered to be a part of the structure.

All Methods The following provisions apply to all methods of measurement and payment.

Payment for each type and class of excavation will be made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, except that extra payment for backfilling overexcavation will be made in accordance with the following provisions:

Payment for backfilling overexcavation, as specified in Section 10 of this specification, will be made only if the excavation outside specified lines and grades is directed by the Engineer to remove unsuitable material and if the unsuitable condition is not a result of the Contractor's improper construction operations as determined by the Contracting Officer.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 12 of this specification.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 4, Structure Excavation, Common

(1) This item shall consist of all excavation required for the installation of the grouted rock riprap and concrete apron cutoff walls for the approach channels to side channel inlets numbers 1 through 7 and weir inlets numbers 3 through 8, as shown on drawings and staked in the field.

(2) Section 5, Use of Excavated Materials, Method 1 shall apply.

(3) Section 6, Disposal of Waste Materials, Method 1 shall apply.

(4) Section 11, Measurement and Payment, will be by Method 2; and will include compensation for Subsidiary Items: Removal of Water, Pollution Control and Spoil Disposal.

b. Bid Item 5, Channel Excavation, Common

(1) This items shall consist of all excavation required to construct:

a. The Bulldog Floodway Earth Channel between stations 203+00 and ~~207+10;~~ 219+75±.

b. The concrete lined Apache Junction Outlet channel and Bulldog Floodway between stations 101+50 and 203+00, including side channel inlets numbers 1 through 7 and weir inlets numbers 3 through 8 as shown on drawings and staked in field.

(2) Section 5, Use of Excavated Materials, Method 1 shall apply.

(3) Section 6, Disposal of Waste Materials Method 1 shall apply.

(4) Section 11, Measurement and Payment, will be by Method 1; and will include compensation for Subsidiary Items: Removal of Water, Pollution Control and Spoil Disposal.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:.

a. Bid Item 4, Foundation Excavation, Common

(1) This item shall consist of all excavation except structure excavation within the base area of the dam, as shown on the drawings and staked in the field.

(2) Approximate depths are shown on the drawings. Final depths will be determined by the Engineer and the Arizona Department of Water Resources after examination of the materials encountered. Time for geologic examination and mapping of the foundation materials should be anticipated.

(3) Section 5, Use of Excavated Materials, Method 1 shall apply.

(4) Section 6, Disposal of Waste Materials, Method 1 shall apply.

(5) Section 11, Measurement and Payment, will be by Method 3 and will include compensation for Subsidiary Items: Removal of Water, Pollution Control and Spoil Disposal.

b. Bid Item 5, Structure Excavation, Common

(1) This item shall consist of all excavation required for installation of:

(a) The principal spillway;

(b) The emergency spillway; and

(c) The grouted rock riprap cutoff walls for the approach channels to Drop Inlet Number 1 and Weir Inlet Numbers 1 and 2.

(2) Section 5, Use of Excavated Materials, Method 1 shall apply.

(3) Section 6, Disposal of Waste Materials, Method 1 shall apply.

(4) Section 11, Measurement and Payment will be by Method 2 and will include compensation for Subsidiary Items: Removal of Water, Pollution Control and Spoil Disposal.

c. Bid Item 6, Channel Excavation, Common

(1) This item shall consist of all the excavation required to construct:

(a) The concrete lined Apache Junction Floodway between stations 12+00 and 27+37.50 including drop Inlet Number 1 and Weir Inlet Numbers 1 and 2.

(b) The emergency spillway outlet channel.

(c) The entrance section to the principal spillway low level entrance.

(d) The Apache Junction Floodway earth channel between stations 27+37.50 and 42+45 as shown on drawings and staked in the field.

(2) Section 5, Use of Excavated Materials, Method 1 shall apply. Suitable materials in excess of the amount needed to construct the required earthfills in (1) c. above shall be used for the construction of Apache Junction FRS.

(3) Section 6, Disposal of Waste Materials, Method 1 shall apply.

(4) Section 11, Measurement and Payment will be by Method 2, and will include compensation for Subsidiary Items: Removal of Water, Pollution Control and Spoil Disposal.

d. Subisdiary Item, Borrow Excavation, Common

(1) This item shall consist of all excavation required from designated borrow areas for obtaining fill materials not available from required excavations.

(2) The borrow area shall be left reasonably smoothe and graded to direct flow toward the Principal Spillway Inlet. The side slopes of borrow areas shall be left not steeper than 4:1.

(3) Section 5, Use of Excavated Materials, Method 1 shall apply.

(4) Section 6, Disposal of Waste Materials, Method 1 shall apply.

(5) Section 11, Measurement and Payment, no separate payment will be made for Borrow Excavation. Compensation for Borrow Excavation will be included in the Bid Items 7 and 8.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 10 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Unified Standard Specifications and construction details contained herein:

a. Bid Item 2, Structure Excavation, MAG Section 206

1. This item shall consist of all excavation required for the construction of the bridge abutments as shown on the drawings.

2. All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown for spoil on the Bulldog Floodway drawings.

3. The location of underground utilities and drainage pipes, culverts and structures have been shown on the drawings to the extent they are known. However, it shall be the Contractor's responsibility to cooperate with the pertinent utility companies so that any obstructing utility installation may be adjusted.

4. The following phone numbers should put the Contractor in contact with the proper personnel:

Flood Control District	262-1501
Mountain Bell Telephone Company	163-3219
Salt River Project	273-2202
Arizona Public Service	271-7014
Location Staking (APS, Mtn. Bell, SRP)	263-1000
Maricopa County Highway Department	262-3631
Pinal County Highway Department	1-868-5801

5. Section 11, Measurement and Payment, will be by Method 2.

b. Subidiary Item, Roadway Excavation, MAG Section 205

1. This item shall consist of the excavation required to complete the grading and construction of roadways as shown on the drawings.

2. Section 205.2, unsuitable material and Section 205.6, surplus material -- will be designated as waste and shall be disposed of at the locations shown for spoil on the Bulldog Floodway drawings.

3. Section 11, Measurement and Payment, no separate payment will be made for Roadway Excavation. Compensation for this item will be included in Bid Item 3, Fill Construction.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS -SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Structure Excavation

(1) This item shall consist of all excavation required for installation of the 6 inch waterline from station (-) 7+00 K to the Irrigation Booster Pump at Prospector Park as shown on the drawings and staked in the field.

(2) Section 5, Use of excavated materials, method 1 shall apply.

(3) Section 6, Disposal of waste materials, method 1 shall apply.

(4) Section 11, measurement and payment, no separate payment will be made for structure excavation. Compensation for structure excavation will be included in Bid Item 16.

CONSTRUCTION SPECIFICATION

23. EARTHFILL

1. SCOPE

The work shall consist of the construction of earth embankments and other earthfills required by the drawings and specifications.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing and disposition of materials in the various fills shall be subject to approval by the Engineer.

Fill materials shall contain no sod, brush, roots or other perishable materials. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The types of materials used in the various fills shall be as listed and described in the specifications and drawings.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to effect a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose materials by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock

outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be not steeper than 1 horizontal to 1 vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted. Hand compacted fill, including fill compacted by manually directed power tampers, shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of fill compacted by manually directed power tampers.

Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earthfill in dams, levees and other structures designed to restrain the movement of water shall be placed so as to meet the following additional requirements:

a. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

b. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

c. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of approximately 2 percent shall be maintained to insure effective drainage, and except as otherwise specified for drainfill or sectional zones.

d. Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of stream flow during construction are specifically authorized in the contract.

e. Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification, and shall be scarified, moistened and recompacted when the new fill is placed against it as needed to insure a good bond with the new fill and to obtain the specified moisture content and density at the contact of the in place and new fills.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of fill, the moisture content of the materials being placed shall be maintained within the specified range.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the fill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the fill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

6. COMPACTION

Earthfill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction. Each layer of fill shall be compacted as necessary to make the density of the fill matrix not less than the minimum density specified. The fill matrix is defined as the portion of the fill material finer than the maximum particle size used in the compaction test method specified.

Class B compaction. Each layer of fill shall be compacted to a mass density not less than the minimum density specified.

Class C compaction. Each layer of fill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified, or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Unless otherwise specified, heavy equipment including backhoe mounted powertampers, or vibrating compactors and manually directed vibrating rollers, shall not be operated within 2 feet of any structure. Towed or self-propelled vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14 days after placement of the concrete; (2) over cradled or bedded precast conduits prior to 7 days after placement of the concrete cradle or bedding; or (3) over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 2 feet, whichever is greater.

Compacting of fill adjacent to structures shall not be started until the concrete has attained the strength specified in Section 10 for this purpose. The strength will be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of fill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

Structure	Time Interval
Retaining walls and counterforts (impact basins)	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast-in-place (with inside forms in place)	7 days
Conduits and spillway risers, cast-in-place (inside forms removed)	14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Cantilever outlet bents (backfilled) both sides simultaneously)	3 days

7. REWORKING OR REMOVAL AND REPLACEMENT OF DEFECTIVE FILL

Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable fill. The replacement fill and the foundation, abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

8. TESTING

During the course of the work, the Engineer will perform such tests as are required to identify materials, to determine compaction characteristics, to determine moisture content, and to determine density of fill in place. These tests performed by the Engineer will be used to verify that the fills conform to the requirements of the specifications. Such tests are not intended to provide the Contractor with the information required by him for the proper execution of the work and their performance shall not relieve the Contractor of the necessity to perform tests for that purpose.

Densities of fill requiring Class A compaction will be determined by the Engineer in accordance with ASTM Method D 1556, D 2167, D 2922 or D 2937 except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample prior to computation of density or if using the nuclear gauge, added to the specified density to bring it to the measure of equivalent composition for comparison. The density so computed will be used to determine the percent compaction of the fill matrix. Unless otherwise specified, moisture content will be determined by one of the following methods: ASTM Method D 2216 or D 3017.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earthfill within the specified zone boundaries and pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified, no deduction in volume will be made for embedded conduits and appurtenances.

The pay limits shall be as defined below, with the further provision that earthfill required to fill voids resulting from overexcavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only where such overexcavation is directed by the Engineer to remove unsuitable material and where the unsuitable condition is not a result of the Contractor's improper construction operations as determined by the Contracting Officer.

Method 1 The pay limits shall be as designated on the drawings.

Method 2 The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the specified neat lines of the fill surface.

Method 3 The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the measured surface of the completed fill.

Method 4 The pay limits shall be the specified pay limits for excavation and the specified neat lines of the fill surface.

Method 5 The pay limits shall be the specified pay limits for excavation and the measured surface of the completed fill.

Method 6 Payment for each type and compaction class of earthfill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Method 7 Payment for each type and compaction class of earthfill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work, except furnishing, transporting, and applying water to the foundation and fill materials. Water applied to the foundation and fill materials will be measured and payment will be made as specified in Construction Specification 10.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

(a) Bid Item 6, Structure Backfill

(1) This item shall consist of placing and compacting all earth fill required adjacent to all structures as shown on the drawings.

(2) The earthfill used for structure backfill shall have a minimum of 15 percent by weight passing the number 200 sieve.

(3) The maximum rock size placed shall be two (2) inches.

(4) The maximum thickness of a layer prior to compaction shall be six (6) inches.

(5) The moisture content of the fill material at the time of compaction shall be not less than 2% below nor more than 2% above optimum moisture content as determined by ASTM D 2216 with the drying oven controlled a 110 plus or minus 5 degrees Celsius.

(6) Section 6, Compaction, Class A shall apply. The fill matrix shall be compacted to at least 95 percent of the maximum desnity obtained from compaction tests performed by Method C, ASTM D698 or the rapid compaction test (Test No. S-6, SCS reference NEH Section 19).

(7) Section 9, Measurement and Payment; will be by Method 4, and will include compensation for Subisdiary Items, Removal of Water and Pollution Control.

b. Bid Item 7, Earthfill

(1) This item shall include placing and compacting all earthfill required to construct the:

a. earth dikes and berms
b. road ramps
c. approaches to weir inlets, including the filling of gullies in front of the weir inlets.

(2) All earthfill shall be obtained from the required excavations and shall meet the following gradation requirements:

Sieve Size	% Passing By Weight
6"	100
#4	75-100
#200	15-60

Gradations will be determined by ASTM C-136. For percent of fines greater than size 200, they will be determined by ASTM C-117.

The maximum rock size shall be six (6) inches.

(3) The maximum thickness of a layer prior to compaction shall be nine (9) inches.

(4) The moisture content of the fill material at the time of compaction as determined by ASTM D2216 with drying oven controlled at 110 degrees plus or minus 5 degrees Celsius, shall not be less than 2% below nor more than 2% above optimum moisture content.

(5) Section 6, Compaction, Class A shall apply. The fill matrix shall be compacted to at least 95 percent of the maximum density obtained from compaction tests performed by Method C, ASTM D968 or the rapid compaction test (Test No. S-6, SCS reference NEH Section 19).

(6) Section 9, Measurement and Payment will be by Method 2, and will include compensation for Subisidary Items, Removal of Water, Pollution Control, and Post Barricades.

(c) Subsidiary Item, Spoil Disposal

(1) This item shall consist of placing all spoil in the spoil disposal areas, as shown on the drawings.

(2) Spoil material shall consist of all surpluss or unsuitable material resulting from the required excavations.

(3) Section 6, Compaction, does not apply to this item.

(4) Spoil material shall be placed in layers not to exceed two (2) feet in depth.

(5) After placement the completed surface shall be finished to a reasonably smooth surface, sloped to drain, and shall blend with the surrounding terrain.

(6) Fill slopes resulting from the deposition of spoil shall not be steeper than 4:1.

(7) No special moisture content of spoil material will be required.

(8) Section 9, Measurement and Payment, no separate payment will be made for spoil disposal. Compensation for this work will be included in the payment for Bid Items 4 and 5.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 7, Earthfill

(1) This item consists of the placing and compaction of all earthfill required to construct the:

(a) Earth dam (Apache Junction FRS)

(b) Diversions, roads, ramps, berms and dikes associated with the Apache Junction Floodway and FRS as shown on the drawings.

(c) Approaches to Weir Inlets including the filling of gullies in front of the Weir Inlets.

(2) All earthfill shall be obtained from the required excavations and the borrow area and shall meet the following gradation requirements:

Sieve Size	% Passing By Weight
6"	100
#4	75-100
#200	15-60

Gradations will be determined by ASTM C-136. For percent of fines greater than size 200, they will be determined by ASTM C-117.

(3) The maximum thickness of layer prior to compaction shall be nine (9) inches.

(4) The moisture content of the fill material at the time of compaction, as determined by ASTM D2216 with the drying oven controlled at 110 plus or minus 5 degrees Celsius, shall not be less than 2% below nor more than 2% above optimum moisture content.

(5) Section 6, Compaction, Class A shall apply. The fill matrix shall be compacted to at least 95 percent of the maximum density obtained from compaction tests performed by Method C, ASTM D698 or the rapid compaction test (Test No. S-6, SCS Reference NEH Section 19).

(6) Embankment slopes shall be finished so that the surface is firm and covered with many small indentations parallel to the top of dam (horizontal). This may be accomplished with one pass of a bulldozer, cultipacker, or similar equipment over the entire surface.

(7) Section 9, Measurement and Payment, will be by Method 2, and will include compensation for Subsidiary Items Borrow Excavation, Foundation Preparation and Pollution Control.

b. Bid Item 8, Structure Backfill

(1) This item shall consist of placing and compacting all earth fill required adjacent to the Apache Junction Floodway and associated structures as shown on the drawings including:

(a) The principal spillway structure.

(b) The baffle block emergency spillway.

(c) The Apache Junction Floodway and associated structures.

(2) Structure backfill gradation shall meet the requirements of Earthfill given in Paragraph 10 (a) (2) above except that the maximum sieve size shall be two (2) inches.

(3) The maximum thickness of a layer prior to compaction shall be six (6) inches.

(4) The moisture content of the fill material at the time of compaction shall be as specified in Paragraph 10 (a) (4) above.

(5) Section 6, Compaction, Class A shall apply. The fill matrix shall be compacted to at least 95 percent of the maximum density obtained from compaction tests performed by Method C, ASTM D698 or the rapid compaction test (Test No. S-6, SCS Reference NEH Section 19).

(6) Section 9, Measurement and Payment, will be by Method 4, and will include compensation for Subsidiary Items Borrow Excavation and Pollution Control.

c. Subsidiary Item, Foundation Preparation

(1) This item shall consist of providing compactive effort to the embankment foundation area of the Apache Junction FRS after the foundation excavation has been completed.

(2) This requirement is in addition to those requirements given in Section 3 of this specification.

(3) Prior to the placement of earthfill material, the foundation shall be compacted by eight passes of smooth wheel drum vibrator roller exerting a minimum centrifugal force of 40,000 pounds with 1500 to 2400 vibration/min. at an amplitude of 0.8 to 2.0 mm. Each pass shall consist of at least one passage of the drum over the entire surface.

(4) The moisture content at the time of compaction, as determined by ASTM D2216, shall be within 2 percent of optimum.

(5) Section 9, Measurement and Payment, no separate payment will be made for Foundation Preparation. Compensation will be included in the payment for Bid Item 7.

d. Subsidiary Item, Waste Disposal

(1) This item shall consist of placing all waste in the waste disposal areas, as shown on the drawings.

(2) Spoil material shall consist of all surplus or unsuitable material resulting from the required excavations.

(3) Section 6, Compaction, does not apply to this item.

(4) Spoil material shall be placed in layers not to exceed two (2) feet in depth.

(5) After placement the completed surface shall be finished to a reasonably smooth surface, sloped to drain, and shall blend with the existing terrian.

(6) Fill slopes resulting from the deposition of spoil shall not be steeper than 4:1.

(7) No special moisture content of spoil material will be required.

(8) Section 9, Measurement and Payment, no separate payment will be made for spoil disposal. Compensation for this work will be included in the payment for Bid Items 4, 5 and 6.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 8 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Unified Standard Specifications and construction details contained herein:

a. Bid Item 3, Fill Construction, MAG Section 211

1. This item shall consist of the placing and compaction of all earthfill required for the construction of the approach roadways as shown on the drawings.

2. All fill material shall be obtained from the required excavations for the Bulldog Floodway and be subject to approval of the Engineer. The fill materials shall be free of all debris, vegetation and other unsuitable material.

3. Depressions and ditches shall be cleaned of all loose or wet soils and widened to accommodate compaction equipment. Sloping surfaces shall be benched to provide a level surface for fill placement.

4. Compaction shall be to a minimum of 95% of the maximum density as determioned in accordance with AASHTO T-99, Method D and T-191 or ASTM D-2922 and D-3017 within a moisture content range of plus or minus 2% of optimum.

5. Section 9, Measurement and Payment, will be by Method 2 and will include compensation for all subsidiary incidental and appurtenant work and subsidiary items Roadway Excavation and Subgrade Preparation.

b. Bid Item 4, Structure Backfill, MAG Section 206

1. This item shall consist of placing and compacting special backfill material around the bridge abutments as shown on the drawings.

2. Special backfill shall be Type "A". Select material in accordance with Table 702 of MAG compacted to a minimum of 95% of the maximum density as determined by AASHTO T-99, Method A, and T-191 or ASTM D-2922 and D-3017. Compaction equipment shall be maintained at least two (2) feet from the structure.

3. Moisture content shall range plus or minus 2% of optimum.

4. Section 9, Measurement and Payment, will be by Method 4 and will include compensation for all subsidiary incidental and appurtenant work and subsidiary items Drainfill Fine Aggregate and Drainfill Coarse Aggregate.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

(a) Bid Item 4, Earthfill

(1) This item consists of all earthfill required to construct the:

Road ramps associated with intersection of Idaho Road and Lost Dutchman Boulevard at the Apache Junction Flood Retarding Structure (FRS) as shown on the drawings.

(2) All earthfill shall be obtained from the required excavations and the borrow area of the Apache Junction Floodway and FRS and shall meet the following gradation requirements:

Sieve Size	% Passing By Weight
6"	100
#4	75-100
#200	15-60

Gradations will be determined by ASTM C-136. For percent of fines greater than size 200, they will be determined by ASTM C-117.

(3) The maximum thickness of layer prior to compaction shall be nine (9) inches.

(4) The moisture content of the fill material at the time of compaction shall not be less than 2% below nor more than 2% above optimum moisture content as determined by ASTM D2216 with the drying oven controlled at 110 plus or minus 5 degrees Celsius.

(5) Section 6, Compaction, Class A shall apply. The fill matrix shall be compacted to at least 95 percent of the maximum density obtained from compaction tests performed by Method C, ASTM D698 or the rapid compaction test (Test No. S-6, SCS Reference NEH Section 19).

(6) Section 9, Measurement and Payment, will be by Method 2 and will include Compensation for Subsidiary Items, Removal of Water, Pollution Control, Traffic Control and Relocation of Utilities.

b. Subsidiary Item, Structure Backfill

(1) This item shall consist of all structure backfill required for installation of the 6 inch waterline from station (-)7+00 K to Irrigation Booster Pump at Prospector Park as shown on the drawings and staked in the field.

(2) Structure backfill gradation shall meet the requirements of earthfill given in section 10(a)(2) except that the maximum sieve size shall be two(2) inches.

(3) The maximum thickness of a layer prior to compaction shall be six(6) inches.

(4) The moisture content of the fill material at the time of compaction shall be as specified in section 10(a)(4).

(5) Section 6, compaction, Class A shall apply and shall meet the requirements as specified in section 10(a)(5).

(6) Section 9, measurement and payment, no separate payment will be made for structure backfill. Compensation for structure backfill will be included in Bid Item 16.

CONSTRUCTION SPECIFICATION

24. DRAINFILL

1. SCOPE

The work shall consist of furnishing, placing and compacting drainfill required in the construction of structure drainage systems.

2. MATERIALS

Method 1 Drainfill materials shall conform to the requirements of Material Specification 521. At least 30 days prior to delivery of the materials to the site the Contractor shall inform the Contracting Officer in writing of the source from which he intends to obtain them. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing.

Method 2 Drainfill materials shall be sand, gravel, or crushed stone or mixtures thereof obtained from the specified sources. They shall be selected as necessary to avoid the inclusion of organic matter, clay balls, excessive fine particles or other substances that would interfere with their free-draining properties.

3. BASE PREPARATION

Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substance, and standing water when the drainfill is placed. Earth surfaces upon or against which drainfill will be placed shall not be scarified.

4. PLACEMENT

Drainfill shall not be placed until the subgrade has been inspected and approved by the Engineer. Drainfill shall not be placed over or around pipe or drain tile until the installation of the pipe or tile has been inspected and approved.

Drainfill shall be placed uniformly in layers not more than 12 inches deep before compaction. When compaction is accomplished by manually controlled equipment, the layers shall be not more than 8 inches deep. the material shall be placed in a manner to avoid segregation of particle sizes and to insure the continuity and integrity of all zones. No foreign materials shall be allowed to become intermixed with or otherwise contaminate the drainfill.

Traffic shall not be allowed to cross over drains at random. Equipment crossovers shall be maintained, and the number and

location of such crossovers shall be established and approved prior to the beginning of drainfill placement. Each crossover shall be cleaned of all contaminating materials and shall be inspected and approved by the Engineer before additional drainfill is placed.

Any damage to the foundation surface or the sides or bottoms of trenches occurring during placement of drainfill shall be repaired before drainfill placement is continued.

The upper surface of drainfill constructed concurrently with adjacent zones of earthfill shall be maintained at an elevation at least one foot above the upper surface of the adjacent fill.

Drainfill over or around pipe or drain tile shall be placed in a manner to avoid any displacement in line or grade of the pipe or tile.

Drainfill shall not be placed adjacent to structures until the concrete has attained the strength specified in Section 9 of this specification. The strength shall be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining when a structure may be put in service.

When the required strength of the concrete is not specified as described above, placement of drainfill adjacent to structures shall not be started until the following item intervals have elapsed after placement of the concrete.

Structure	Time Interval
Retaining walls and counterforts (impact basins)	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and galleries, cast-in-place (with inside forms in place)	7 days
Conduits and galleries, cast-in-place (inside forms removed)	14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Cantilever outlet bents backfilled on both sides simultaneously	3 days

5. CONTROL OF MOISTURE

The moisture content of drainfill materials shall be controlled as specified in Section 9. When the addition of water is required, it shall be applied in such a way as to avoid excessive wetting to adjacent earth fill. Except as specified in Section 9, control of moisture content will not be required.

6. COMPACTION

Drainfill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction. Each layer of drainfill shall be compacted to a relative density of not less than 70 percent as determined by ASTM Method D 4254.

Class I compaction. Each layer of drainfill shall be compacted by at least 2 passes, over the entire surface, of a steel-drum vibrating roller weighing not less than 5 tons and exerting a vertical vibrating force of not less than 20,000 pounds at least 1200 times per minute, or by an approved equivalent method.

Class II compaction. Each layer of drainfill shall be compacted by one of the following methods or by an approved equivalent method:

a. At least 2 passes, over the entire surface, of a pneumatic-tired roller exerting a pressure of not less than 75 pounds per square inch. A pass is defined as at least one complete coverage of the roller wheel, tire or drum over the entire surface of the layer.

b. At least 4 passes, over the entire surface, of the track of a crawler-type tractor weighing not less than 20 tons.

c. Controlled movement of the hauling equipment so that the entire surface is traversed by not less than one tread track of the loaded equipment.

Class III compaction. No compaction will be required beyond that resulting from the placing and spreading operations.

When compaction other than Class III compaction is specified materials placed in trenches or other locations inaccessible to heavy equipment shall be compacted by means of manually controlled pneumatic or vibrating tampers or by approved equivalent methods.

Heavy equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from cranes or hoists will not be permitted.

7. TESTING

The Engineer will perform such tests as are required to verify that the drainfill materials and the drainfill in place meet the requirements of the specifications. These tests are not intented to provide the Contractor with information he needs to assure that the materials and workmanship meet the requirements of the specifications, and their performance will not relieve the Contractor of the responsibility of performing his own tests for that purpose.

8. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of drainfill within the neat lines shown on the drawings will be measured and computed to the nearest cubic yard. Where the Engineer directs placement of drainfill outside the neat lines to replace unsuitable foundation material, the volume of such drainfill will be included, but only to the extent that the unsuitable condition is not a result of the Contractor's improper construction operations as determined by the Contracting Officer.

Payment for drainfill will be made at the contract unit price for each type of drainfill, complete in place. Except as otherwise specified in Section 9, such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

(a) Bid Item 8, Transition Fill

(1) This item consists of furnishing and installing all transition fill at the locations shown on the drawings.

(2) Section 2, Materials, Method 1 shall apply.

(3) The Transition Fill material shall be well graded within the following limits of gradation:

Sieve Size	Percent Passing
2"	100
3/4"	90-100
#4	60-100
#10	40-100
#20	20-75
#40	0-55
#60	0-40
#100	0-25
#200	0-5

(4) The Transition Fill material shall contain sufficient moisture to permit placing without segregation.

(5) Section 6, Compaction, shall be Class III.

(6) The material passing the #200 sieve shall be non-plastic.

(b) Bid Item 9, Drainfill - SCHEDULE A

(1) This item consists of furnishing and installing the Drainfill material necessary to construct the:

(a) Drainfill portion of the structure drain along the reinforced concrete channel and side inlet structures,

(b) Drainfill portion of the bedding systems under all grouted and loose rock riprap.

(2) Section 2, Materials, Method 1 shall apply.

(3) The Drainfill material shall be well graded within the following limits of gradation:

Sieve Size	Percent Passing
2"	100
3/4"	90-100
1/2 "	60-100
3/8"	40-80
#4	5-25
#10	0-8
#20	0-5

ASTM D448, gravel size #78 meets this requirement.

(4) The drainfill material shall contain sufficient moisture to permit placing without segregation.

(5) Section 6, Compaction, shall be Class III.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

The Transition Fill material shall be well graded within the following limits of gradation: (the material passing the #200 sieve shall be non-plastic)

Sieve Size	Percent Passing
2"	100
3/4"	90-100
#4	60-100
#10	40-100
#20	20-75
#40	0-55
#60	0-40
#100	0-25
#200	0-5

The Drainfill Material shall be well graded within the following limits of gradation:

Sieve Size	Percent Passing
2"	100
3/4"	90-100
1/2 "	60-100
3/8"	40-80
#4	5-25
#10	0-8
#20	0-5

ASTM D448, gravel size #78 meets this requirement.

The Transition Fill Material and Drainfill Material shall contain sufficient moisture to permit placing without minimum segregation.

a. Bid Item 9, Transition Fill - FRS Transition

(1) This item consists of furnishing and installing the transition fill material necessary to construct the 3 foot wide transition zone along the centerline of the Apache Junction FRS as shown on the drawings.

(2) Section 6, Compaction, shall be Class II.

b. Bid Item 10, Transition Fill - FRS Structures

(1) This item consists of furnishing and installing the transition fill material as shown on the drawings:

a. Along the Principal Spillway Conduit,

b. Under the Baffle Chute Emergency Spillway.

(2) Section 6, Compaction, does not apply. Compaction shall be accomplished by use of manually controlled vibrating tampers. Such tampers shall operate at a minimum frequency of 2000 cycles per minute, (with not less than 200 pounds), and apply a minimum of 7 pounds of force per square inch of base plate. Each fill lift shall be covered by at least 2 passes of the compaction equipment.

c. Bid Item 11, Transition Fill - Floodway

(1) This item consists of furnishing and installing the transition fill material necessary to construct the transition fill portions of the structure drain along the Apache Junction Floodway and under the energy dissipator.

(2) Section 6, Compaction, shall be Class III.

d. Bid Item 12, Drainfill - FRS Structures

(1) This item consists of furnishing and installing the drain fill material as shown on the drawings:

(a) Along the Principal Spillway Conduit,

(b) Under the Baffle Chute Emergency Spillway,

(c) Under the Emergency Spillway Outlet Channel loose riprap..

(2) Section 6, Compaction does not apply. Compaction shall be accomplished by manually controlled vibrating tampers as specified in Section 9.b. (2) above.

e. Bid Item 13, Drainfill - Floodway

(1) This item consists of furnishing and installing the drainfill material as shown on the drawings for the :

(a) Structure drain along the Apache Junction Floodway.

(b) Bedding systems under all grouted and loose rock riprap structures along the Apache Junction Floodway.

(2) Section 6, Compaction, shall be Class III.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Drainfill Fine Aggregate

1. This item shall consist of furnishing and installing drainfill fine Aggregate along the abutment walls as shown on the drawings.

2. The material shall be well graded within the following limits of gradation:

Sieve Size	Percent Passing
2"	100
3/4	90-100
#4	60-100
#10	40-100
#20	20-75
#40	0-55
#60	0-40
#100	0-25
#200	0-5

3. The material shall contain sufficient moisture to permit placing without segregation.

4. Section 6, Compaction, shall be Class III.

5. The material passing the #200 sieve shall be non-plastic.

6. Section 2, Materials, Method 1 shall apply.

7. No separate payment will be made for Drainfill Fine Aggregate. Compensation for this item will be included in Bid Item 4, Structure backfill.

b. Subsidiary Item, Drainfill Coarse Aggregate

1. This item shall consist of furnishing and installing Drainfill Coarse Aggregate along the abutment walls as shown on the drawings.

2. The Drainfill material shall be well graded within the following limits of gradation:

Sieve Size	Percent Passing
2"	100
3/4"	90-100
1/2"	60-100
3/8"	40-80
#4	5-25
#10	0-8
#20	0-5

ASTMD 448, gravel size #78 meets this requirement.

3. The drainfill material shall contain sufficient moisture to permit placing without segregation.

4. Section 6, Compaction, shall be Class III.

5. Section 2, Materials, Method 1 shall apply.

6. No separate pay will be made for Drainfill Coarse Aggregate. Compensation for this item will be included in Bid Item 4, Structure Backfill.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

(b) Bid Item 5, Drainfill/Bedding

(1) This item consists of furnishing and installing the Drainfill material necessary to construct the:

Drainfill portion of the drainage and bedding systems under the corrugated steel pipe culverts, as shown on the drawings.

(2) The Drainfill material shall be well graded within the following limits of gradation:

Sieve Size	% Passing By Weight
2"	100
3/4"	90-100
1/2"	60-100
3/8"	40-80
#4	5-25
#10	0-8
#20	0-5

(3) The Drainfill material shall contain sufficient moisture to permit placing without segregation.

(4) Section 2, materials, method 1 shall apply.

(5) Section 6, compaction, shall be Class III.

CONSTRUCTION SPECIFICATION

31. CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing and curing portland cement concrete as required to build the structures designated in Section 26 of this specification.

2. MATERIALS

Portland cement shall conform to the requirements of Material Specification 531 for the specified type. One brand only of any type of cement shall be used in any single structure as defined in Section 26.

Aggregates shall conform to the requirements of Material Specification 522 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 26.

Water used in mixing or curing concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

Air entraining admixtures shall conform to the requirements of Material Specification 532. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that in the cement.

Pozzolan shall conform to ASTM C618, Class F, except the loss of ignition shall not exceed 3.0 percent.

Water-reducing, set-retarding admixture shall conform to the requirements of Material Specification 533.

Shear plates shall conform to the requirements of Material Specification 581 for structural quality or commercial or merchant quality steel. Structural quality shall be used if specifically designated in the drawings or specifications.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

Waterstops shall conform to the requirements of Material Specifications 537 and 538 for the specified kinds.

Curing compound shall conform to the requirements of Material Specification 534.

3. CLASSES OF CONCRETE

Method 1 Concrete shall be classified according to the required compressive strength. The strength of the concrete at 28 days shall equal or exceed the Minimum Compressive Strength at 28 days tabulated below for the class of concrete specified.

Class of Concrete	Minimum Compressive Strength at 28 days (psi)
5000	5000
4000	4000
3000	3000
2500	2500

Method 2 Concrete shall be classified as follows:

Class of Concrete	Water Content (gallons/bag)	Cement Content (bag/cu. yd.)
5000X	5	7
4000X	6	6
3000X	7	5
2500X	8	4-1/2

4. AIR CONTENT AND CONSISTENCY

Unless otherwise specified the air content (by volume) of the concrete at the time of placement shall be:

Maximum Size Aggregate	Air Content (%)
3/8 inch to 1/2 inch	6 to 9
Over 1/2 inch to 1 inch	5 to 8
Over 1 inch to 2-1/2 inches	4 to 7

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

Type of Structure	Slump (inches)
Massive sections, pavements, footings	2 ± 1/2
Heavy beams, thick slabs, thick walls (over 12 in.)	3 ± 1/2
Columns, light beams, thin slabs, thin walls (12 in. or less)	4 ± 1

5. DESIGN OF THE CONCRETE MIX

Method 1 The Contractor will be responsible for the design of the concrete mixtures. At least 5 days prior to any placement of concrete he shall furnish the Contracting Officer a statement of the materials and mix proportion (including admixtures, if any) he intends to use for each specified class of concrete. The statement shall include evidence satisfactory to the Contracting Officer that the materials and proportions selected will produce concrete of the quality, consistency and strength specified.

The materials and proportions so stated shall constitute the "job mix". After a job mix has been designated, neither the source, character or grading of the aggregates nor the type or brand or quantity of cement or admixture shall be changed without prior notice to the Contracting Officer and establishment of a new job mix supported by evidence, as required for the initial job mix, that the proposed new materials and mix proportions will produce concrete of the quality, consistency, and strength specified.

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

The use of calcium chloride or other accelerators or antifreeze compounds will not be allowed.

Before placing concrete containing a water-reducing, set-retarding admixture, the Contractor shall furnish test results satisfactory to the Contracting Officer showing that its performance in the job mix meets the requirements of Material Specifications 533, Section 4.

When specified, mixes that include fly ash as a partial substitution for portland cement shall be based on absolute volume with a maximum substitution of 20 percent.

Method 2 At least 35 days prior to any placement of concrete the Contractor shall inform the Contracting Officer in writing of the source and grading of aggregates and the brand and type of cement and the brand and type of admixture, if any, he proposes to use for each class of concrete, and shall furnish test results or other evidence satisfactory to the contracting officer that the proposed materials meet the requirements of the specifications.

When acceptable sources, types and gradings of aggregates are designated in the contract, test results or other data to verify that the aggregates meet the specification will not be required. Grading will be tested at the site.

Job mix proportions and batch weights will be determined by the Engineer. During the course of the work, the Engineer will adjust the job mix proportions and batch weights whenever necessary.

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

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

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

The use of calcium chloride or other accelerators or antifreeze compounds will not be allowed.

When it is anticipated that a water-reducing, set-retarding admixture will be used, the Contractor shall furnish to the Engineer a sample of the admixture he proposes to use sufficient for the tests required by Material Specification 533, Section 4. Concrete containing the admixture shall not be placed until test results have been obtained showing that its performance in the job mix meets the requirements of Material Specification 533, Section 4.

6. INSPECTING AND TESTING

During the course of the work, the Engineer will perform such tests as are required to assure the concrete meets the contract requirements. Tests performed by the Engineer are not for the purpose of providing the Contractor with the information required for proper work execution and performance and shall not relieve the Contractor of the necessity to perform tests for that purpose.

The following tests will be performed by the methods indicated:

Test	Method (ASTM Designation)
Sampling	C 172 [1/]
Slump Test	C 143 [1/]
Air Content	C 231 [1/] or C 173 [1/]
Compression Test Specimens	C 31 [1/], C 42 or C 684 [2/]
Compressive Strength	C 39 [2/] or C 42
Unit Weight	C 138

[1]/ Test of a portion of a batch may be made on samples representative of that portion for any of the following purposes:

(1) Determining uniformity of the batch.

(2) Checking compliance with requirements for slump and air content when the batch is discharged over an extended period of time.

(3) Checking compliance of the concrete with the specifications when the whole amount being placed in a small structure, or a distinct portion of a larger structure, is less than full batch.

[2]/ For each strength test of specimens made according to ASTM Designation C 39 or C 684, three (3) standard test specimens shall be made. The test result shall be the average of the strength of the three (3) specimens, except that if one (1) specimen in the test shows manifest evidence of improper sampling, molding or testing, it shall be discarded and the strengths of the remaining two (2) specimens shall be averaged. Should more than one (1) specimen representing a test show such defects, the entire test shall be discarded.

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

7. HANDLING AND MEASUREMENT OF MATERIALS

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation or degradation, or intermingling of various sizes.

Scales for weighing aggregates and cement shall be beam type or springless dial type. They shall be accurate within 1 percent under operating conditions. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean.

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

Cement	plus or minus 1.0 percent
Aggregates	plus or minus 2.0 percent

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

Except as otherwise provided in Section 8, cement and aggregates shall be measured as follows:

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

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

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

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

8. MIXERS AND MIXING

Mixers and mixing shall be in accordance with recommended standards set forth in ACI 304, some specific interpretations of which are stated below.

Concrete may be furnished by batch mixing at the site of the work or by ready-mix methods.

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

Concrete shall be uniform and thoroughly mixed when delivered to the forms. Variations in slump of more than 1 inch within a batch will be considered evidence of inadequate mixing and shall be corrected by changing batching procedures, increasing mixing time, changing mixers or other means. Mixing time shall be within the limits specified below unless the Contractor demonstrates by mixer performance tests that adequate uniformity is obtained by different times of mixing.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point. If less water than the design maximum water-cement ratio has been incorporated in the batch, water to compensate for up to a one (1) inch loss in slump may be added, up to the design maximum water cement ratio. Withholding some of the mixing water until the concrete arrives on the job, then adding the remaining water and turning the mixer 30 revolutions at mixing speed may overcome transporting conditions. When loss of slump or workability cannot be offset by these measures, complete mixing shall be performed on the job using centrally dry batched materials, or by on site batching and mixing.

Batch mixing at the site. For concrete mixed at the site of the work with paving mixers or stationary construction mixers, the time of mixing after all cement and aggregates are in the mixer drum shall be not less than 1-1/2 minutes. The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates and all mixing water shall be introduced into the drum before one-fourth of the mixing time has elapsed.

Controls shall be provided to insure that the batch cannot be discharged until the required time has elapsed.

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

Volumetric batching and continuous mixing at the site. Unless otherwise specified, volumetric batching and continuous mixing at the construction site will be permitted. The batching and mixing equipment shall conform to the requirements of ASTM Specification C 685 and shall be demonstrated prior to placement of concrete, by tests with the job mix, to produce concrete meeting the specified proportioning and uniformity requirements. Concrete made by this method shall be produced, inspected, and documented in conformance with Sections 6, 7, 8, 13, and 14 of ASTM Specification C 685.

Ready-mixed concrete. Ready-mixed concrete shall be mixed and delivered to the site of the work by one of the following methods:

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

b. Shrink-mixed concrete--Mixed partially in a stationary mixer, and the mixing completed in a truck mixer.

c. Central-mixed concrete--completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitatior or in a truck mixer operating at agitating speed or in nonagitating equipment.

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

When ready mixed concrete is furnished, the Contractor shall furnish the Engineer a statement-of-delivery ticket showing the time of loading, the revolution counter reading at the time of loading and the quantities of materials used for each load of concrete.

Truck-mixed concrete. When concrete is mixed in a truck mixer loaded to its maximum capacity, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100. If the batch is at least 1/2 cubic yard less than maximum capacity, the number of revolutions at mixing speed may be reduced to not less than 50. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The mixing operation shall begin within 30 minutes after the cement has been added to the aggregates and the water shall be added during mixing. When mixing is begun during or immediately after charging, a portion of the mixing water shall be added ahead of, or with, the other ingredients.

Shrinked-mixed concrete. When concrete is partially mixed at a central plant and the mixing is completed in a truck mixer, the mixing time in the central plant mixer shall be the minimum required to intermingle the ingredients and shall be not less than 30 seconds. The mixing shall be completed in a truck mixer and the number of revolutions of the drum or blades at mixing speed shall be not less than 50 nor more than 100: Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed.

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

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

The use of nonagitating equipment to transport concrete to the site of the work will be permitted only if the consistency and uniformity of the concrete as discharged at the point of delivery meet the requirements of this specification. Bodies of nonagitating hauling equipment shall be so constructed that leakage of the concrete mix, or any part thereof will not occur. Concrete hauled in open-top vehicles shall be protected from rain, and from more than 20 minutes exposure to the sun when the air temperature is above 75°F.

9. FORMS

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

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

All edges that will be exposed shall be chamfered, unless finished with molding tools as specified in Section 20.

10. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any form release agent on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed.

Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted. All ice, snow and frost shall be removed and the temperature of all surfaces to be in contact with the new concrete shall be no colder than 40°F.

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

Weepholes in walls or slabs shall be formed with nonferrous materials.

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85°F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.

The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable, by methods that will prevent segregation of the aggregates or loss of mortar.

12. PLACING

Concrete shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved.

The Contractor shall have all equipment and materials required for curing available at the site ready for use before placement of concrete begins.

No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with specifications. Other preparations include but are not limited to the concrete batching plant, mixing and delivery equipment and system, placing and finishing equipment and system, schedule of work, work force and heating or cooling facilities as applicable. All deficiencies are to be corrected before concrete is delivered for placing.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. The depositing of concrete shall be regulated so that the concrete can be consolidated with a minimum of lateral movement.

Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.

13. LAYERS

Unless otherwise specified, slab concrete shall be placed to design thickness in one continuous layer. Formed concrete shall be placed

in horizontal layers not more than 20 inches thick. Hoppers and chutes, pipes or "elephant trucks" shall be used as necessary to prevent splashing of mortar on the forms and reinforcing steel above the layer being placed.

Successive layers shall be placed at a fast enough rate to prevent the formation of "cold joints". If the surface of a layer of concrete in place sets to the degree that it will not flow and merge with the succeeding layer when vibrated, the Contractor shall discontinue placing concrete and shall make a construction joint according to the procedure specified in Section 15.

If placing is discontinued when an incomplete layer is in place, the unfinished end of the layer shall be formed by a vertical bulkhead.

14. CONSOLIDATING

Unless otherwise specified, concrete shall be consolidated with internal type mechanical vibrators capable of transmitting vibration to the concrete at frequencies not less than 6000 impulses per minute.

The location, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without causing segregation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface.

The Contractor shall provide a sufficient number of vibrators to properly consolidate the concrete immediately after it is placed in the work. Vibration shall be applied to the freshly deposited concrete by slowly inserting and removing the vibrator at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. The vibrator shall extend into the previously placed layer of fresh concrete, at all points, to insure effective bond between layers.

Vibration shall not be applied directly to the reinforcement steel or the forms nor to concrete that has hardened to the degree that it does not become plastic when vibrated.

The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

Vibration shall be supplemented by spading and hand tamping as necessary to insure smooth and dense concrete along form surfaces, in corners and around embedded items.

15. CONSTRUCTION JOINTS

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

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

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

Steel tying and form construction adjacent to concrete in place shall not be started until the concrete has cured at least 12 hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

Method 1 Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by either sandblasting after the concrete has gained sufficient strength to resist excessive cutting, or air-water cutting as soon as the concrete has hardened sufficiently to prevent the jet from displacing the coarse aggregates, or both. The surface of the concrete in place shall be cut to expose clean, sound aggregate but not so deep as to undercut the edges of larger particles of the aggregate. After cutting, the surface shall be thoroughly washed to remove all loose material. If the surface is congested by reinforcing steel, is relatively inaccessible, or it is considered undesirable to disturb the concrete before it is hardened, cleaning of the joint by air-waterjets will not be permitted and the wet sandblasting method will be required after the concrete has hardened.

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

Method 2 Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains, or debris by washing and scrubbing with a wire brush or wire broom or by other means approved by the Engineer. The surfaces shall be kept moist for at least one hour prior to placement of new concrete. The new concrete shall be placed directly on the cleaned and washed surface.

16. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be made only at locations shown on the drawings.

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

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

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

17. WATERSTOPS

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

18. REMOVAL OF FORMS

Forms shall be removed only when the Engineer is present and has given approval. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

Method 1 Forms shall not be removed sooner than the following minimum times after the concrete is placed. These periods represent cumulative number of days and fractions of days, not necessarily consecutive, during which the temperature of the air adjacent to the concrete is above 50°F.

Element	Time
Beams, arches - supporting forms and shoring	14 days
Conduits, deck slabs - supporting (inside) forms and shoring	7 days
Conduits (outside forms), sides of beams, small structures	24 hours
Columns, walls, spillway risers - with side or vertical load	7 days
Columns, walls, spillway riser - with no side or vertical load:	
Concrete supporting more than 30 feet of wall in place above it	7 days
Concrete supporting 20 to 30 feet of wall in place above it [1/]	3 days
Concrete supporting not more than 20 feet of wall in place above it [1/]	24 hours

[1/] Age of stripped concrete shall be at least 7 days before any load is applied other than the weight of the column or wall, forms and scaffolds for succeeding lifts.

Method 2 Forms, supports and housings shall not be removed until the concrete has attained the strength specified in Section 26 for this purpose. The strength will be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining form removal time.

19. FINISHING FORMED SURFACES

All concrete surfaces shall be true and even, and shall be free from open or rough spaces, depressions or projections.

Immediately after the removal of forms:

All bulges, fins, form marks or other irregularities which in the judgment of the Engineer will adversely affect the appearance or the function of the structure shall be removed. All form bolts and ties shall be removed to a depth at least 1 inch below the surface of the concrete. The cavities produced by form ties and all other holes of similar size and depth shall be thoroughly cleaned and, after the interior surfaces have been kept continuously wet for at least 3

hours, shall be carefully packed with a dry patching mortar mixed not richer than 1 part cement to 3 parts sand. Patching mortar shall be mixed in advance and allowed to stand without addition of water until it has reached the stiffest consistency that will permit placing. Manipulation of the mortar with a trowel during this period shall be performed as required to insure the proper consistency.

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

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

All repaired areas shall be cured as specified in Section 21.

20. FINISHING UNFORMED SURFACES

All exposed surfaces of the concrete shall be accurately screeded to grade and then float finished, unless specified otherwise.

After placing and consolidating the concrete, all exposed surfaces shall be accurately struck off to grade. Following strike-off, the surfaces shall be immediately smoothed by darbying or bull floating before any free water has bled to the surface. The concrete will then be allowed to rest until the bleed water and water sheen has left the surface and the concrete has stiffened to where it will sustain foot pressure with only about 1/4 inch (6mm) indentation. At this time all joints and edges that will be exposed to view that are not chamfered shall be finished with edging and/or molding tools. After edging and hand-jointing is complete, all exposed surfaces shall be floated with wood or magnesium floats. The floating should work the concrete no more than necessary to remove screed, edger and jointer marks and produce a compact surface, uniform in texture.

Joints and edges on unformed surfaces shall be chamfered or finished with molding tools.

21. CURING

Concrete shall be cured in accordance with the recommended practice of ACI 308, of which some specific interpretations are set forth below.

Concrete shall be prevented from drying for a period of at least 7 days after it is placed. Exposed surfaces and concrete formed in absorptive wood forms shall be kept continually wet during the entire curing period or until the forms have been removed. After forms have been removed, the exposed surface shall be kept continuously wet until patching and repair are complete and until the curing period is completed or until a curing compound is applied.

Moisture can be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or and approved material. Water and/or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

Except as otherwise specified in Section 26, curing compound may be used for exposed surfaces or formed surfaces after patching and repair have been completed. Unless otherwise specified, the curing compound shall be white pigmented and conform to ASTM C 309 Type 2, Class A or B. If surface coatings are to be applied to concrete where curing compound is used, Type 2, Class B shall be used and allowed to age a minimum of 30 days prior to the application of the coating. Clear curing compound (Type 1) or clear with fugitive dye (Type 1-D) may be used only when specified in Section 26.

Curing compound shall be thoroughly mixed before applying and agitated during application. It shall be applied using a continuously agitating pressure sprayer at a uniform rate of not less than one gallon per 150 square feet of surface. It shall form a uniform continuous, adherent film that shall not check, crack or peel and shall be free from pinholes or other imperfections.

All surfaces covered with curing compound shall be continuously protected from damage to the protective film during the required curing period.

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

Unless otherwise specified in Section 26, curing compound shall not be applied to construction joints or other areas that are to receive additional concrete, paint or other material that require a positive bond.

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

22. REMOVAL, REPLACEMENT, OR REPAIR

When concrete is honeycombed, damaged or otherwise defective, the Contractor shall remove and replace the structure or structural member containing the defective concrete, or correct or repair the defective parts. The Contracting Officer will determine the required extent of removal, replacement or repair and advise the Contractor, in writing, of this determination.

Prior to starting repair work the Contractor shall obtain the Contracting Officer's approval of his plan for making the repair. The appropriate methods described in Chapter VII of the Concrete

Manual, Bureau of Reclamation, U.S. Department of the Interior, shall be used as the primary reference for repairs. If approved in writing by the Contracting Officer, proprietary compounds for adhesion or as patching ingredients may be used. Such compounds shall be used in accordance with the manufacturer's recommendations.

Approval of the Contractor's repair plan shall not be considered a waiver of the Contracting Officer's right to require complete removal of defective work if the completed repair does not produce concrete of the required quality and appearance.

Repair work shall be performed only when the Engineer is present.

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

Curing as specified in Section 21 shall be applied to repaired areas immediately after the repairs are completed.

23. CONCRETING IN COLD WEATHER

Concreting in cold weather shall be performed in accordance with ACI 306 Recommended Practice for Cold Weather Concreting, of which some specific interpretations are set forth below.

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

a. The temperature of the concrete at time of placing shall not be less than 50°F nor more than 90°F. The temperature of neither aggregates nor mixing water shall be more than 140°F just prior to mixing with the cement.

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

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

d. When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with curing compound as specified in Section 21 or is covered tightly with an approved impervious material.

24. CONCRETING IN HOT WEATHER

Concreting in Hot Weather shall be in accordance with the recommended practice of ACI 305, of which some specific interpretations are set forth below.

For the purpose of the specification hot weather is defined as any combination of high temperature, low relative humidity and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal properties.

When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90°F at the time of delivery at the work site, during placement, or during the first 24 hours after placement, the following provisions shall apply;

a. The Contractor shall maintain the temperature of the concrete below 90°F during mixing, conveying, and placing.

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

c. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or other means to maintain adequate moisture during the time between placement and finishing, and after finishing.

d. Finishing of slabs and other exposed surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay.

e. Formed surfaces shall be kept completely and continuously wet for the duration of curing period (prior to, during and after form removal) or until curing compound is applied as specified in subsection g, below.

f. Concrete surfaces, especially flat work placed with large areas of surface, shall be covered as soon as the concrete has sufficiently hardened and shall be kept continuously wet for at least 24 hours of the curing period. This protective method may be continued for the required curing period or until curing compound as specified in (g) below is applied:

g. Moist curing may be discontinued before the end of the curing period if white pigmented curing compound is applied immediately, following the procedures specified in Section 21.

h. In extreme conditions it may be necessary to (1) restrict placement to late afternoon or evening (2) restrict the depth of layers to assure coverage of the previous layer while it

will still respond readily to vibration, (3) suspend placement until conditions improve, and (4) remove forms, repair, patch and reapply wet curing by small areas at a time.

25. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, concrete will be measured to the neat lines or pay limits shown on the drawings, and the volume of concrete will be computed to the nearest 0.1 cubic yard. No deduction in volume will be made for chamfers, rounded or beveled edges, or for any void or embedded item that is less than five cubic feet in volume. Where concrete is placed against the sides or bottom of an excavation without intervening forms, drainfill, or bedding, the volume of concrete required to fill voids resulting from overexcavation outside the neat lines or pay limits will be included in the measurement for payment where such overexcavation is directed by the Engineer to remove unsuitable foundation material; but only to the extent that the unsuitable condition is not a result of the Contractor's improper construction operations, as determined by the Contracting Officer.

Method 1 Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to completion of the concrete work, such as joint fillers, waterstops, dowels or dowel assemblies and shear plates, but not including reinforcing steel or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

Method 2 Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to completion of the concrete work, such as joint fillers, waterstops, dowels or other assemblies, and shear plates, but not including furnishing and placing reinforcing steel or furnishing and handling cement or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

Cement will be measured by dividing the volume of concrete accepted for payment by the yield of the applicable job mix. The yield will be determined by the procedure specified in ASTM Designation C 138.

If the amount of cement actually used per batch exceeds the amount in the job mix specified by the Engineer, the measurement will be based on the latter. One barrel of cement will be considered equal to 4 bags or 376 pounds. Payment for each type of cement will be

made at the contract unit price for furnishing and handling that type of cement and such payment will constitute full compensation for all materials, labor, equipment, storage, transportation and all other items necessary and incidental to furnishing and handling the cement.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is make subsidiary. Such items and the items to which they are made subsidiary are identified in Section 26 of this specification.

26. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 10, Concrete, Class 4000X

(1) This item shall consist of furnishing, forming and placing all concrete required to construct the Bulldog Floodway and Apache Junction Outlet Channel including all side inlets and appurtenant structures except those specified in paragraph 26(c).

(2) Section 3, Classes of Concrete, Method 2 shall apply and concrete shall be Class 4000X.

(3) Section 5, Design of the Concrete Mix, Method 2 shall apply.

(4) Coarse aggreagte shall be sized number 57 in accordance with ASTM C-33.

(5) Section 15, Construction Joints, Method 1 shall apply.

(6) Performed expansion joint filler shall conform to ASTM D-1752 and shall be Type I.

(7) Section 18, Removal of forms, Method 1 shall apply.

(8) Waterstops shall be Class II, Type B, D, or E size designation 20 with a center bulb diameter of not less than one inch. All splices except straight butt splices shall be factory made. Straight butt splices shall be made according to the manufacturer's recommendations.

(9) Joint sealing compound shall be Type II, Class A, conforming to Material Specification 536 and Federal Specification TT-S-227.

(10) Pozzolan will be used as a partial substitute for Portland Cement not to exceed a maximum substitution of 20 percent based on absolute volume.

(11) Curing compound shall be clear and meet the requirements of ASTM C309-81 for Type ID, Class B.

(12) All 4000X concrete shall be integrally colored. The cured concrete color shall blend with the natural earth tones at the site. Such colors may be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The Contractor shall provide a trial test sample on an unexposed footing or slab to verify color.

Color matching of concrete patching materials shall also be established by the Contractor in the trial sample. The color tone or finished concrete and patching materials shall be approved by the Engineer prior to full production.

(13) Section 25, Measurement and Payment, Method 2 shall apply.

b. Bid Item 14, Cement

(1) This item shall consist of furnishing the cement for all the concrete required to construct the structures described in Section 26.a.(1).

(2) Cement shall be Type II or IIA.

c. Subsidiary Item, Concrete, Class 2500

(1) This item shall consist of furnishing, forming and placing all concrete including cement to construct post anchors for fences and identification signs.

(2) Section 3, Classes of Concrete, Method 1 shall apply and concrete shall be Class 2500.

(3) Cement shall be Type II or Type IIA.

(4) Coarse aggregate shall be Size No. 57 in accordance with ASTM-C-33.

(5) Section 25, Measurement and Payment; no separate payment will be made for Concrete, Class 2500. Compensation for this item will be included in Bid Items 16 and 17.

(6) Section 5, Design of the Concrete Mix, Method 1 shall apply.

(7) Section 15, Construction Joints, Method 2 shall apply.

(8) Section 18, Removal of Forms, does not apply.

(9) Pozzolan may be used as a partial substitute for portland cement not to exceed a maximum substitution of 20 percent based on absolute volume.

26. ITEMS OF WORK AND CONSTRUCTION DETAIL - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 14, Concrete, Class 4000X

(1) This item shall consist of furnishing, forming and placing all concrete required to construct:

(a) The Apache Junction Floodway including all appurtenant structures and inlets,

(b) The emergency spillway baffle chute,

(c) The principal spillway, including inlet riser and conduit cradle structures, all as shown on the drawings.

(2) Section 3, Classes of Concrete, Method 2 shall apply and concrete shall be Class 4000X.

(3) Section 5, Design of the Concrete Mix, Method 2 shall apply.

(4) Coarse aggregate shall be size number 57 in accordance with ASTM C-33.

(5) Section 15, Construction Joints, Method 1 shall apply.

(6) Preformed expansion joint filler shall conform to ASTM D-1752 and shall be Type I.

(7) Section 18, Removal of Forms, Method 1 shall apply.

(8) Waterstops shall be Class II, Type B, D, or E size designation 20 with a center bulb diameter of not less than one inch. All splices except straight butt splices shall be factory made, straight butt splices shall be made according to the Manufacturer's recommendations.

(9) Joint sealing compound shall be Type II, Class A, conforming to Material Specification 536 and Federal Specification TT-S-227.

(10) Curing compound shall be clear and meet the requirements fo ASTM C309-81 for Type ID, Class B.

(11) Pozzolan will be used as a partial substitute for Portland Cement not to exceed a maximum substitution of 20 percent based on absolute volume.

(12) All 4000X concrete Item 14 shall be integrally colored. The cured concrete color shall blend with the natural earth tones at the site. Such colors may be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The Contractor shall provide a trial test sample on an unexposed footing or slab to verify color.

Color matching of concrete patching materials shall also be established by the Contractor in the trial sample. The color tone or finshed concrete and patching materials shall be approved by the Engineer prior to full production.

(13) All exposed formed surfaces of the emergency spillway shall be finished in the following manner:

Upon patching and pointing per Section 19, the concrete surfaces shall be promptly covered with wet burlap or wet cotton mats (no polyethyhlene film). When the mortar used in patching and pointing has set sufficiently, surfaces shall be rubbed with a medium coarse carborundum stone using water for lubrication and cleaning. The rubbing shall be started as soon as possible after the forms are removed, patching is finished, and the patching mortar has set throughly

Rubbing shall be continued until all form marks, projections and irregularities have been removed and a uniform surface has been obtained. After rubbing is completed the surface shall be washed to remove loose powder and shall be left free from unsound patched, paste, powder and objectionable marks.

(14) Shear plates in the principal spillway riser construction joints shall conform to the requirements of ASTM A36.

(15) Section 25, Measurement and Payment, Method 2 shall apply.

b. Bid Item 20, Cement

(1) This item shall consist of furnishing the cement for all the concrete required to construct the structures described in Section 26.A.(1).

(2) Cement shall be Type II or IIA.

c. Subsidiary Item, Concrete, Class 2500

(1) This item shall consist of furnishing, forming and placing all concrete including cement to construct the post anchors for fences and identification signs.

(2) Section 5, Classes of Concrete, Method 1 shall apply and concrete shall be Class 2500.

(3) Cement shall be Type II or Type IIA.

(4) Coarse Aggregate shall be size No. 57 in accordance with ASTM-C-33.

(5) Section 5, Design of the Concrete Mix, Method 1 shall apply.

(6) Section 15, Construction Joints, Method 2 shall apply.

(7) Section 18, Removal of Forms, does not apply.

(8) Pozzolan may be used as a partial substitute for Portland cement not to exceed a maximum substitution of 20 percent based on absolute volume.

(9) Section 25, Measurement and Payment, no separate payment will be made for Concrete, Class 2500. Compensation for this item will be included in Bid Items 22, 23, and 24.

26. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 25 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Unified Standard Specifications and construction details contained herein:

a. Bid Item 8, Concrete Class "S", MAG Section 505

1. This item shall consist of furnishing, forming, and placing all Concrete Class "S" required to construct the bridges as shown on the drawings. It shall also include furnishing and installing the elastomeric bearing pads, galvanized sheet metal strips, premolded joint filler and steel roadway angle and pipe hanger assemblies as shown on the drawings.

2. Concrete shall conform to Section 725 except that Class"S" Concrete shall have a strength of 5000 psi at 28 days.

3. The use of fly ash will be permitted as stated in MAG Section 725.2.1.

4. The top surface of the bridge deck shall be cured by the liquid-membrane curing compound method and by the water curing method. The curing compound shall be applied progressively immediately following the surface finishing operation. Liquid-membrane curing compound shall be applied at a rate of one gallon per 100 square feet. The curing compound shall form a continuous unbroken surface. Water curing shall be applied not later than four hours after the completion of the deck finishing operations and shall be applied for a period of a least 7 days after placing.

5. Cast-in-place dimensional tolerances shall be in accordance with Section 601.4.02(A) of the Arizona Department of Transporation Highways Division Standard Specifications for Road and Bridge Construction, edition of 1982.

6. Elastomeric bearing pads shall be in accordance with ADOT requirements and shall be made of durometer 60 neoprene. Pads shall conform to the dimensions and thickness shown on the drawings.

7. Premolded joint filler (premold joint) shall conform to MAG Section 729.1 of the Uniform Standard Sepcifications.

8. No vehicular loads will be permitted on the bridges before the lapse of twenty-one (21) days from the date of the last placement of concrete for the deck, unless approval is obtained in writing from the Contracting Officer.

9. Concrete shall be integrally colored. The cured concrete color shall blend with the natural earth tones at the site. Such colors may be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The Contractor shall construct an unexposed footing or a sample slab to verify color.

10. Curing compound shall meet the requirements of ASTM C309-81 for type I-D, Class B. The curing compound shall be continuously stirred or agitated during application.

11. Measurement and payment shall be in accordance with Section 505.10 and will include compensation for subsidiary item, Traffic Control.

b. Bid Item 9, Concrete Class "AA", MAG Section 505

1. This item shall consist of furnishing, forming, and placing all Concrete Class "AA" required to construct the bridge abutments as shown on the drawings. It shall also include furnishing and installing premolded joint filler and weep hole drains as shown on the drawings.

2. Concrete shall conform to Section 725 except that Class "AA" Concrete shall have a strength of 4000 psi at 28 days.

3. The use of fly ash will be permitted as stated in MAG Section 725.2.1.

4. Cast-in-place dimensional tolerances shall be in accordance with Section 601.4.02 (A) of the Arizona Department of Transportation Highways Division Strandard Specifications for Road and Bridge Construction, Edition of 1982.

5. Premolded Joint Filler (Premold Joint) shall conform to MAG Sections 729.1 of the Uniform Standard Specifications.

6. Concrete shall be integrally colored. The concrete color shall blend with the natural earth tones at the site and can be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The Contractor shall construct an unexposed footing or a sample slab to verify color.

Color matching of concrete patching materials shall also be established by the Contractor in the trial sample. The color tone of finished concrete and patching materials shall be approved by the Engineer prior to full production.

7. Curing compound shall meet the requirements of ASTM C309-81 for type I-D, Class B. The curing compound shall be continuously stirred or agitated during application.

8. Measurement and payment shall be in accordance with Section 505.10 and will include compensation for subsidiary item, Traffic Control.

26. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

(a) Bid Item 6, Concrete, Class 4000X

(1) This item shall consist of furnishing, forming and placing all concrete required to construct the headwalls for the pipe culverts underneath the road fill for Idaho Road and Lost Dutchman Boulevard, as shown on the drawings and described in the specifications.

(2) Section 3, Classes of Concrete, Method 2 shall apply and concrete shall be Class 4000X.

(3) Section 5, Design of the Concrete Mix, Method 2 shall apply.

(4) Section 15, Construction Joints, Method 1 shall apply.

(5) Coarse aggregate shall be sized number 57 in accordance with ASTM C-33.

(6) Section 18, Removal of Forms, Method 1 shall apply.

(7) Curing compound shall meet the requirements of ASTM C309-81 for Type ID, Class B.

(8) Pozzolan will be used as a partial substitute for Portland Cement not to exceed a maximum substitution of 20 percent based on absolute volume.

(9) All 4000X concrete shall be integrally colored. The cured concrete color shall blend with the natural earth tones at the site. Such colors may be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The Contractor shall provide a trial test sample on an unexposed footing of slab to verify color.

Color matching of concrete patching materials shall also be established by the Contractor in the trial sample. The color tone or finished concrete and patching materials shall be approved by the Engineer prior to full production.

(10) Section 25, Measurement and Payment, Method 2 shall apply.

b. Bid Item 7, Cement

(1) This item shall consist of furnishing the cement for all the concrete required to construct the structures described in Bid Item 6(a)(1).

(2) Cement shall be Type II or IIA as described in this specification.

c. Subsidiary Item, Concrete Class 2500

(1) This item shall consist of furnishing, forming, and pacing all concrete and steel straps required to construct the thrust blocks for the 6 inch waterline at the locations specified on the drawings.

(2) Section 3, Classes of Concrete, Method I shall apply and concrete shall be Class 2500.

(3) Section 5, Design of Concrete Mix, Method I shall apply.

(4) Section 15, Construction Joints, does not apply.

(5) Section 18, Removal of Forms, does not apply.

(6) Coarse aggregate shall be size number 57 in accordance with ASTMC-33.

(7) Section 25, Measurement and payment, no separate payment will be made for Concrete Class 2500. Compensation for Concrete Class 2500 will be included in Bid Item 16.

CONSTRUCTION SPECIFICATION

34. STEEL REINFORCEMENT

1. SCOPE

The work shall consist of furnishing and placing steel reinforcement for reinforced concrete or pneumatically applied mortar.

2. MATERIALS

Steel reinforcement shall conform to the requirements of Material Specification 539. Before reinforcement is placed, the surfaces of the bars and fabric and any metal supports shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease or other coatings or foreign substances. After placement, the reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete.

3. BAR SCHEDULE, LISTS AND DIAGRAMS

Any supplemental bar schedules, bar lists or bar-bending diagrams required to accomplish the fabrication and placement of reinforcement shall be provided by the Contractor. Prior to placement of reinforcement, the Contractor shall furnish four prints or copies of any such lists or diagrams to the Contracting Officer. Acceptance of the reinforcement will not be based on approval of these lists or diagrams but will be based on inspection of the reinforcement after it has been placed.

4. BENDING

Reinforcement shall be cut and bent in compliance with the requirements of the American Concrete Institute Standard 315. Bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks, cracks or improper bends will be rejected.

5. SPLICING BAR REINFORCEMENT

Method 1 Splices of reinforcement shall be made only at locations shown on the drawings and provided by the steel schedule. Placement of bars at the lap splice locations shown, when not in contact, shall not be farther apart than one-fifth the shown lap length and in any case no greater than 6 inches.

Method 2 Splices of reinforcement shall be limited to those locations shown on the drawings. Splice lengths shall be determined prior to fabrication and meet the requirements of ACI Standard 318

"Building Code Requirements for Reinforced Concrete" based upon design information contained in Section 10 of this specification. Bar placement drawings and schedules shall be provided for approval prior to fabrication. The drawings shall show all splice locations, layouts, and lap distances.

6. SPLICING WELDED WIRE FABRIC

Unless otherwise specified, welded wire fabric shall be spliced in the following manner:

a. Adjacent sections shall be spliced end to end (longitudinal lap) by overlapping a minimum of one full mesh plus 2 inches plus the length of the two end overhangs. The splice length is measured from the end of the longitudinal wires in one piece of fabric to the end of the longitudinal wires in the lapped piece of fabric.

b. Adjacent sections shall be spliced side to side (transverse lap) a minimum of one full mesh plus 2 inches. The splice length shall be measured from the centerline of the first longitudinal wire in one piece of fabric to the centerline of the first longitudinal wire in the lapped piece of fabric.

7. PLACING

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Tack welding of bars will not be permitted. Metal chairs, metal hangers, metal spacers and concrete chairs may be used to support the reinforcement. Metal hangers, spacers and ties shall be placed in such a manner that they will not be exposed in the finished concrete surface. The legs of metal chairs or side form spacers that may be exposed on any face of slabs, walls, beams or other concrete surfaces shall have a protective coating or finish by means of hot dip galvanizing, epoxy coating, plastic coating, or be stainless steel. Metal chairs and spacers not fully covered by a protective coating or finish shall have a minimum cover of 3/4 inch of concrete over the unprotected metal portion except for those with plastic coatings may have a minimum cover of 1/2 inch of concrete over the unprotected metal portion. Precast concrete chairs shall be manufactured of the same class of concrete as that specified for the structure and shall have tie wires securely anchored in the chair or a V-shaped groove at least 3/4 inch in depth molded into the upper surface to receive the steel bar at the point of support. Precast concrete chairs shall be moist at the time concrete is placed.

High density or structural plastic rebar accessories, designed to insure maximum concrete bond, may be substituted for metal or concrete accessories in spacer applications as approved by the

Contracting Officer. Exposure of plastic rebair accessories at the finished concrete surface shall be kept to a minimum. Plastic rebar accessories, if used, shall be staggered along adjacent parallel bars and shall be placed at intervals no closer than 12 inches. Plastic rebar accessories shall not be used in concrete sections 6 inches or less in thickness.

Reinforcement shall not be placed until the prepared site has been inspected and approved by the Engineer. After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by the Engineer.

8. STORAGE

Steel reinforcement stored at the work site shall be placed above the ground surface on platforms, skids or other supports and protected from mechanical damage or corrosion.

9. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the weight of reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest pound by computation from the placing drawings. Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of reinforcement will be based on the unit weights established in Tables 34-1 and 34-2. Computation of weights for welded wire fabric not shown in Table 34-2 shall be based on ACI Standard 315. The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for laps. The weight of steel reinforcing in extra splices or extra length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

Payment for furnishing and placing reinforcing steel will be made at the contract unit price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including preparing and furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, storing, cutting, bending, cleaning and securing all reinforcements.

Method 2 For items of work for which specific unit prices are established in the contract, the weight of bar reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest pound by computation from the placing drawings.

Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of bar reinforcement will be based on the unit weights established in Table 34-1. The weight of steel reinforcing in extra splices or extra length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for laps.

Payment for furnishing and placing bar reinforcing steel will be made at the contract unit price for bar reinforcement. Payment for furnishing and placing welded wire fabric reinforcing steel will be made at the contract unit price for welded wire fabric reinforcement. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including preparing and

furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, cutting, bending, cleaning, and securing all reinforcement.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items to which they are made subsidiary are identified in Section 10 of this specification.

TABLE 34-1. STANDARD REINFORCING BARS

Bar Size No.	Wt. (lb./ft.)
3	0.376
4	0.668
5	1.043
6	1.502
7	2.044
8	2.670
9	3.400
10	4.303
11	5.313
14	7.65
18	13.60

TABLE 34-2. RECTANGULAR WELDED WIRE FABRIC [1/]

Style Designation By Steel Wire Gauge	Style Designation By W-Number	Weight, lb. Per 100 Sq. Ft.
6 x 6 - 10 x 10	6 x 6 - W1.4 x W1.4	21
6 x 6 - 8 x 8	6 x 6 - W2.1 x W2.1	30
6 x 6 - 6 x 6	6 x 6 - W2.9 x W2.9	42
6 x 6 - 4 x 4	6 x 6 - W4.0 x W4.0	58
4 x 4 - 10 x 10	4 x 4 - W1.4 x W1.4	31
4 x 4 - 8 x 8	4 x 4 - W2.1 x W2.1	44
4 x 4 - 6 x 6	4 x 4 - W2.9 x W2.9	62
4 x 4 - 4 x 4	4 x 4 - W4.0 x W4.0	85
4 x 12 - 8 x 12	4 x 12 - W2.1 x W0.9 [2/]	25
4 x 12 - 7 x 11	4 x 12 - W2.5 x W1.1 [2/]	31

1/ Style designation is defined in ACI Standard 315 of the American Concrete Institute.

2/ Welded smooth wire fabric with wires smaller than Size W1.4 is manufactured from galvanized wire.

10. ITEMS OF WORK AND CONSTRUCTION DETAIL - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 11, Steel Reinforcement

(1) This item consists of furnishing and installing all steel reinforcement required in the construction of:

(a) The Bulldog Floodway

(b) The Apache Junction Outlet Channel

(c) Side Channel and Weir Inlets

(d) All appurtenant structures

(2) All steel bars shall be ASTM 615 Grade 40. Contractor may substitute Grade 60 bars for Grade 40.

(3) Section 5, Splicing Bar Reinforcement, Method 1 shall apply.

(4) Section 9, Measurement and Payment, Method 1 shall apply.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 15, Steel Reinforcement

(1) This item shall consist of furnishing and installing all steel reinforcement required in the construction of:

a) Apache Junction Floodway

b) Emergency Spillway

c) Principal Spillway Riser

d) Drop and Weir Inlets

e) All Appurtenant Structures

(2) All steel bars shall be ASTM G15, Grade 40. Contractor may substitute Grade 60 for Grade 40.

(3) Section 5, Splicing Bar Reinforcement, Method 1 shall apply.

(4) Section 9, Measurement and Payment, Method 1 shall apply.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 8 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Unified Standard Specifications and construction details contained herein:

a. Bid Item 10, Steel Reinforcement, MAG Section 727

1. This item shall consist of furnishing and installing all steel reinforcement required for the construction of the bridges as shown on the drawings.

2. All steel shall be Grade 60.

3. Section 9, Measurement and Payment, Method 1 shall apply.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

(a) Bid Item 8, Steel Reinforcement

(1) This item consists of furnishing and installing all steel reinforcement required in the construction of:

The headwalls for the pipe culverts under the road ramps.

(2) All steel bars shall be ASTM 615 Grade 40. Contractor may substitute Grade 60 for Grade 40.

(3) Section 5, Splicing Bar Reinforcement, Method 1 shall apply.

(4) Section 9, Measurement and Payment, Method 1 shall apply.

CONSTRUCTION SPECIFICATION

41. REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUITS

1. SCOPE

The work shall consist of furnishing and installing reinforced concrete pressure pipe, fittings and accessories in principal spillway conduits appurtenant to earth dams.

2. MATERIALS

Reinforced concrete pressure pipe, fittings and accessories shall conform to the requirements of Material Specification 541.

Portland cement concrete for bedding and cradles shall conform to the requirements of Construction Specification 31 for the specified class of concrete.

Joint sealing compound shall conform to the requirements of Material Specification 536.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

3. LAYING THE PIPE

The pipe shall be set to the specified line and grade and temporarily supported on precast concrete blocks or wedges. Bell and spigot pipe shall be laid with the bell upstream.

Just before each joint is connected the connecting surfaces of the bell and spigot or spigots and sleeve shall be thoroughly cleaned and dried, and the rubber gasket and the inside surface of the bell or sleeve shall be lubricated with a light film of soft vegetable soap compound (flax soap). The rubber gasket shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the pipe.

Method 1 The joint shall be connected by means of a pulling or jacking force so applied to the pipe that the spigot enters squarely into the bell.

Method 2 The joint shall be connected in accordance with the manufacturer's instructions.

Use with Either Method When the spigot has been seated to within 1/2 inch of its final position, the position of the gasket in the joint shall be checked around the entire circumference of the pipe by means of a metal feeler gauge. In any case where the gasket is

found to be displaced, the joint shall be disengaged and properly reconnected. After the position of the gasket has been checked, the spigot shall be completely pulled into the bell and the section of pipe shall be adjusted to line and grade.

4. FILLING JOINTS

Before the placement of the bedding or cradle, the exterior annular space between the ends of the pipe sections shall be cleaned and completely filled with joint sealing compound. Before the compound is applied, the surfaces against which it is to be placed shall be cleaned of all dust, lubricant and other substances that would interfere with a bond between the compound and the pipe. If recommended by the manufacturer of the compound, the concrete surfaces shall be coated with a primer in accordance with the manufacturer recommendations. Primers shall be applied to the concrete surfaces only and shall not come in contact with the gasket or gasket sealing surfaces. Unless the compound or primer is specifically recommended for use on moist concrete, the surfaces shall be dry when it is applied.

The joint sealing compound shall be allowed to cure until it is sufficiently firm to prevent the entry of concrete or earth into the joint before concrete, bedding or backfill is placed against it. Unless otherwise specified, where bedding or backfill (other than concrete) containing particles larger than one-fourth inch in maximum dimension is to be placed within 6 inches of the joint sealing compound, the compound shall be covered before the bedding or backfill is placed with a strip of 16-gage to 24-gage metal at least 2 inches wider than the space between the ends of the pipe sections.

5. PRESSURE TESTING

Method 1 Pressure testing of the completed conduit will not be required.

Method 2 Prior to the placement of any concrete or earthfill around the conduit or filling of the pipe joints, the conduit shall be tested for leaks in the following manner: The ends of the conduits shall be plugged and a standpipe with a minimum diameter of two (2) inches shall be attached to the upstream plug. The conduit shall be braced at each end to prevent slippage. The conduit and the standpipe shall be filled with water. The water level in the standpipe shall be maintained by continuous pumping a minimum of 10 feet above the invert of the upstream end of the conduit for a period of not less than two hours. Any leaks shall be repaired and the conduit shall be tested again as described above. The procedure shall be repeated until the conduit is watertight.

The pipe joints shall show no leakage. Damp spots developing on the surface of the pipe will not be considered as leakage.

Method 3 Prior to placement of any concrete or earthfill around the conduit or filling of the pipe joints, the conduit shall be air tested in accordance with Section 7 and ASTM C 924.

The conduit shall be braced on each end to prevent slippage. All end plugs used for the air test shall be capable of resisting the internal pressure and must be securely braced.

All testing equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer. The pressure gauges used shall be graduated to read in increments of 0.1 psi and calibrated to provide accuracy within 10 percent plus or minus of the standard gauge. The Contractor has the option of pre-wetting the conduit or line prior to testing.

Any conduit that fails to pass this test must be repaired by a method satisfactory to the Contracting Officer. After the repairs are made the conduit shall be retested until it passes the test requirements.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the invert centerline of the conduit. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe complete in place including accessories such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work, except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract price for that type and size of fitting or appurtenance.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the the pipe complete in place including accessories

such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work, except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract lump sum price for that type and size of fitting and appurtenance.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 16, 30-inch Pipe

(1) This item shall consist of furnishing and placing the 30-inch diameter principal spillway pipe as shown on the drawings.

(2) The pipe shall meet AWWA C-301 specifications.

(3) Cement for the pipe shall be Type II.

(4) Section 3, Laying the Pipe, Method 1 shall apply.

(5) Section 5, Pressure Testing, Method 1 shall apply.

(6) Section 6, Measurement and Payment, Method 1 shall apply.

CONSTRUCTION SPECIFICATION

51. CORRUGATED METAL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and placing circular, arched or elliptical corrugated metal pipe and the necessary fittings.

2. MATERIALS

Pipe and fittings shall conform to the requirements of Material Specification 551 or Material Specification 552, whichever is specified.

3. LAYING AND BEDDING THE PIPE

Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical midheight of the pipe. Field welding of corrugated galvanized iron or steel pipe will not be permitted. Unless otherwise specified, the pipe sections shall be joined with standard coupling bands. The pipe shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about a vertical center line. Perforations shall be clear of any obstructions at the time the pipe is laid.

The pipe shall be loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

4. STRUTTING

When required, struts or horizontal ties shall be installed in the manner specified on the drawings. Struts and ties shall remain in place until the backfill has been placed to a height of 5 feet above the top of the pipe, or has been completed if the finished height is less than 5 feet above the top of the pipe, at which time they shall be removed by the Contractor.

5. HANDLING THE PIPE

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in such a manner as to prevent bruising, scaling, or breaking of the spelter coating or bituminous coating.

6. REPAIR OF DAMAGED COATINGS

Any damage to the zinc coating shall be repaired by thoroughly wire brushing the damaged area, removing all loose and cracked coating, removing all dirt and greasy material with solvent, and painting with two (2) coats of one of the following paint options.

Painting shall be by use of one of the following options based upon installed exposure of the pipe as determined by the Contracting Officer:

Normal exterior or interior atmospheric exposure:

(a) Zinc dust - zinc oxide primer, Federal Specification TT-P-641, Type I or Type II,

(b) Single package, moisture cured urethane primer in silver metallic color, or

(c) Zinc-rich cold galvanizing compound, brush, or aerosol application.

Submergence in water exposure:

(a) Zinc dust-zinc oxide primer, Federal Specification TT-P-641, Type III.

(b) Zinc dust paint, Military Specification MIL-P-21035,

(c) Zinc Dust Chlorinated Rubber, Federal Specification TT-P-1046a, or

(d) Epoxy-Polyamid, Department of Defense Specification DOD-P-15145 B.

If the coating is damaged in any individual area larger than 12 square inches, or if more than 0.2 percent of a total surface area of a length of pipe is damaged, the length will be rejected.

Breaks or scuffs in bituminous coatings that are less than 36 square inches in area shall be repaired by the application of two coats of hot asphaltic paint or a coating of cold-applied bituminous mastic. The repair coating shall be at least 0.05 inches thick after hardening and shall bond securely and permanently to the pipe. The material shall meet the physical requirements for bituminous coatings contained in the references cited in Material Specifications 551 and 552. Whenever individual breaks exceed 36 square inches in area or when the total area of breaks exceeds 0.5 percent of the total surface area of the pipe, the pipe will be rejected.

Bituminous coating damaged by welding of coated pipe or pipe fittings shall be repaired as specified in this Section for breaks and scuffs in bituminous coatings.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract the quantity of each type, class, size and gauge of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined as the sum of the nominal laying lengths of the pipe sections and fittings used. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work except items designated as "special fittings." Payment for special fittings will be made at the contract lump sum price for special fittings (CMP).

Method 4 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined as the sum of the nominal laying lengths of the pipe sections and fittings used. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work except items designated as "special fittings." Payment for special fittings will be made at the contract lump sum price for special fittings (CMP).

Method 5 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe, including the necessary fittings and all other items necessary and incidental to the completion of the work except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

Method 6 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each type, class, size and gauge of pipe will be made at the contract price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe, including the necessary fittings and all other items necessary and incidental to the completion of the work except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

Method 7 For items of work for which specific lump sum prices are established in the contract, payment for corrugated metal pipe structures will be made at the contract lump sum prices. Such payment will constitute full compensation for furnishing, fabricating, transporting, and installing the pipe, fittings, and appurtenances, and all other items necessary and incidental to completion of the work, including, except as otherwise specified, required excavation, dewatering, and backfilling.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details shown on drawings are:

Bid Item 9, Corrugated Steel Pipe - Ellipse (9'-1"H, 10'-0"V

(1) This item shall consist of furnishing and installing two multi-plate galvanized corrugated steel pipe culverts, No. 10 gauge (thickness = 0.138 in.), 6-in. by 2-in. corrugations, bolted fabrication. Each culvert shall be an ellipse, with a horizontal axis of 109 in. (9 ft. 1 in.) and a vertical axis of 120 in. (10 ft.) as shown on the drawings.

(2) Pipe and fittings shall conform to the requirements of Material Specification 551.

(3) Bedding materials and compaction of bedding material shall be accomplished in accordance with Construction Specification 24.

(4) Backfill shall be placed and brought up evenly on both sides of the pipe for its full length. Backfill material shall be selected, placed and compacted in accordance with Construction Specification 23. No heavy equipment shall be allowed to travel over the pipe backfill until three (3) feet of compacted fill have been placed over the pipe.

(5) Section 7, Measruement and Payment, Method 1 shall apply and payment for bedding/drainfill material where called for under this specification is made under Construction Specification 24, "Drainfill".

CONSTRUCTION SPECIFICATION

61. LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap shall conform to the requirements of Material Specification 523 or, if so specified shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

At least 30 days prior to delivery of rock from other than designated sources, the Contractor shall designate in writing the source from which he intends to obtain the rock and information satisfactory to the Contracting Officer that the material meets the requirements of the contract. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in Section 9 of this specification.

Rock from designated sources shall be excavated, selected and processed as necessary to meet the quality and grading requirements in Section 9 of this specification. The rock shall conform to the specified grading limits when installed in the riprap.

Filter or bedding materials when required, shall, unless otherwise specified, conform to the requirements of Material Specification 521.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding course is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by the Engineer.

4. EQUIPMENT-PLACED ROCK RIPRAP

The rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works.

5. HAND-PLACED RIPRAP

The rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. TESTING

The Engineer will perform such tests as are required to verify that the riprap, filter, and bedding materials and the completed work meet the requirements of the specifications. These tests are not intended to provide the Contractor with the information he needs to assure that the materials and workmanship meet the requirements of the specifications, and their performance will not relieve the Contractor of the responsibility of performing his own tests for that purpose.

8. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the volume of each type of riprap, including filter layers and bedding, will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of riprap, including filter layers and bedding, will be made at the

contract unit price for that type of riprap. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 2 For items of work for which specific unit prices are established in the contract, the volume of each type of riprap and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic year by the method of average cross-sectional end areas. For each load of rock placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 4 For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter material or bedding delivered and placed within the specified limits will be measured to the nearest cubic yard by measurement of the hauling equipment. For each load of material placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load; or the volume, to the nearest 0.1 cubic yard, of filter material or bedding in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full

compensation for all labor, materials, equipment and all other items necessary and incidental to completion of the riprap, filter layers and bedding.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 12, 24-inch Loose Rock Riprap

(1) This item consist of furnishing and placing 24 inch loose rock riprap at the locations shown on the drawings.

(2) The riprap shall be well graded from 3 inches to 24 inches in diameter with ~~a coefficient of uniformity greater or equal to 4 and~~: a minimum or 50 percent by weight greater than ~~15~~ 12 inches in diameter, a minimum of 15 percent by weight greater than 20 inches in diameter, and a maximum of 15 percent by weight less than 9 inches in diameter.

(3) Riprap shall be placed to the thicknesses shown on the drawings.

(4) The riprap shall be hand or equipment placed.

(5) Section 8, Measurement and payment, Method 2 shall apply. Payment for drainfill and transition fill material, where called for under the loose rock riprap, is made under the "Drainfill Specification", Construction Specification 24.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 17, 24-inch Loose Rock Riprap

(1) This item consists of furnishing and placing 24-inch loose rock riprap at the locations shown on the drawings.

(2) The riprap shall be well graded from 3 inches to 24 inches in diameter with ~~a coefficient of uniformity greater or equal to 4 and:~~ a minimum of 50 percent by weight greater than ~~18~~ 12 inches in diameter, a minimum of 15 percent by weight greater than 20 inches in diameter, and a maximum of 15 percent by weight less than 9 inches in diameter.

(3) Riprap shall be placed to the thicknesses shown on the drawings.

(4) The riprap shall be hand or equipment placed.

(5) Section 8, Measurement and Payment, Method 2 shall apply. Payment for drainfill and transition fill material, where called for under the loose rock riprap, is made under the "Drainfill Specification:, Construction Specification 24.

b. Bid Item 18, 12 inch Loose Rock Riprap

(1) This item consists of furnishing and placing 12 inch loose rock riprap at the locations shown on the drawings.

(2) The riprap shall be well graded from 1 inch to 12 inches in diameter with ~~a coefficient of uniformity greater or equal to 4 and:~~ a minimum of 50% by weight greater than 6 inches in diameter, and a minimum of 15 percent by weight greater than 9 inches in diameter, and a maximum of 15 percent by weight less than 3 inches in diameter.

(3) Riprap shall be placed to the thickness shown on the drawings.

(4) The riprap shall be hand or equipment placed.

(5) Section 8, Measurement and Payment, Method 2 shall apply. Payment for drainfill and transition fill material, where called for under the loose rock riprap, is made under the "Drainfill Specification", Construction Specification 24.

CONSTRUCTION SPECIFICATION

62. GROUTED ROCK RIPRAP

1. SCOPE

The work shall consist of furnishing, transporting, and placing rock and concrete grout in the construction of grouted rock riprap sections.

2. MATERIALS

Rock for grouted rock riprap shall conform to the requirements of Material Specification 523, or if so specified shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines, and other materials not meeting the required gradation limits.

At least 30 days prior to delivery of rock from other than designated sources, the Contractor shall designate, in writing, the source from which he intends to obtain the rock and information satisfactory to the Contracting Office that the material meets the requirements of the contract. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in Section 13 of this specification.

Rock from designated sources shall be excavated, selected and processed as necessary to meet the quality and grading requirements in Section 13 of this specification. The rock shall conform to the specified grading limits when installed in the riprap.

Filter or bedding materials when required, shall unless otherwise specified, conform to the requirements of Material Specification 521.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type.

Pozzolan. Unless otherwise specified in Section 13 of this specification, pozzolans conforming to Specification ASTM C-618 class F in amounts not to exceed 20 percent, based on absolute volume, may be substituted for an equivalent amount of portland cement in the grout mixture.

Aggregates shall conform to the requirements of Material Specification 522, except that the grading for coarse aggregate shall be as specified in the construction details.

Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter or other deleterious substances.

Air-entraining admixtures shall conform to the requirements of Material Specification 532.

Curing compound shall conform to the requirements of Material Specification 534.

Other admixtures, when required, shall be as specified in the construction details.

3. SUBGRADE PREPARATION

Riprap or filter shall not be placed until the subgrade surfaces have been inspected and approved by the Engineer.

4. FILTER LAYERS OR BEDDING

When filter layers or bedding beneath the riprap is specified, the material shall be spread uniformly on the prepared subgrade surfaces to the depth shown on the drawings. Compaction of the material will not be required but the surfaces of such layers shall be finished reasonably free of mounds, dips, or windrows.

5. PLACING ROCK

The rock shall be placed on the surfaces and to the depths specified in such a manner as to avoid displacement of the underlying materials. The rock may be equipment or hand placed as necessary to produce a surface in which the tops of the individual rocks do not vary more than the specified deviation from the neat lines shown on the drawings. Double decking of thin, flat rocks to bring the surface up to the required grade will not be permitted.

6. DESIGN OF THE GROUT MIX

The mix proportions for the grout mix shall be as specified in the construction details. During the course of the work the Engineer will require adjustment of the mix proportions whenever necessary. After the mix has been designated, it shall not be changed without the approval of the Engineer.

7. HANDLING AND MEASUREMENT OF MATERIAL

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate proportioning of the ingredients of the mix.

Except as otherwise provided in Section 11, cement and aggregates shall be measured as follows:

Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

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

Water shall be measured, by volume or by weight, to an accuracy within one percent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of ±3 percent.

8. MIXERS AND MIXING

The mixer, when loaded to capacity, shall be capable of combining the ingredients of the grout mix into a thoroughly mixed and uniform mass and of discharging it with a satisfactory degree of uniformity.

Mixer shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation.

The time of mixing after all cement and aggregates are in the mixer drum shall be not less than one minute for mixers having a capacity of one cubic yard or less. For mixers of larger capacities, the minimum time shall be increased fifteen seconds for each cubic yard or fraction thereof of additional capacity. The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregate, and all mixing water shall be introduced into the drum before one-fourth of the mixing time has elapsed.

When ready-mixed grout mix is furnished, the Contractor shall furnish to the Engineer a delivery ticket showing the time of loading and the quantities of materials used for each load of grout mix.

No mixing water in excess of the amount called for by the job mix shall be added to the grout mix during mixing or hauling or after arrival at the delivery point.

9. CONVEYING AND PLACING

The grout mix shall be delivered to the site and placed within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the final placement as rapidly as practicable by methods that will prevent segregation of the aggregates or loss of mortar.

Grout mix shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.

The grout mix shall not be placed until the rock riprap has been inspected and approved by the Engineer.

Rock to be grouted shall be kept wet for at least 2 hours immediately prior to grouting.

The rock riprap shall be flushed with water to remove the fines from the rock prior to placing the grout. The rock shall be kept moist just ahead of the actual placing, but the grout shall not be placed in standing or flowing water. Grout placed on inverts or other nearly level areas may be placed in one course. On slopes, the grout shall be placed in two (2) courses in successive lateral strips approximately ten (10) feet in width starting at the toe of the slope and progressing to the top. The grout shall be delivered to the place of final deposit by approved means and discharged directly on the surface of the rock, using a splash plate of metal or wood to prevent displacement of the rock directly under the discharge. The flow of grout shall be directed with brooms, spades or baffles to prevent it from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be done to loosen tight pockets of rock and otherwise aid the penetration of grout so that all voids shall be filled and the grout fully penetrates the rock blanket. All brooming on slopes shall be uphill and after the grout has stiffened, the entire surface shall be rebroomed to eliminate runs and to fill voids caused by sloughing.

After completion of any strip or panel, no workman or other load shall be permitted on the grouted surface for a period of twenty-four (24) hours. The grouted surface shall be protected from injurious action by the sun, rain, flowing water and mechanical injury.

10. CURING AND PROTECTION

The surface of treatment materials shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period, or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

The grouted rock may be coated with an approved curing compound in lieu of continued application of moisture. The compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until finishing of that surface is completed. The compound shall be applied at a

uniform rate of not less than one gallon per 150 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete. If the membrane is damaged during the curing period, the damaged area shall be resprayed at the rate of application specified above.

Grout mix shall not be placed when the daily minimum temperature is less than 40°F unless facilities are provided to insure that the temperature of the materials is maintained at not less than 50°F nor more than 90°F during placement and the curing period. Grout mix shall not be placed on frozen surfaces. When freezing conditions prevail, rock to be grouted must be covered and heated to a range of 50°F to 90°F for at least 24 hours prior to placing treatment materials.

11. INSPECTING AND TESTING FRESH GROUT

The Engineer will inspect and test grout during the course of the work. Sampling of fresh grout will be done by the methods prescribed in ASTM Designation C 172. The volume of each batch will be determined by the methods prescribed in ASTM Designation C 138.

The Engineer shall have free entry to all parts of the Contractor's plant and equipment which concern mixing and placing the grout while work on the contract is being performed. Proper facilities shall be provided for the Engineer to inspect materials and processes used in mixing and placing the grout as well as for securing samples of the grout mix. All tests and inspections shall be so conducted as not to interfere unnecessarily with the mixing and placing of the grout.

When ready-mixed grout is furnished, the Contractor shall furnish to the Engineer a statement-of-delivery ticket for each batch delivered to the job site. The ticket shall show the total weights in pounds of cement, water, and fine and coarse aggregates, amount of air-entraining agent, time of loading, and the revolution counter reading at the time of batching.

12. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the volume of grouted rock riprap, including filter layers or bedding, will be determined from the specified thickness shown on the drawings and the area on which acceptable placement has been made. Payment for grouted rock riprap will be made at the contract unit price. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the grouted rock riprap and filter layers or bedding.

Method 2 For items of work for which specific unit prices are established in the contract, the volume of riprap and the volume of filter layers or bedding will be determined from the specified

thickness shown on the drawings and the area on which acceptable placement has been made. The volume of grout will be determined from the calculated batch volume and the number of mixed batches delivered to the site and acceptably placed in the work. Payment for riprap; filter or bedding material; and the concrete grout will be made at the contract unit price for each item. Such payment will be considered full compensation for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 13 of this specification.

13. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 13, 24 inch Grouted Rock Riprap

(1) This item consists of furnishing and placing 24-inch grouted rock riprap grout, at the locations shown on the drawings.

(2) The riprap shall be graded from 6 inches to 24 inches in diameter with: minimum of 50 percent by weight greater than 15 inches in diameter, a minimum of 15 percent by weight greater than 20 inches, and a maximum of 5 percent by weight less than 9 inches in diameter.

(3) The riprap shall be hand or equipment placed.

(4) In Section 6, Design of the Grout Mix, the contractor shall be responsible for proportioning the grout mix. The grout shall consist of Portland Cement, fine and coarse aggregate, water,and an air entraining agent. The cement content shall be 5-1/2 bags per cubic yard of concrete. The maximum nominal size of coarse aggregate shall be 3/4 inch. the slump shall be within the range of 6 to 10 inches. The air content (by volume) of the grout mixture at the time of placement shall five (5) to seven (7) percent. At least five (5) days prior to placement of the grout, the contractor shall furnish the Engineer with a statement of the mix proportions for approval.

(5) Cement shall by Type II or Type IIA. Pozzolan may be used as a partial substitute for portland cement not to exceed a maximum substitution of 20 percent based on absolute volume.

(6) The grout shall be integrally colored. The color grout shall blend with the natural earth tones at the site and can be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The color tone of the grout mix shall be approved by the Engineer prior to full production.

(7) Grout shall be placed such that a smooth surface is not created. Rock edges shall protrude 4 to 8 inches above the grout surface, not to exceed one-third of rock dimension, upon completion of the grouting process.

(8) Curing compound shall be clear and meet the requirements of ASTM C309-81 for Type ID, Class B. The curing compound shall be continuously stirred or agitated during application.

(9) Section 12, Measurement and Payment, shall not apply. Measurement and payment for items of work for which specific unit prices are established in the contract, the volume of grouted rock riprap will be determined from the specified thickness shown on the drawings and the area on which acceptable placement has been made. Payment for grouted rock riprap will be made at the contract unit price. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the grouted rock riprap. Payment for drainfill and transition fill material where called for under the grouted rock riprap is made under the "Drainfill Specification", Construction Specification 24.

13. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 19, 24-inch Grouted Rock Riprap

(1) This item consists of furnishing and placing 24-inch grouted rock riprap at the locations shown on the drawings.

(2) The riprap shall be graded from 6 inches to 24 inches in diameter with: a minimum of 50 percent by weight greater than 15 inches in diameter, a minimum of 15 percent by weight greater than 20 inches, and a maximum of 5 percent by weight less than 9 inches in diameter.

(3) The riprap shall be hand or equipment placed.

(4) In Section 6, Design of the Grout Mix, the Contractor shall be responsible for proportioning the grout mix. The grout shall consist of Portland Cement, fine and coarse aggregate, water, and an air entraining agent. The cement content shall be 5 1/2 bags per cubic yard of concrete. The maximum nominal size of coarse aggregate shall be 3/4 inch. The slump shall be within the range of 6 to 10 inches. The air content (by volume) of the grout mixture at the time of placement shall be five (5) to seven (7) percent. At least five (5) days prior to placement of the gorut, the Contractor shall furnish the Engineer with a statement of the mix proportions for approval.

(5) Cement shall be Type II or type IIA. Pozzolan may be used as a partial substitute for Portland Cement, not to exceed a maximum substitution of 20 percent based on absolute volume.

(6) The grout shall be integrally colored. The cured color grout shall blend with the natural earth tones at the site. Such colors may be produced using Davis Colors' Omaha Tan additive or similar quality products produced by Colorful Admixtures or L.M. Scofield. The color tone of the grout mix shall be approved by the Engineer prior to full production.

(7) Grout shall be placed such that a smoothe surface is not created. Rock edges shall protrude 4 to 8 inches above the grout surface not to exceed one-third of rock dimension, upon completion of the grouting process.

(8) Curing compound shall be clear and meet the requirements of ASTM C309-81 for Type ID, Class B. The curing compound shall be continuously stirred or agitated during application.

(9) Section 12, Measurement and Payment shall not apply. Measurement and Payment for items of work for which specific unit prices are established in the contract, the volume of grouted rock riprap will be determined from the specified thickness shown on the drawings and the area on which acceptable placement has been made. Payment for grouted rock riprap will be made at the contract unit price. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the grouted rock riprap. Payment for drainfill and transition fill material where called for under the grouted rock riprap is made under the "Drainfill Specification", Construction Specification 24.

CONSTRUCTION SPECIFICATION

81. METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating and erecting metalwork, including the metal parts of composite structures.

2. MATERIALS

Unless otherwise specified, materials shall conform to the requirements of Material Specification 581. Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit. Galvanizing shall conform to the requirements of Material Specification 582.

3. FABRICATION

Fabrication of structural steel shall conform to the requirements of Section 1.23 of the "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction)," American Institute of Steel Construction.

Fabrication of structural aluminum shall conform to the requirements in the Aluminum Construction Manual, "Specifications for Aluminum Structures," Section 6 and Section 7, The Aluminum Association, November 1976.

4. ERECTION

The frame of metal structures shall be carried up true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind and erection stresses. The Contractor shall furnish such fitting up bolts, nuts and washers as may be required.

No riveting or welding shall be done until as much of the structure as will be stiffened thereby has been properly aligned.

Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

All field welding shall be done in conformance to the requirements for shop fabrication, except those that expressly apply to shop conditions only.

Galvanized items shall not be cut, welded or drilled after the zinc coating is applied.

5. PROTECTIVE COATINGS

Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings.

Items specified to be painted shall be painted in conformance to the requirements of Construction Specification 82 for the specified paint systems.

6. MEASUREMENT AND PAYMENT

Method 1 The work will not be measured. Payment for metal fabrication and installation will be made at the contract lump sum price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

Method 2 The weight of metal installed complete in place shall be determined to the nearest pound. Unless otherwise provided, the weight of metal shall be computed by the method specified in Section 3 of the "Code of Standard Practice for Steel Buildings and Bridges," American Institute of Steel Construction, except that the following unit weights shall also be used, as appropriate, as the basis of computation:

Material	Unit Weight Pounds per Cubic Foot
Aluminum alloy	173.0
Bronze or copper alloy	536.0
Iron, malleable	470.0
Iron, wrought	487.0

Payment for furnishing, fabricating and installing metalwork will be made at the contract unit price for the specified types of labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 3 The work will not be measured. Payment for furnishing, fabricating and installing each item of metalwork will be made at the contract price for that item. Such payment will constitute full compensation for all labor, materials, equipment and all other items

necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

13. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 15, Metalwork

(1) This item shall include furnishing, fabricating, and installing the ladders and wire screens for the weep holes on the Bulldog Floodway and Apache Junction Outlet, as shown on drawings.

(2) The ladders shall be fabricated of structural steel conforming to the requirements of ASTM A-36.

(3) Painting shall be in accordance with Construction Specification 82.

(4) Section 6, Measurement and Payment, Method 1 will apply and will include compensation for Subsidiary Item, Cleaning and Painting.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 21, Metalwork

(1) This item shall include furnishing, fabricating, and installing the principal spillway inlet riser trash racks, principal spillway inlet manhole frame and cover, ladders and the wire screens for the weep holes on the Apache Junction Floodway as shown on drawings.

(2) The trash racks and ladders shall be fabricated of structural steel conforming to the requirements of ASTM A-36.

(3) Manhole casting shall be of uniform quality, free from blowholes, shrinkeage, distortion or other defects. They shall be smooth and well cleaned by shotblasting. Metal used in the manufacturing of castings shall conform to ASTM A48-76 Class 35 for Gray Iron. Cast dimensions may vary one half the maximum shrinkage possessed by the metal or + or - 1/16 inch per foot. Weight of the casted manhole shall be 310 lbs. + or - 5 percent. Round frames and covers shall have continuously machined surfaces to prevent rocking. The manufacture shall submitt shop drawings for approval by the Contracting Officer prior to manufacture or shipping of castings to job site. A proof of load test shall be submitted and be in accordance with Federal Specification RR-F-621C.

(4) Painting shall be in accordance with Construction Specification 82.

(5) Section 6, Measurement and Payment, Method 1 shall apply and will include compensation for Subsidiary Item, Cleaning and Painting.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Sections 1 through 6 of this specification do not apply. Items of work to be performed shall be in conformance with the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Unified Standard Specifications and construction details contained herein:

a. Bid Item 11, Pedestrian Handrail, MAG Section 520

This item shall consist of furnishing. fabricating and installing all materials and constructing the pedestrian handrail as shown on the drawings.

CONSTRUCTION SPECIFICATION

82. CLEANING AND PAINTING METALWORK

1. SCOPE

The work shall consist of cleaning metal surfaces and applying paints and protective coatings.

2. PAINTS

For the purposes of this specification paints shall be designated by types as defined below:

Type 1 paint shall conform to the requirements of Federal Specification TT-P-86, Type IV, Red Lead Base Paint.

Type 2 paint shall conform to the requirements of Military Specification MIL-P-23377D, Int. Amend. 2, Epoxy Chromate Metal Primer.

Type 3 paint shall conform to the requirements to Federal Specification TT-P-86, Type II or Type III, Red Lead Base Paint.

Type 4 paint shall conform to the requirements of Federal Specification TT-P-86, Type I, Red Lead Base Paint.

Type 5 paint shall conform to the requirements of Federal Specification TT-P-636, Synthetic Primer.

Type 6 paint shall conform to the requirements of Military Specification MIL-C-22750D Amend. 1, Epoxy-Polyamide.

Type 7 paint shall conform to the requirements of Federal Specification TT-E-489, Class A, Alkyd Gloss Enamel.

Type 8 paint shall conform to the requirements of Federal Specification TT-E-529, Alkyd Semi Gloss Enamel.

Type 9 paint shall conform to the requirements of Federal Specification TT-P-641, Type I or Type II, Zinc Dust-Zinc Oxide Primer.

Type 10 paint shall be a single package moisture cured urethane primer in a silver metallic color.

Type 11 paint shall conform to the requirements of Federal Specification TT-P-641, Type III Zinc Dust-Zinc Oxide Primer; Federal Specification TT-P-1046a, Zinc Dust Chlorinated Rubber; or Zinc Dust Paint meeting the requirements of Military Specification MIL-P-21035.

Type 12 paint shall conform to the requirements of Department of Defense Specification DOD-P-15145B, Epoxy-Polyamide.

Type 13 paint shall conform to the requirements of Material Specification 583. The paint shall be mixed at the time of use.

Paints of Types 1, 3, and 5 may be thinned with mineral spirits as necessary for proper application but the amount of thinner used shall not exceed one pint per gallon of paint. Other paints may be thinned in accordance with the manufacturer's instructions only if such thinning is approved by the Engineer.

When tinting is required, it shall be accomplished by the addition of pigment-in-oil tinting colors conforming to the requirements of Federal Specification TT-P-381.

Mineral spirits shall conform to the requirements of Federal Specification TT-T-291, Grade 1, Light Thinner.

3. SURFACE PREPARATION

Surfaces to be painted shall be thoroughly cleaned prior to the application of the paint. For the purposes of this specification methods of surface preparation shall be designated as defined below:

Method 1 (near white blast) surface preparation shall consist of the removal of all grease and oil by means of steam cleaning or solvent cleaning methods and removal of all dirt, rust, mill scale and other coatings by means of sandblasting, grit blasting or pickling. The finished surface shall uniformly expose the base metal and shall present an etched, but not polished or peened, appearance. Not more than 5 percent of the surface may exhibit very light shadows, light streaks, or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating.

Method 2 (hand tool clean) surface preparation shall consist of the removal of all grease and oil by means of steam cleaning or solvent cleaning and the removal of all dirt, surface rust and loose scale by means of wire brushing, flame cleaning, use of rotary abrading tools or light sandblasting.

Method 3 (acid clean) surface preparation shall consist of the treatment of the surface with a dilute acid solution. The surface shall be thoroughly wetted with a dilute (about 5 percent strength) phosphoric acid solution. After the acid has dried, the surface shall be thoroughly rinsed with clear water and allowed to dry. Dirt, grease and oil shall be removed from the surface by solvent cleaning prior to the acid treatment.

Cleaning solvent shall be mineral spirits. Cleaning cloths and solvents shall be discarded before they become contaminated to the extent that a greasy film would remain on the surface being cleaned.

The final cleaning and wiping shall be done with clean solvent and clean cloths. Grit blasting shall be accomplished using compressed air blast nozzles and grit made of steel, malleable iron or cast iron crushed shot. Abrasives used shall have a maximum particle size that will pass the No. 16 sieve (U.S. Standard) and a minimum size that will be retained on the No. 50 sieve (U.S. Standard). The equipment used for sandblasting shall be equipped with adequate separators and traps to insure that the compressed air shall be free of detrimental amounts of water and oil. Blast cleaned surfaces shall be brushed, blown or vacuum cleaned to remove any trace of blast products or abrasives prior to painting.

Surfaces that are not to be painted immediately after cleaning shall be treated with one brush coat of metal conditioner conforming to the requirements of Military Specification MIL-M-10578, except that surfaces cleaned by pickling in phosphoric acid solution shall not require such treatment.

Surfaces shall be thoroughly dry when paint is applied.

No field coats of paint shall be applied until the prepared surfaces have been inspected and approved by the Engineer.

4. PAINT SYSTEMS

For the purposes of this specification, systems of preparing and painting metalwork will be designated as defined below:

Paint System A shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two priming coats of Type 1 or type 2 paint and two or more top coats of Type 6 paint as necessary to provide a total dry paint film thickness of 6 mils.

Paint System B shall consist of the preparation of the surfaces to be painted by Method 1 and the application of one priming coat of Type 1 or Type 2 paint and two top coats of Type 6 paint.

Paint System C shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 3, Type 4 or Type 5 paint and two top coats of Type 7 or Type 8 paint.

Paint System D shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 3 or 5 paint and two top coats of Type 7 paint.

Paint System E shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 3 or 5 paint and two top coats of Type 8 paint.

Paint System F shall consist of the preparation of the surfaces to be painted by Method 3 and the application of two coats of Type 9 or 10 paint.

Paint System G shall consist of the preparation of the surfaces to be painted by Method 3 and the application of two coats of Type 11 or 12 paint.

Paint System H shall consist of the preparation of the surfaces to be painted by Method 1 and the application of four or more coats of Type 1 paint as necessary to provide a total dry paint film thickness of 6 mils.

Paint System I shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two or more coats of Type 13 paint as necessity to provide a total dry paint film thickness of at least 16 mils.

5. APPLICATION OF PAINT

Surfaces shall be painted immediately after preparation (or within two days after preparation and treatment with metal conditioner) with at least one coat of the type of priming paint required by the specified paint system. Surfaces not required to be painted shall be protected against contamination and damage during the cleaning and painting operation.

Paints shall be thoroughly mixed at the time of application.

After erection or installation of the metalwork, all damage to shop applied coats shall be repaired and all bolts, nuts, welds and field rivet heads shall be cleaned and painted with one coat of the specified priming paint.

Except on surfaces accessible only to spray equipment, initial priming coats shall be applied by brush. All other other coats may be applied by brush or spray. Each coat shall be applied in such a manner as to produce a paint film of uniform thickness with a rate of coverage within the limits recommended by the paint manufacturer.

The drying time between coats shall be as prescribed by the manufacturer of the paint but not less than that required for the paint film to dry through. The elapsed time between the application of the first and second prime coats of Paint System A shall not exceed 60 hours. In the application of Paint System I, if, for any reason, the first dries hard before the second coat is applied or the elapsed time between coats exceeds 48 hours, the method of application must be modified in any of the following ways: (1) the first coat must be wiped down with MIBK with the application of the second coat following the wipedown by not more than 6 feet; or (2) the first coat must be lightly brush blasted or given a fog coat

of the paint before application of the full second coat; or (3) a special bonding additive supplied by the paint manufacturer must be mixed with the paint applied in the second coat.

The finished surface of each coat shall be free from runs, drops, ridges, laps or excessive brushmarks and shall present no variation in color, texture and finish.

The surface of each dried coat shall be cleaned as necessary before application of the next coat.

Except for Paint System I, the first coat of each two-coat system shall be tinted for contrast. The first coat of red-lead paint shall be tinted by the addition of 3 ounces per gallon of 1B black pigment. The first coat of machinery paint shall be tinted off color with 3 ounces per gallon of a pigment suitable to the color of the paint.

6. ATMOSPHERIC CONDITIONS

Paint shall not be applied when the temperature of the item to be painted or of the surrounding air is less than 50°F. For Paint System I, the temperature of the coated surface must be maintained at not less than 50°F for 6 hours after the application of each coat. Painting shall be done only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation will result during the period of time required for application and drying. Surfaces protected from adverse atmospheric conditions by special cover, heating or ventilation shall remain so protected until the paint is dry.

7. TESTS

Acceptance of dry paint film thickness for Paint Systems A, H, and I will be based on the measurement of wet paint film thickness by means of an Elcometer or other suitable film thickness gauge. Other testing instruments employed by the Engineer may include an inspedtor thickness guage (dry film thickness) and a pin-hole detector.

8. PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for painting metalwork will be at the contract lump sum price. Such payment will constitute full compensation for furnishing, preparing and applying all materials and for the cleaning, painting and coating of metalwork including labor, tools, equipment and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Subsidiary Item, Cleaning and Painting

(1) This item shall consist of cleaning and painting the ladders and the identification sign.

(2) In Section 4, Paint Systems:

(a) Paint System B shall apply for the ladders.

(b) Paint System E shall be applied to the Identification Sign. The two topcoats of paint on the identification sign shall be white and the letters dark green.

(3) Section 8, Payment, no separate payment will be made for cleaning and painting. Compensation for this work will be included in Bid Items 15 and 17.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Subsidiary Item, Cleaning and Painting

(1) This item shall consist of cleaning and painting the principal spillway inlet trash racks, the identification sign, and ladders.

(2) In Section 4, Paint Systems:

(a) Paint System B shall apply for the ladders, and principal spillway trash rack.

(b) Paint System E shall apply to the Identification Sign. The two topcoats of paint on the identification sign shall be white and the letters dark green.

(3) Section 8, Payment, no separate payment will be made for cleaning and painting. Compensation for this work will be included in Bid Items 21 and 24.

CONSTRUCTION SPECIFICATION

83. TIMBER FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of the construction of timber structures and timber portions of composite structures.

2. MATERIALS

Structural timber and lumber shall conform to the requirements of Material Specification 584. Treated timber and lumber shall be impregnated with the specified type and quantity of preservative and in the manner specified in Material Specification 585.

Hardware, except cast iron, shall be galvanized as specified for iron and steel hardware in Material Specification 582. Unless otherwise specified, structural steel shapes, plates and rods shall not be galvanized. Nuts, driftbolts, dowels and screws shall be either wrought iron or medium steel.

Steel bolts shall conform to the requirements of ASTM Specification A 307. When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of Material Specification 582.

Washers shall be ogee gray iron castings or malleable iron castings unless washers cut from medium steel or wrought iron plate are specified on the drawings. Cast washers shall have a thickness equal to the diameter of the bolt and a diameter equal to four times the thickness. For plate washers the thickness shall be equal to one-half the diameter of the bolt, and the sides of the square shall be equal to four times the diameter of the bolt. Holes in washers shall be not more than one-eighth inch greater in diameter than the bolt. Split ring connectors, tooth ring connectors and pressed steel shear plate connectors shall be manufactured from hot-rolled, low carbon steel conforming to the requirements of ASTM Designation A-711, Grade 1015. Malleable iron shear plate connectors and spike grid connectors shall be manufactured in conformance with the requirements of ASTM Designation A 47, Grade No. 35018. All connectors shall be of approved design and the type and size specified.

Structural shapes, rods and plates shall be structural steel conforming to the requirements of Material Specification 581. No welds will be permitted in truss rods or other main members of trusses or girders.

3. WORKMANSHIP

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. No open or shimmed joints will be accepted. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood surfaces shall be considered evidence of poor workmanship and sufficient cause for rejection of the work.

Holes for round driftpins and dowels shall be bored with a bit one-sixteenth inch smaller in diameter than that of the driftpin or dowel to be used. The diameter of holes for square driftpins or dowels shall be equal to one side of the driftpin or dowel. Holes for machine bolts and rods shall be bored with a bit not larger than the body of the screw at the base of the thread.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood. Cast iron washers shall be used when the bolt will be in contact with earth. All nuts shall be checked or burred effectively with a pointed tool after finally tightened.

Unless otherwise specified, surfacing, cutting and boring of timber and lumber shall be done before treatment. If cutting of treated timber and lumber is authorized, all cuts and abrasions shall be carefully trimmed and coated with not less than three brush coats of a wood preservative containing, by weight, not less than 5 percent pentachlorophenol.

All recesses and holes cut or bored in treated timber and lumber shall be swabbed with not less than three coats of a wood preservative containing, by weight, not less than 5 percent pentachlorophenol. After field treatment any unfilled holes shall be plugged with tightly fitting wooden plugs as treated above for cuts, abraisons and holes.

4. HANDLING AND STORING MATERIALS

All timber and lumber stored at the site of the work shall be neatly stacked on supports at least twelve inches above the ground surface and protected from the weather by suitable covering. Untreated material shall be so stacked and stripped as to permit free circulation of air between the tiers and courses. Treated timber shall be close-stacked. The ground underneath and in the vicinity of all stacks shall be cleared of weeds and rubbish. The use of cant hooks, peavies, or other pointed tools, except end hooks will not be permitted in the handling of structural timber or lumber. Treated timber shall be handled with rope slings or other methods that will prevent the breaking or bruising of outer fibers, or penetration of the surface in any manner.

5. PAINTING

Except as otherwise specified, surfaces designated for painting shall be painted in accordance with Construction Specification 84.

6. MEASUREMENT AND PAYMENT

Method 1 The unit of measurement of lumber and timber will be the number of thousand feet board measure (MBM) of each type, size, species and grade of lumber and timber in place in the completed structure. The quantity of each type, size, species and grade will be computed from the nominal dimensions and actual lengths of the pieces in the completed structure and will not include waste timber used for erection purposes (such as falsework or temporary sheeting and bracing) or any portion of any pile or other round timber. The total quantity of lumber and timber in each type, size, species and grade will be computed to the nearest 0.01 MBM.

The unit of measurement of plywood will be the number of square feet of each type, species, grade and thickness in place in the completed structure.

Payment for each type, size, species and grade of lumber and timber will be made at the contract unit price for that type, size, species and grade. Payment for each type, species, grade and thickness of plywood will be made at the contract unit price for that type, species, grade and thickness. Such payment will be considered full compensation for all labor, equipment, transportation and materials and all other items necessary and incidental to the completion of the structure in place including hardware and accessories, paint and wood preservatives.

Method 2 No measurement of material quantities will be made. Payment for each structure, complete in place, will be made at the contract lump sum price for that structure. Such payment will be considered full compensation for all labor, transportation, equipment and materials and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, measurement and payment for each structure unit, except those for which a linear foot payment is established, will be counted and payment made at the contract unit price. Items for which a linear foot payment is established will be measured to the nearest linear foot and payment will be made at the contract unit prices appropriate. Such payment will be considered full compensation for all labor, equipment, transportation, materials and all other items necessary and incidental to the completion of the structure in place, including hardware and accessories, paint and woods preservatives.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and construction details are:

Subsidiary Item, Post Barricades

(1) This item shall consist of fabricating and installing the post barricades at the locations shown on the drawings.

(2) In Section 2, Materials, the posts shall be pressure treated in accordance with Federal Specification TT-W-570 or TT-W-550 and AWPA Standard C4

(3) No separated payment will be made for this item. Compensation will be included in Bid Item 7, Earth Fill.

CONSTRUCTION SPECIFICATION

91. CHAIN-LINK FENCE

1. SCOPE

The work shall consist of furnishing and installing chain link fencing complete with all posts, braces, gates and all other appurtenances.

2. MATERIALS

Chain-link fence fabric, fence posts, top rails, braces, gates and accessories shall conform to the requirements of Federal Specification RR-F-191. Types, classes, and materials shall be as follows except as otherwise specified.

Fabric: Type I. 2-inch mesh, 9-gage, minimum weight of zinc coating - 1.8 ounces per square foot.

Barbed Wire: Zinc-coated steel

Posts: Type I, Class 1, zinc-coated

Top Rails: Type II, Class I, zinc-coated

Braces: Zinc-coated steel

Gates: Type I, zinc-coated steel

3. INSTALLING FENCE POSTS

Unless otherwise specified, line posts shall be placed at intervals of 10 feet measured from center to center of adjacent post. In determining the post spacing, measurement will be made parallel with the ground surface.

Posts will be set in concrete backfill in the manner shown on the drawings.

Posts set in the tops of concrete walls shall be grouted into preformed holes to a depth of 12 inches.

All corner posts, end posts, gate posts, and pull posts shall be embedded, braced and trussed as shown on the drawing.

4. INSTALLING WIRE FABRIC

Fencing fabric shall not be stretched until at least 4 days after the posts are grouted into walls or 14 days after the posts are set in the concrete backfill.

Fencing shall be installed on the side of the posts designated on the drawings.

The fabric shall be stretched taut and securely fastened, by means of tie clips, to the posts at intervals not exceeding 15 inches and to the top rails or tension wires at intervals not exceeding 2 feet. Care shall be taken to equalize the tension on each side of each post.

Barbed wire shall be installed as shown on the drawings and shall be pulled taut and fastened to each post with tie wires or metal tie clips.

5. MEASUREMENT AND PAYMENT

Method 1 The length of fence will be measured to the nearest 0.1 foot along the fence, including gates. Payment will be made at the contract unit price for the specified height of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 2 The length of fence will be measured to the nearest 0.1 foot along the fence, excluding gate openings. Payment will be made at the contract unit price for the specified height of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work except furnishing, fabricating and installing each type and size of gate payment will be made at the contract unit price for that type and size of gate.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

Bid Item 22, Chain Link Fence

(1) This item shall consist of furnishing and installing the chain link fence, including sleeves and appurtenances, along the emergency spillway side walls as shown on the drawings.

(2) The fence shall be chain link, 9 gauge, Type 1, Grade A, with a nominal height of 4 feet.

(3) In Section 5, Measurement and Payment, the work will not be measured. Payment will be lump sum and shall include all labor, materials, and equipment incidental to completion of the work. Payment will include compensation for Subsidiary Item, Concrete, Class 2500.

CONSTRUCTION SPECIFICATION

92. FARM FIELD FENCES

1. SCOPE

The work shall consist of furnishing and installing farm field fences, including gates and fittings.

2. MATERIALS

Materials for farm field fences shall conform to the requirements of Material Specification 591. All wooden posts shall be of the same species.

3. SETTING POSTS

Concrete or wood posts shall set in holes and backfilled with earth except where otherwise specified. Steel posts shall be driven unless otherwise specified.

Posts holes shall be at least 6 inches larger than the diameter or side dimension of the posts.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the post hole up to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12 inches and shall completely fill the post hole up to the ground surface. Backfill, either earth or concrete, shall be crowned up around posts at the ground surface.

No stress shall be applied to posts set in concrete until at least 24 hours after the concrete has set.

4. CORNER ASSEMBLY

Unless otherwise specified, corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more.

5. END PANELS

End panels shall be built at gates and fence ends.

6. PULL POST ASSEMBLY

Pull post assemblies shall be installed at the following locations:

a. In straight fence sections, at intervals of no more than 660 feet.

b. At any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 degrees (except as provided in Section 9 of this specification).

c. At the beginning and end of each curve.

7. ATTACHING FENCING TO POSTS

The fencing shall be stretched and attached to posts as follows:

a. The fencing shall be placed on the side of the post opposite the area being protected, except on curves.

b. The fencing shall be placed on the the outside of curves.

c. The fencing shall be fastened to each end post, corner post and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.

d. The fencing shall be fastened to wooden line posts by means of staples. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Staples shall be driven diagonally with the grain of the wood and at a slight downward angle and shall not be driven so tightly as to bind the wire against the post.

e. The fencing shall be fastened to steel or concrete line posts with either two turns of 14 gauge galvanized steel or iron wire or the post manufacturer's special wire fasteners.

f. Wire shall be spliced by means of a Western Union splice or by suitable splice sleeves applied with a tool designed for the purpose. The Western Union splice shall have not less than 8 wraps of each end about the other. All wraps shall be tightly wound and closely spaced. Splices made with splice sleeves shall have a tensile strength no less than 80 percent of the strength of the wire.

8. STAYS

Stays shall be attached to the fencing in a manner to insure maintenance of the proper spacing of the fence wire strands.

9. CROSSINGS AT DEPRESSIONS AND WATERCOURSES

Where fencing is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored by means of extra embedment or by special anchors as detailed on the drawings.

a. If the fence wire is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored by means of extra embedment or by special anchors as detailed on the drawings.

b. If the wire fence is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire.

10. MEASUREMENT AND PAYMENT

Method 1 The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, including gate openings. Payment for each type and kind of fence will be made at the contract unit price for that type and kind of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work including fabricating and installing gates.

Method 2 The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, excluding gate openings. Payment for each type and kind of fence will be made at the contract unit price for that type and kind of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work, except fabricating and installing gates. Payment for each type and size of gate will be made at the contract price each for fabricating and installing that type and size of gate.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 11 of this specification.

11. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 16, Fence

(1) This item shall consist of furnishing and installing barbed wire fence, including gates, post anchors and appurtenances as shown on the drawings and staked in the field.

(2) The barbed wire shall be Type I, with two strands of 12 1/2 gauge line wires and 14 gauge barbs spaced on approximately 5-inch centers in accordance with Material Specification 591 and Federal Specification RR-F-221. The zinc coating on the barbed wire shall be a minimum weight of 0.3 oz. per square foot.

(3) Gates, corners, pull and end post assemblies shall be as shown on the drawings. Line posts shall be Type 1, Style 1, painted in accordance with Material Specification 591 and Federal Specification RR-F-221.

(4) Chains shall be welded, case hardened straight link pattern of 5/16 inch stock diameter, 18 inches long. Padlocks will be furnished by the Flood Control District of Maricopa County.

(5) Section 10, Measurement and Payment, will be by Method 1 and will include compensation for Subsidiary Item, Concrete, Class 2500.

11. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 23, Farm Fence

(1) This item shall consist of furnishing and installing barbed wire fence, including gates, post anchors and appurtenances as shown on the drawings and staked in the field.

(2) The barbed wire shall be Type I, with two strands of 12 1/2 gauge line wires and 14 gauge barbs spaced on approximately 5-inch centers in accordance with Material Specification 591 and Federal Specification RR-F-221. The zinc coating on the barbed wire shall be a minimum weight of 0.3 oz. per square foot.

(3) Gates, corners, pull and end post assemblies shall be as shown on the drawings. Line post shall be Type 1, Style 1, painted in accordance with Material Specification 591 and Federal Specification RR-F-221.

(4) Chains shall be welded, case hardened straight link pattern of 5/16 inch stock diameter, 18 inches long. Padlocks will be furnished by the Flood Control District of Maricopa County.

(5) Section 10, Measurement and Payment will be by Method 1 and will include compensation for Subsidiary Item, Concrete, Class 2500.

CONSTRUCTION SPECIFICATION

93. IDENTIFICATION MARKERS OR PLAQUES

1. SCOPE

The work shall consist of furnishing and installing identification markers or plaques at the designated locations.

2. MATERIALS

The markers or plaques shall be constructed of the specified materials, and shall meet all requirements for lettering, painting, finishing, and related items as shown on the drawings or as specified in Section 6 of this specification.

3. CONSTRUCTION METHODS

The markers or plaques shall be installed at locations and in the manner or condition specified.

4. MONUMENTS

Unless otherwise specified the markers or plaques shall be mounted on concrete monuments or on existing structures. The monuments shall be of the type, kind, and size and located as specified.

5. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, payment for each type, kind, and size of marker or plaque complete in place, will be made at the contract unit price for that type, kind, and size.

For items of work for which specific lump prices are established in the contract, payment for identification markers or plaques will be made at the contract lump sum price.

Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 17, Identification Sign

(1) This item shall consist of the fabrication, painting and installation of the identification signs as shown on the drawings.

(2) Materials shall conform to the requirements of Material Specification 581.

(3) Measurement and Payment will include compensation for Subsidiary Items, Cleaning and Painting and Concrete Class 2500.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 24, Identification Sign

(1) This item shall consist of the fabrication, painting and installation of the identification signs as shown on the drawings.

(2) Materials shall conform to the requirement of Material Specification 581.

(3) Measurement and payment and will include Compensation for Subsidiary Item, Cleaning and Painting, and Concrete Class 2500.

CONSTRUCTION SPECIFICATION

94. CONTRACTOR INSPECTION

1. SCOPE

The work shall consist of providing all equipment, materials, labor and services necessary to ensure that the specified quality is maintained on all work performed. The Contractor shall be responsible for the day-to-day quality control.

2. EQUIPMENT AND MATERIALS

Equipment for materials testing shall be of the quality and condition required to meet the test specifications cited in the contract references. Equipment shall be in good condition and properly adjusted. Calibration of equipment shall be done at the frequency specified in Section 8. Records of equipment calibration tests shall be available to the government at all times. Nuclear devices shall be operated and maintained by qualified operators and as prescribed by applicable state and federal regulations.

Materials include but shall not be limited to: sand for density tests, bound field books and forms for record-keeping, concrete specimen molds, and all other equipment and materials prescribed by the test procedures referenced in the contract.

The quality of materials used in quality control testing and the equipment employed shall: meet the appropriate standards specified and the standards of the industry, be appropriate for its intended use, and provide the accuracy specified by the contract requirements unless otherwise specified in Section 8 of this specification.

3. INSPECTION PERSONNEL

Inspections and materials testing shall be accomplished by qualified personnel: a licensed engineering firm, testing laboratory, certified inspection technicians, or licensed and experienced personnel from the contractor's organization. The contractor's written inspection plan shall identify the names and qualifications, training, and experience of all quality control personnel who will actually be performing the inspection and quality control work.

4. INSPECTION SYSTEM

The Contractor shall develop and conduct an inspection system adequate to maintain quality control of all work performed and materials and equipment used. The inspection system established shall be based upon a plan and implemented by the necessary mobilization of personnel, equipment and materials. Inspection shall include the initial work needed to verify adequacy of completed work and provide controls for any corrective work. The inspection system and records to substantiate daily conduct of the system shall be kept by the Contractor and are subject to review by the Contracting Officer at any time.

The contractor's inspection system shall cover all aspects of quality control and shall specifically address any testing and inspection requirements detailed in Section 8 of this specification. The planned inspection system shall also identify the contractor's primary quality control manager and provide an organizational listing of the individual quality control personnel and their specific duties, experience and qualifications.

If the government's quality assurance inspections indicate that the contractor's inspection system is not adequate or is not producing the desired results, corrective actions shall be taken by the Contractor in both the inspection system, its plan and the work. The Contracting Officer may direct that changes be made in the inspection system including, but not limited to, the removal of unsatisfactory quality control personnel.

5. PRE-CONSTRUCTION CONFERENCE

After the contract is awarded and before construction operations are started the Contractor shall meet with the Contracting Officer and discuss the contractor's inspection plan. The meeting shall develop a mutual understanding regarding inspection details including the form of documentation to be used for recording the quality control operations, inspections, management procedures and the interrelationship of Contractor and government inspection efforts. The finalized plan will be approved by the Contracting Officer and it shall become a part of the contract.

6. RECORDS

The inspection records shall be kept daily and shall document both acceptable and deficient features of the work. They shall include complete records of required material tests, submittal and approval of shop drawings, manufacturer's recommendation and certifications, and a complete record of materials delivery, quality examination, certification and storage. Tests performed by the Contractor (including subcontractors) shall be a part of the record. All records shall be on forms acceptable to the Contracting Officer and shall be legible, properly dated and identified as to the responsible tester, the material or item tested, and its location of placement in the structure. In addition, these records shall include factual evidence that required activities or tests have been performed, including but not limited to the following:

1. Type and number of control activities and tests involved and the location (elevation, station and offset) of the work tested.

2. Result of control activities or tests.

3. Method of testing used (e.g. citation of reference specification).

4. Nature of defects, cause for rejection, etc.

5. Proposed remedial action.

6. Corrective actions taken and quality control testing.

7. MEASUREMENT AND PAYMENT

Method 1 for items of work for which lump sum prices are established in the contract, payment for contractor inspection will be made at the contract lump sum price. Such payment shall constitute full compensation for all labor, materials, equipment, transportation and all other items necessary and incidental to completion of the work. Progress estimates for payment of this bid item will be based on the percent completion of all contract items (dollar value) used in preparing the regular progress payments.

Method 2 for items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds, after presentation of invoices by the Contractor showing his, her or the subcontractor's inspection costs and cost of supplies. If the total of such payments is less than the contract lump sum for contractor inspection, the unpaid balance will be included in final contract payments. Total payment will be the lump sum contract price for contractor inspection, regardless of actual cost to the Contractor.

Payment will not be made under this item for the purchase cost of materials and equipment having a residual value.

Payment of the lump sum contact price for contractor inspection will constitute full compensation for all labor, materials, equipment, transportation, and all other items necessary and incidental to completion of the work.

All Methods. The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE A

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 19, Contractor Inspection

1. This item shall consist of furnishing the personnel, equipment and material required by the Contractor to perform the testing and inspection that is necessary to implement an inspection system that will insure the specified quality is being maintained for:

   (a) Earthfill and Structure Backfill
   (b) Transition Fill and Drain Fill
   (c) Loose Rock Riprap
   (d) Grouted Rock Riprap
   (e) Steel Reinforcement

2. The moisture-density determinations required for the quality control of structure backfill and earthfill shall be performed in accordance with Method ~~A~~, C ASTM D698 (Standard Proctor Test) or Test No. S-6 (Rapid Compaction Control Method) as described in Section 19 of the SCS National Engineering Handbook

3. Prior to establishing fill production operations, it shall be demonstrated and verified by test results that the proposed equipment fleet is capable of producing fill of the quality specified.

4. For production operations the initial test frequency shall be one (1) test per 2,000 cu. yds. of compacted earthfill and one (1) test per 500 cu. yds. of compacted structure backfill. When approved by the Contracting Officer, the testing frequency may be modified as the job progresses, provided the quality of the fill is consistant or when the testing frequency is not compatible with the daily production.

5. A sieve analysis will be performed when there is a significant change in borrow material or every 25,000 cu. yds. of earth material placed, whichever occurs first, to assure that the structure backfill and earthfill materials are within the specified gradation limits.

6. The gradation of Transition Fill and Drain Fill shall be determined in accordance with ASTM C136 and C117. The testing plan shall include those tests and inspections required during the processing or importation operation to verify that the processed material is within the specified limits. During

placement operations a sieve analysis of the in place fill will be performed for each 1,000 cu. yds. or at more frequent intervals whenever the tested in-place material does not meet the gradation requirements or visual inspections indicate the need to increase the frequency.

7. A sufficient number of tests shall be performed at the source of the rock to assure that the gradation of the Loose Rock Riprap being delivered to the site is within the specified limits. A section of rock having the specified gradation shall be placed and used as a visual reference.

8. A sufficient number of tests shall be performed during the processing of the rock being supplied for the Grouted Rock Riprap to insure that the rock meets the specified gradation before delivery. A minimum of one (1) test will be performed at the site. Rock having the specified gradation shall be placed in a specific section for use as a visual reference. The grout shall have a minimum of one (1) slump test and one (1) air content test performed for every one hundred (100) cu. yds. of grout delivered to the site or once a day, whichever results in the greater number of tests.

9. The placing of steel reinforcement shall be monitored by quality control personnel and prior to scheduling the delivery of concrete, a certification that all bars are the correct size and positioned as specified shall be given to the Contracting Officer.

10. Testing equipment shall be calibrated after it is delivered to the site and whenever erratic or unreasonable test results are being obtained.

    The sand used for testing fill densities shall be calibrated whenever there is a change in the weather or lot of sand.

11. Suitable lab facililties will be set up at the site and will be used exclusively for testing purposes.

12. The Contractor shall designate an experienced quality control manager whose primary responsibility will be implementing the inspection system. The manager shall be on site during major construction activities and will not be involved in directing production oriented activities unless it pertains to achieving the specified quality for the work being performed.

13. The names and qualifications of proposed quality control personnel shall be submitted to the Contracting Officer for review and approval prior to the pre-construction conference. Any change of quality control personnel will require the approval of the Contracting Officer

14. Copies of all test results and inspection reports (Visual inspections of earth work and concrete form work, steel placement verification, concrete placement, etc.), required by the approved inspection plan shall be submitted to the Contracting Officer within 24 hours of when the test or inspection was completed.

15. In Section 7, Measurement and Payment, Method 1 shall apply.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 27, Contractor Inspection

1. This item shall consist of furnishing the personnel, equipment and materials required by the Contractor to perform the testing and inspection that is necessary to implement an inspection system that will insure the specified quality is being maintained for:

   (a) Earthfill and Structure Backfill
   (b) Transition Fill and Drain Fill
   (c) Loose Rock Riprap
   (d) Grouted Rock Riprap
   (e) Steel Reinforcement

2. The moisture-density determinations required for the quality control of structure backfill and earthfill shall be performed in accordance with Method ~~A~~, ASTM D698 (Standard Proctor Test) or Test No. S-6 (Rapid compacted Control Method) as described in Section 19 of the SCS National Engineering Handbook.

3. Prior to establishing fill production operations, it shall be demonstrated and verified by test results that the proposed equipment fleet is capable of producing fill of the quality specified.

4. For production operations the initial test frequency shall be one (1) test per 2,000 cu. yds. of compacted earthfill and one (1) test per 500 cu. yds. of compacted structure backfill. When approved by the Contracting Officer, the testing frequency may be modified as the job progresses, provided the quality of the fill is consistant or when the testing frequency is not compatible with the daily production.

5. A sieve analysis will be performed when there is a significant change in borrow material or every 25,000 cu. yds. of earth material placed, whichever occurs first, to assure that the structure backfill and earthfill materials are within the specified gradation limits.

6. The gradation of Transition Fill and Drain Fill shall be determined in accordance with ASTM C136 and C117. The testing plan shall include those tests and inspections required during the processing or importation operation to verify that the processed material is within the specified

limits. During placement operations a sieve analysis of the in place fill shall be performed for each 2,000 cu. yds. of placed Transition Fill and for each 1,000 cu. yds. of placed Drain Fill. Sieve analyses will be performed at more frequent intervals whenever the tested in place material does not meet the gradation requirements or if visual inspections indicate the need to increase the frequency.

7. The testing plan shall include those tests required during the processing operation to assure that the gradation of the Loose Rock Riprap being delivered to the site is within the specified limits. A minimum of one (1) test for each gradation shall be performed at the site. Rock of each specified gradation shall be placed at a specific location for use as a visual reference.

8. The testing plan shall include those tests required during the processing of the rock being supplied for the Grouted Rock Riprap to insure that the rock meets the specified gradation before delivery. A minimum of one (1) test will be performed at the site. Rock having the specified gradation shall be placed in a specific section for use as a visual reference. The grout shall have a minimum of one (1) slump test and one (1) air content test performed for every one hundred (100) cu. yds. of grout delivered to the site or once a day, whichever results in the greater number of tests.

9. The placing of steel reinforcement shall be monitored by quality control personnel and prior to scheduling the delivery of concrete, a certification that all bars are the correct size and positioned as specified shall be given to the Contracting Officer.

10. Testing equipment shall be calibrated after it is delivered to the site and whenever erratic or unreasonable test results are being obtained.

    The sand used for testing fill densities shall be calibrated whenever there is a change in the humidity or lot of sand.

11. Suitable lab facililties will be set up at the site and will be used exclusively for testing purposes.

12. The Contractor shall designate an experienced quality control manager whose primary responsibility will be implementing the inspection system. The manager shall be on site during major construction activities and will not be involved in directing production oriented activities unless it pertains to achieving the specified quality for the work being performed.

13. The names and qualifications of proposed quality control personnel shall be submitted to the Contracting Officer for review and approval prior to the pre-construction conference. Any changes in quality control personnel will require the approval of the Contracting Officer.

14. Copies of all test results and inspection reports (Visual inspections of earth work and concrete form works, steel placement verifications, concrete placement, etc.), required by the approved inspection plan shall be submitted to the Contracting Officer within 24 hours of when the test or inspection report is completed and certified.

15. In Section 7, Measurement and Payment, Method 1 shall apply.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 13, Contractor Inspection

1. This item shall consist of furnishing the personnel, equipment and material required by the Contractor to perform the testing and inspection that is necessary to implement an inspection system that will insure the specified quality is being maintained for:

   (a) Fill Construction and Structure Backfill
   (b) Untreated Base
   (c) Asphalt Concrete
   (d) Concrete - Class "S" and Class "AA"
   (e) Steel Reinforcement

2. The moisture-density determinations required for ~~the~~ quality control of structure backfill and earthfill shall be performed in accordance with ~~Method A, ASTM D698 (Standard Proctor Test) or Test No. S-6 (Rapid Compaction Control Method) as described in Section 19 of the SCS National Engineering Handbook.~~ AASHTO T-99 METHOD D and T-191 OR ASTM D-2922 and D3017

   A minimum of two (2) tests shall be performed for each item.

3. As a minimum one (1) sieve analysis and one (1) relative density test will be performed in accordance with AASHTO T-99, method A, and T-191 or ASTM D2922 and D3017 to assure that the in-place Untreated Base meets the specified quality.

4. The necessary tests and inspections will be performed to verify that the thickness, density, aggregate gradation and asphalt content of the asphalt Concrete is within the specified limits.

5. The quality control for Concrete - Class "S" and Class "AA" will include the sampling and testing of fresh concrete for the purpose of determining the air content, temperature, slump and the molding of compression test specimens. The minimum test frequency will be one (1) set (4 standard test specimens) of test specimens and one (1) air content test per 100 cu. yds. or one (1) series of test specimens and air content per day, whichever results in the greater number of tests. The temperature and slump will be determined when a set of test specimen are made or otherwise every other truck load.

When approved by the Contracting Officer these test frequencies may be modified to fit job conditions.

6. The placing of steel reinforcement shall be monitored by quality control personnel and prior to scheduling the delivery of concrete, a certification that all bars are the correct size and positioned as specified shall be given to the Contracting Officer.

7. Testing equipment shall be calibrated after it is delivered to the site and whenever erratic or unreasonable test results are being obtained.

   The sand used for testing fill densities shall be calibrated whenever there is a change in the weather or lot of sand.

8. Suitable lab facililties will be set up at the site and will be used exclusively for testing purposes.

9. The Contractor shall designate an experienced quality control manager whose primary responsibility will be implementing the inspection system. The manager shall be on site during major construction activities and will not be involved in directing production oriented activities unless it pertains to achieving the specified quality for the work being performed.

10. The names and qualifications of proposed quality control personnel shall be submitted to the Contracting Officer for review and approval prior to the pre-construction conference. Any change of quality control personnel will require the approval of the Contracting Officer.

11. Copies of all test results and inspection reports (Visual inspections of earth work and concrete form work, steel placement verification, concrete placement, etc.), required by the approved inspection plan shall be submitted to the Contracting Officer within 24 hours of when the test or inspection report is completed and certified.

12. In Section 7, Measurement and Payment, Method 1 shall apply.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 13, Contractor Inspection

1. This item shall consist of furnishing the personnel, equipment and material required by the Contractor to perform the testing and inspection that is necessary to implement an inspection system that will insure the specified quality is being maintained for:

   (a) Earth Fill
   (b) Drain Fill
   (c) Untreated Base
   (d) Asphalt Concrete Pavement

2. The moisture-density determinations required for the quality control of earthfill shall be performed in accordance with Method ~~A~~, C ASTM D698 (Standard Proctor Test) or Test No. S-6 (Rapid Compaction Control Method) as described in Section 19 of the SCS National Engineering Handbook.

3. Prior to establishing fill production operations, it shall be demonstrated and verified by test results that the proposed equipment fleet is capable of producing fill of the quality specified.

4. For production operations the initial test frequency shall be one (1) test per 2,000 cu. yds of compacted earthfill. When approved by the Contracting Officer the testing frequency may be modified as the job progresses, provided the quality of the fill is consistant or when the testing frequency is not compatible with the daily production.

5. The gradation of the Drain Fill shall be determined in accordance with ASTM C136 and C117. A sufficient number of sieve analysis shall be performed during the processing operation to verify that the processed material is within the specified limits. A minimum of two sieve analyses will be performed on in-place material to insure that the quality has not deteriorated through the hauling and handling process.

6. One (1) sieve analysis and one (1) relative density test will be performed in accordance with AASHTO T-99, Method A, and T-191 or ASTM D2992 and D3017 for each 1,500 tons of Aggregate Base material placed to assure that the in-place material is within the specified limits.

7. The necessary tests and inspections will be performed to verify that the thickness, density, aggregate gradation and asphalt content of the Asphalt Concrete Pavement is within the specified limits.

8. Testing equipment shall be calibrated after it is delivered to the site and when ever erratic or unreasonable test results are being obtained.

   The sand used for testing fill densities shall be calibrated whenever there is a change in the humidity or lot of sand.

9. Suitable lab facililties will be set up at the site and will be used exclusively for testing purposes.

10. The Contractor shall designate an experienced quality control manager whose primary responsibility will be implementing the inspection system. The manager shall be on site during major construction activities and will not be involved in directing production oriented activities unless it pertains to achieving the specified quality for the work being performed.

11. The names and qualifications of proposed quality control personnel shall be submitted to the Contracting Officer for review and approval prior to the pre-construction conference. Any change of quality control personnel will require the approval of the Contracting Officer.

12. Copies of all test results and inspection reports (Visual inspections of earth work and concrete form work, steel placement verification, concrete placement, etc.), required by the approved inspection plan shall be submitted to the Contracting Officer within 24 hours of when the test or inspection report is completed and certified.

13. In Section 7, Measurement and Payment, Method 1 shall apply.

CONSTRUCTION SPECIFICATION

205. PLASTIC PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and installing plastic pressure pipe conduits and the necessary fittings and appurtenances as shown on the drawings.

2. MATERIALS

Plastic pressure pipe and fittings shall conform to the requirements of Material Specification 305. Specific requirements for the type, grade, and class of pipe shall be as specified in Section 10 of this specification.

Steel fittings shall conform to the requirements of Material Specification 553.

Mastic field coating repair materials shall conform to the requirements of Military Standard MIL-C-18480 (cold applied mastic).

3. HANDLING THE PIPE

Pipe stored outdoors for prolonged periods shall be covered. Pipe must be delivered to the jobsite and handled by means which shall provide adequate support and not subject it to undue stresses or damage. The load shall be so supported that the bottom rows of pipe are not damaged by crushing. All special handling requirements of the manufacturer shall be strictly observed. Pipe shall be unloaded carefully and stored as close as practical to the final point of placement. When handling and placing plastic pipe, care shall be taken to prevent severe impact blows, abrasion damage, and gouging or cutting by metal surfaces or rocks.

4. EXCAVATION

Excavation shall be in accordance with Construction Specification 21 and/or Section 10 of this specification and as shown on the drawings.

5. JOINTS AND CONNECTIONS

Pipe and fitting joints shall conform to the details shown on the drawings and to the requirements specified in Section 10. All pipe and fitting joints shall be sound and watertight at the pressure specified. The joints shall be made in such a manner that the inside surface of the pipeline is free of any obstructions that reduce the capacity of the line.

All joint assemblies shall be in accordance with manufacturer's recommendations. When a lubricant is required to facilitate joint assembly, it shall be a type having no deleterious effect on the gasket or pipe materials.

Where steel fittings, valves, bolted connections, and other flanged fittings are used, they shall be painted or coated as specified in Section 10 of this specification.

Application of mastic field coating material shall be in accordance with the manufacturer's recommendations to produce a total dry film thickness of at least 20 mils. No backfill shall be placed against a mastic coated surface until 24 hours after the mastic is applied.

6. LAYING AND BEDDING THE PIPE

Plastic pressure pipe conduits complete with fittings and other related appurtenances shall be installed to the lines and grades shown on the drawings and specified in Section 10. The pipe shall be placed with care, bell end upstream unless otherwise specified, and shall not be dropped or dumped on the bedding or into the pipe trench. During installation, the pipe shall be firmly and uniformly bedded throughout its entire length, to the depth and in the manner specified on the drawings. Bell-holes shall be made in the bedding under bells or couplings and other fittings to prevent the pipe from being supported by fittings. Blocking or mounding beneath the pipe shall not be used to bring the pipe to final grade.

The ends of pipe and the couplings shall be free of foreign material when assembled. At the termination of pipe laying, the open end of the pipeline shall be closed off by a suitable cover or plug until operations are resumed. Bedding or select backfill material placed in the bottom of the trench to replace rock or other unsuitable material shall be placed and spread as specified in Section 10 and as shown on the drawings. Bedding materials shall meet the requirements for the class of materials specified in Section 10 and as shown on the drawings.

Care should be taken to prevent permanent distortion and damage during unusually hot or cold weather. After the pipe has been assembled in the trench, it shall be allowed to cool to ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

7. PRESSURE TESTING

Method 1 Pressure testing of the completed conduit will not be required.

Method 2 The conduit shall be tested for strength and leakage at the pressure specified in Section 10 for a period of at least 2 hours.

When cemented or chemically welded joints are used, the assembled pipeline shall be allowed to cure as specified in ASTM D 2855 before flushing and testing, to ensure complete setting of the joints.

Prior to testing, all concrete anchors and thrust blocks shall be in place and shall have been cured for at least three (3) days. Thrust blocks as shown on the drawings shall be placed against a firm trench wall. Where excavation is required outside the trench limits for thrust blocks, the over excavated area shall be backfilled and compacted by hand operated mechanical tamping equipment.

The conduit shall be pressure tested before completing the placement of earth backfill except in some cases it may be necessary to partially backfill around the conduit before testing in order to hold the conduit in place. Where this occurs, the partial backfill shall be placed and compacted in accordance with Section 8 of this specification. Only the body of the pipe sections shall be covered leaving the joints and connections uncovered for inspection purposes. Any leaks shall be repaired and the conduit shall be retested. The procedure shall be repeated until the conduit is watertight. The pipe joints shall show no leakage.

8. BACKFILL

Backfill shall be in accordance with Construction Specification 23 and/or Section 10 of this specification and as shown on the drawings.

9. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are estabilshed in the contract, the quantity of each kind, size, and class of pipe will be determined to the nearest foot by measurement of the laid length along the invert centerline of the conduit. Payment for each kind, size, and class of pipe will be made at the contract unit price for that kind, size, and class. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, and all fittings, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for those items.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe will be determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe will be made at the contract unit price for that kind, size, and class. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, and all fittings, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for those items.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any items of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 16, 6-Inch Waterline

(1) As shown on the drawings this item shall consist of furnishing and installing the six(6) inch waterline from the connection at the relocated existing line at station 6+93±L to the Irrigation Booster Pump at Prospector Park including:

- Furnishing and installing the gate valves and air and vacuum relief valve.

- Furnishing and installing the twelve(12) inch enclosure pipe.

(2) The six(6) inch waterline shall be PVC 1120, 1220, OR 2120, Schedule 40, in accordance with ASTM D 1785.

(3) The three(3) inch pipe extension for the air and vacuum relief valve shall be PVC 1120, 1220, OR 2120, schedule 40, in accordance with ASTM D 1785.

(4) The twelve(12) inch enclosure pipe shall be PVC 1120, schedule 80, in accordance with ASTM D 1785.

(5) The air and vacuum relief valve shall be a three(3) inch ball type, oriface diameter 2 3/8 inch, operating pressure 0-125 psi, and cast aluminum in accordance with ASTM B 179-65, Alloy SC64D.

(6) In line gate valve shall be six(6) inch nut operated with a rated working pressure of 125 psi. Valve connection to PVC pipe shall meet the manufactures recommendations. Slide or screw type valve boxes with drop covers marked "water" shall be installed over each gate valve. Minimum diameter of the bell end of the value box shall be eight(8) inches and the minimum diameter of the stem section of the valve box shall be 5 1/4 inches. Valve box covers shall be installed flush with the finished road grade.

(7) Section 7, Pressure Testing, shall be by method 2 at a pressure of 200 psi± 5 psi. Leakage may not exceed 0.1 gallon per hour per 1000 feet of pipe per inch diameter.

(8) Section 9, Measurement and Payment, will be by method 1 and include compensation for subsidiary items structure excavation, structure backfill, and concrete class 2500.

CONSTRUCTION SPECIFICATION
207. PLASTIC PIPE DRAINS

1. SCOPE

The work shall consist of furnishing and installing poly (vinyl chloride) (PVC) plastic pipe and the necessary fittings as shown on the drawings.

2. MATERIALS

The poly (vinyl chloride) (PVC) pipe and fittings shall conform to the requirements of the following American Society for Testing and Materials (ASTM) Standard Specifications:

a. D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

b. D 2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

c. D 2467 Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

d. D 3034 Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

e. D 2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

The Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe and fittings shall conform to the requirements of the following ASTM Standard Specifications:

a. D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).

b. D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.

c. D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40.

d. D 2469 Socket-type Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80.

Rubber gasket joints shall conform to ASTM Specification D 3139 or D 3212, as appropriate for PVC pipe.

Solvent for cemented joints shall conform to ASTM Specification D 2564 (PVC) or D 2235 (ABS) as appropriate.

Perforations for perforated pipe shall be as provided by ASTM C 508 unless otherwise specified in Section 9.

The compound used in manufacturing the pipe shall meet the requirements of one of the following materials:

1. Poly (vinyl chloride) (PVC) as specified in ASTM D 1784.

Material	Code Classification
Type 1, Grade 1	12454-B
Type 1, Grade 3	12454-C
Type II, Grade 1	14333-D

2. Acrylonitrile-butadiene-styrene (ABS) as specified in ASTM D 1788.

Material	Code Classification
Type 1, Grade 2	5-2-2
Type 1, Grade 3	3-5-5
Type II, Grade 1	4-5-5

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign matter, or other defects. The pipe shall be as uniform in color, opacity, density, and other physical properties as is commercially practicable.

3. HANDLING THE PIPE

Pipe stored outdoors for prolonged periods shall be covered. Pipe must be delivered to the job site and handled by means that shall provide adequate support and not subject it to undue stresses or damage. The load shall be so supported that the bottom rows of pipe are not damaged by crushing. All special handling requirements of the manufacturer shall be strictly observed. Pipe shall be unloaded carefully and stored as close as practical to the final point of placement. When handling and placing the pipe, care shall be taken to prevent severe impact blows, abrasion damage, and gouging or cutting by metal surfaces or rocks.

4. LAYING AND BEDDING THE PIPE

Pipe shall be laid to the lines and grades shown on the drawings and as specified in Section 9.

Construction shall progress in the upstream direction with the bell ends pointed upstream. The spigot ends shall be pulled into the bell ends of previously laid sections. The ends of pipes and fittings shall be free of all foreign material when assembled.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

Care shall be taken to prevent permanent distortion and damage when handling the pipe during unusually warm or cold weather. The pipe shall be firmly and uniformly bedded throughout its entire length to the specified depth with the material and in the manner specified in Section 9, or as shown on the drawings. Blocking or mounding shall not be used to bring the pipe to final grade.

For pipe with bell joints, the bedding material shall be excavated at the locations of the bells to provide continuous equal support for the bells as well as for the entire length of pipe.

5. JOINTS

Pipe joints shall conform to the details shown on the drawings, and except where unsealed joints are indicated, shall be sound, watertight, and shall equal or exceed the strength requirements of the pipe specified. Joints and connections shall leave the inside of the line free of any obstructions that may tend to reduce its capacity. When a lubricant is required to facilitate joint assembly, it shall have no deleterious effect on the gasket or pipe materials.

Pipe shall be installed and joined in accordance with the manufacturer's recommendations except as otherwise specified in Section 9.

6. PRESSURE TESTING

(Method 1) Pressure testing of the completed drain pipe will not be required.

(Method 2) The non-perforated sections of the drain pipe shall be tested for strength and leakage at the pressure specified in Section 9 for a period of at least two (2) hours.

Cemented or chemically welded joints shall be allowed to cure as specified in ASTM D 2855 before testing to ensure complete setting of the joints.

The drain pipe shall be pressure tested before completing the placement of backfill, except in some cases it may be necessary to partially backfill around the drain pipe before testing in order to hold the drain pipe in place. Where this occurs, the partial backfill shall be placed and compacted in accordance with Section 9 of this specification. Only the body of the pipe sections shall be covered leaving the joints and connections uncovered for inspection purposes. Any leaks shall be repaired and the drain pipe shall be retested. The procedure shall be repeated until the drain pipe is watertight. The pipe joints shall show no leakage.

7. BACKFILL

Backfill shall be in accordance with Construction Specification 23 or 24, and/or Section 9 of this specification, as appropriate, and as shown on the drawings.

8. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe will be determined to the nearest foot by measurement of the laid length of pipe along the invert centerline of the drain pipe.

Payment for each kind, size, and class of pipe will be made at the contract unit price for that kind, size, and class of pipe. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe, including excavation, backfill, fittings, and other appurtenances or items necessary and incidental to installing the drain pipe complete in place.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE B

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 25, 6-inch Pipe Drain

(1) This item shall consist of the installation of all 6-inch PVC pipe and appurtenances required to construct the drain for the Emergency Spillway and the drain along the Principal Spillway, as shown on the drawings.

(2) Pipe shall be 6-inch diameter PVC, SDR-21, ASTM D 2241. Joints shall conform to ASTM D 3139. Fittings shall be watertight and compatible to the pipe in strength, size and material.

(3) Pipe shall be perforated as provided by ASTM C-508 where called for on the plans.

(4) Section 6, Pressure Testing, does not apply.

CONSTRUCTION SPECIFICATION

401. RELOCATION OF UTILITIES

1. SCOPE

The work shall consist of cooperation and/or relocation of all utilities as described in Section 3 of these specifications.

2. MAG SECTION 105 and 610

The provisions of Section 105, "Control of Work" and Section 610, "Waterline Construction" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Subsidiary Item, Relocation of Utilities MAG Section 105 and 610

(1) This item shall consist of the relocation of the following utility lines:

(a) The existing 4-in. temporary water line as shown on the drawings shall be relocated as necessary to keep the waterline active throughout construction.

(b) Relocate the existing 2 inch waterline and appurtances and 3 inch reduced pressure backflow preventor, crossing Lost Dutchman Road, to a 3 foot clear depth under the finished grade of the road fill.

(c) The contractor shall remove the abandoned Mountain Bell Telephone cable within the limits of the road ramp construction.

(d) The underground AT&T cable remains in its present location and shall not be disturbed.

(2) No separate payment will be made for this item. Compensation for this work will be included in Bid Item 4.

CONSTRUCTION SPECIFICATION

402. SUBGRADE PREPARATION

1. SCOPE

The work shall consist of the subgrade preparation for roadways and bridge approaches prior to the placement of sub-base material and pavement.

2. MAG SECTION 301

The provisions of Section 301, "Subgrade Preparation" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and construction details are:

a. Subsidiary Item, Subgrade Preparation, MAG Section 301

1. This item shall consist of preparing the subgrade to the required lines and grades as shown on the drawings and staked in the field.

2. No separate payment will be made for Subgrade Preparation. Compensation for this item will be included in Bid Item 3, Fill Construction.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 11, Subgrade Preparation, MAG Section 301

(1) This item shall consist of the preparation of subgrade to the required line and grade for the full width pavement as shown on the drawings for the Idaho Road and Lost Dutchman Boulevard crossings at the Apache Junction FRS.

(2) Subgrade Preparation shall also include the preparation of subgrade to the required line and grade for the portion of the project located beyond the full width pavement at the intersection of the Idaho Road and Lost Dutchman Boulevard where the untreated base course is required in accordance with the plans.

(3) Measurement and payment for items of work for which specific unit prices are established in the contract, the quantity of work will be determined to the nearest foot by measurement along the centerline of road.

CONSTRUCTION SPECIFICATION

403. UNTREATED BASE

1. SCOPE

The work shall consist of furnishing, placing and compacting the untreated base material required for the construction of the bridge approaches and roads.

2. MAG Section 310

The provisions of Section 310 "Untreated Base" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 5, Untreated Base, MAG Section 310

1. This item shall consist of furnishing, placing and compacting the aggregate base for the bridge approach roadways as shown on the drawings.

2. Aggreagate base shall be crushed and conform to the requirements of MAG Section 702.

3. The quantity of Untreated base within the specified limits will be measured to the nearest ton by actual weight. For each load of Untreated Base placed as specified, the Contractor shall furnish to the Engineer a statement of delivery ticket showing the weight to the nearest 0.1 ton, of Untreated Base delivered.

Payment for Untreated Base will be made at the contract unit price and will include compensation for all subsidiary work incidental and appurtenant.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

Bid Item 12, Untreated Base, MAG Section 310

(1) This item shall consist of the placing of the Untreated Base to the required line and grade as shown on the drawings for the Idaho Road and Lost Dutchman Boulevard road crossings at the Apache Junction FRS.

(2) Placement of the Untreated Base shall also include the placement of the Untreated Base to the required line and grade for the portion of the project located beyond the full width payment at the intersection of Idaho Road and Lost Dutchman Boulevard where Untreated Base course is required in accordance with the plans.

(3) Measurement and payment for items of work for which specific unit prices are established in the contract, the quantity of work within the specified limits will be measured to the nearest ton by actual weight. For each load of Untreated Base placed as specified the Contractor shall furnish to the Engineer a statement of delivery ticket showing the weight to the nearest 0.1 ton, of Untreated Base delivered.

CONSTRUCTION SPECIFICATION

404. BITUMINOUS PRIME COAT

1. SCOPE

The work shall consist of furnishing and applying the bituminous prime coat to the aggregate base.

2. MAG Section 315

The provisions of Section 315 "Bituminous Prime Coat" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3 ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 7, Bituminous Prime Coat, MAG Section 315

1. This item shall consist of furnishing and applying the Bituminous Prime Coat to the aggregate base.

2. The bituminous material shall be Grade MC-70 or MC-250 Liquid Asphalt as approved by the Engineer. Prime coat shall be applied to the total width of the Aggregate Base Material at the rate of 0.40 gallons per square yard.

3. Measurement and payment for items of work for which specific unit prices are established in the contract, the quantity of work will be determined to the nearest 0.1 ton by actual weight. The Contractor will be required to furnish the Engineer certified weight slips showing the weight to the nearest 0.1 ton for the undiluted bituminous used.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 13, Bituminous Prime Coat, MAG Section 315

(1) This item shall consist of the application of the bituminous prime coat to the aggregate base course, as shown on the drawings for the Idaho Road and Lost Dutchman Boulevard Road crossing at the Apache Junction FRS.

(2) Application of the prime coats shall also include the portion of the project located beyond the full width payment at the intersection of Idaho Road and Lost Dutchman Boulevard required in accordance with the plans.

(3) The bituminous material shall be Grade MC-70 or MC-250 liquid asphalt as approved by the Engineer. Prime coat shall be applied to the total width of the aggregate base material at the rate of 0.40 gallons per square yard.

(4) Measurement and payment for items of work for which specific unit prices are established in the contract, the quantity of work will be determined to the nearest 0.1 ton by actual weight. The Contractor will be required to furnish the Engineer certified weight slips showing the weight to thenearest 0.1 ton for the undiluted bituminous used.

CONSTRUCTION SPECIFICATION

405. ASPHALT CONCRETE PAVEMENT

1. SCOPE

The work shall consist of furnishing all materials, mixing at a plant, hauling and placing a mixture of an aggregate material and a bituminous material to form a pavement course to the specified depth as shown on the drawings.

2. MAG Section 321

The provisions of Section 321 "Asphalt Concrete Pavement" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 6, Asphalt Concrete, MAG Section 321

1. This item shall consist of furnishing and placing asphalt concrete to the lines and grades shown on the drawings.

2. The bituminous material to be used shall be either AC-20 or AC-40 complying with Table 711-1A of MAG Specifications as revised in 1983.

3. The mineral aggregate shall meet the grading requirements for Mix Designation C-3/4 in accordance with Section 710 of the Uniform Standard Specifications.

4. In addition to pugmill type mixing plants, Drum Dryer Mixers will be allowed in accordance with Standard Specification 710.9. The moisture content of the bituminous mixture immediately behind the paver shall not exceed three percent.

5. The proper proportioning of the material at the cold feed shall be determined by the Contractor and approved by the Engineer prior to the production of asphalt concrete. Production shall not commence until calibration tests indicate that an acceptable product can be obtained.

6. The correct proportions of each aggregate size introduced into the mixer shall be drawn from the storage bins by an approved type of continous feeder which shall supply the correct ammount of aggregate in proportion to the bituminous material and shall be so arranged that the proportion of each aggregate size can be separately adjusted. The continous feeder for the aggregate size can be separately adjusted. The continous feeder for the aggregate may be mechanically or electrically activated.

7. The plant shall be equipped with a sampling device to take representative composite samples of the cold feed. If tests indicate non-compliance with specifications, operations shall cease until proper corrections have been made.

8. The production of the plant shall be governed by the rate required to obtain a thorough and uniform mixture of the materials. Mixing shall continue until the uniformity of

coating, when tested in accordance with requirement of AASHTO T 195, is at least 95 percent.

9. Measurement and Payment shall be in accordance with sections 321.8 and 321.9 and will include compensation for subsidiary Item, Pavement Matching and Surface Replacement.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 14, Asphalt Concrete Pavement, MAG Section 321

(1) This item shall consist of furnishing and placing of the asphalt concrete pavement upon the prepared base to the required line and grade as shown on the drawings for the Idaho Road and Lost Dutchman Boulevard Road crossing at the Apache Junction FRS.

(2) Placement of the asphalt concrete pavement shall also include that portion of the project located beyond the full width pavement at the intersection of Idaho Road and Lost Dutchman Boulevard where untreated base course is required in accordance with the plans.

(3) The bituminous material to be used shall be either AC-20 or AC-40 complying with Table 711-1A of MAG Specifications as revised in 1983.

(4) The mineral aggregate shall meet the grading requirements for Mix Designation C-3/4 in accordance with Section 710 of the Uniform Standard Specifications.

(5) In addition to pugmill type mixing plants, Drum Dryer Mixers will be allowed in accordance with Standard Specification 710.9. The moisture content of the bituminous mixture immediately behind the paver shall not exceed three percent.

(6) The proper proportioning of the material at the cold feed shall be determined by the Contractor and approved by the Engineer prior to the production of asphalt concrete. Production shall not commence until calilbration tests indicate that an acceptable product can be obtained.

(7) The correct proportions of each aggregate size introduced into the mixer shall be drawn from the storage bins by an approved type of continous feeder which shall supply the correct ammount of aggregate in proportion to the bituminous material and shall be so arranged that the proportion of each aggregate size can be separately adjusted. The continous feeder for the aggregate may be mechanically or electrically activated.

(8) The plant shall be equipped with a sampling device to take representative composite samples of the cold feed. If tests indicate non-compliance with specifications, operations shall cease until proper corrections have been made.

(9) The production of the plant shall be governed by the rate required to obtain a thorough and uniform mixture of the materials. Mixing shall continue until the uniformity of coating, when tested in accordance with requirement of AASHTO T 195, is a least 95 percent.

(10) Measurement and payment will be in accordance with Sections 321.8 and 321.9 and will include compensation for subsidiary items tack coat and preservative seal, installation of flexible metal guard rails, and pavement matching and surface replacement.

b. Subsidiary Item, Tack Coat and Preservative Seal

(1) This item shall consist of furnishing and placing tack coat and preservative seal in accordance to MAG.

(2) No separate payment will be made for this item. Compensation for this work will be included in Bid Item 14.

CONSTRUCTION SPECIFICATION

406. FLEXIBLE METAL GUARDRAIL

1. SCOPE

The work shall consist of furnishing all materials and constructing the metal beam guardrail at the locations shown on the drawings.

2. MAG Section 415

The provisions of Section 415 "Flexible Metal Guardrail" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

Subsidiary Item, Installation of Flexible Metal Guard Rails, MAG Section 415

(1) This item shall consist of providing and installation of the metal guard rail as shown on the drawings.

(2) Guardrail details shall be in accordance with Standard Details 135-1, 135-2, 135-3, and 135-4 of Uniform Standard details for Public Works Construction issued by MAG.

(3) No separate payment will be made for this item. Compensation for this work will be included in Bid Item 14.

CONSTRUCTION SPECIFICATION

407. PAVEMENT MATCHING AND SURFACING REPLACEMENT

1. SCOPE

The work shall consist of replacement of pavement and Surfacing removed by construction activities or to be matched in connection with the improved roadway.

2. MAG Section 336

The provisions of Section 335 "Pavement Matching and Surfacing Replacement" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in conformance with this specification and the constrution details are:

a. Subsidiary Item, Pavement Matching and Surface Replacement, MAG Section 336

1. This item shall consist of preparing existing pavement edges to be joined with new pavement.

2. Existing pavements which are to be matched by the new roadway pavement shall be trimmed to a neat, straight and vertical edge. The trimmed edges shall be painted with a light coat of emulsified asphalt immediately prior to constructing the new abutting pavement.

3. No separate payment will be made for Pavement Matching and Surface Replacement. Compensation for this item will be included in Bid Item 6, Asphalt Concrete.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Subsidiary Item, Pavement Matching and Surfacing Replacement MAG Section 336

(1) This item shall consist of preparing existing pavement edges to be joined with new pavement.

(2) Existing pavements which are to be matched by the new roadway pavement shall be trimmed to a neat, straight and vertical edge. The trimmed edges shall be painted with a light coat of emulsified asphalt immediately prior to constructing the new abutting pavement.

(3) No separate payment will be made for this item. Compensation for this work will be included in Bid Item 14.

CONSTRUCTION SPECIFICATION

408. TRAFFIC CONTROL

1. SCOPE

The work shall consist of furnishing, installing, maintaining, moving and removing all traffic control devices, including flagging service, required to provide safe and efficient passage through and/or around the work.

2. MAG Section 401

The provisions of section 401 "Traffic Control" of the Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction dated 1979 and current revisions thereto, together with the Maricopa County Highway Department Supplement to the Uniform Standard Specifications apply to this specification and the construction details contained herein.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE C

Items of work to be performed in accordance with this specification and the construction details are:

a. Subsidiary Item, Traffic Control, MAG Section 401

1. This item shall consist of furnishing, installing, maintaining, moving and removing all traffic control devices and include flagging service to provide safe passage through and/or around the construction area shown on the drawings.

2. The Contractor will be authorized to close only one road at a given time for a duration not to exceed 90 days.

3. The number and kind of barricades, signs, delineators, barriers and all other traffic control devices and any approvals of the contractors method of application of all traffic control measrues, shall not relieve the Contractor of the responsibility of protecting the work, the workmen and the traveling public.

4. The Contractor shall install and maintain deceleration sand berms (approximately five feet high) in the path of through traffic prior to bridge construction or excavation. Sand berms shall remain until the bridge is open to the traffic.

5. The Contractor shall provide a detailed traffic control plan for approval by the Contracting Officer prior to disrupting traffic. The plan shall show all types of signs, sand berms, and their location.

6. All necessary signs, barricades and centerline vertical panels shall remain three working days beyond acceptance of the project by the County.

7. No separate payemnt will be made for Traffic Control. Compensation for this item will be included in Bid Item 8, Concrete Class "S" and Bid Item 9, Concrete Class "AA".

3. ITEMS OF WORK AND CONSTRUCTION DETAILS - SCHEDULE D

Items of work to be performed in conformance with this specification and construction details are:

a. Subsidiary Item, Traffic Control MAG Section 408

(1) This item shall consist of furnishing, installing, maintaining, moving and removing all traffic control devices and include flagging service to provide safe passage through and/or around the construction area shown on the drawings.

(2) The number and kind of barricades, signs, delineators, barriers and all other traffic control devices and any approvals of the Contractor's method of application of all traffic control measures, shall not relieve the Contractor of the responsibility of protecting the work, the workmen and the traveling public.

(3) The Contractor shall provide a detailed traffic control plan for approval by the Contracting Officer prior to disrupting traffic. The plan shall show all types of signs, sand berms, and their location.

(4) No separate payment will be made for this item. Compensation for this work will be included in Bid Item 4.

MATERIAL SPECIFICATION

305. PLASTIC PRESSURE PIPE

1. SCOPE

This specification covers the quality of plastic pressure pipe and fittings.

2. PRESSURE PIPE

All pipe shall be plastic pressure pipe suitable for underground use. The pipe shall conform to the requirements of the following ASTM specifications:

D 1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40

D 2241 Poly(Vinyl Chloride) (PVC) Plastic Pipe, (SDR-PR)

D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80

D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, (SDR-PR)

D 2239 Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on Controlled Inside Diameter.

D 3035 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

D 2447 Polyethylene (PE) Plastic Pipe Schedules 40 and 80 Based on Outside Diameter

D 2672 Bell-End Poly(Vinyl Chloride) (PVC) Pipe

3. PRESSURE PIPE FITTINGS

Presure pipe fittings shall conform to the requirements of the following ASTM specifications:

D 2466 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D 2467 Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D 2464 Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D 3036 Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Line Couplings.

D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40

D 2469 Socket-Type Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80

D 2465 Threaded Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Threaded, Schedule 80

D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe

D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings, for Polyethylene (PE) Plastic Pipe and Tubing.

D 2683 Socket-type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

4. SOLVENTS AND GASKETS

Solvents for solvent welded pipe joints shall conform to the following ASTM specifications:

D 2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings

D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

Rubber gaskets for pipe joints shall conform to the requirements of ASTM Specification F 477, Elastomeric Seals (Gaskets) for joining Plastic Pipe.

MATERIAL SPECIFICATION

521. AGGREGATES FOR DRAINFILL AND FILTERS

1. SCOPE

This specification covers the quality of mineral aggregates for the construction of drainfill and filters.

2. QUALITY

Drainfill and filter aggregates shall be sand, gravel or crushed stone or mixtures thereof. They shall be composed of clean, hard, durable mineral particles free from organic matter, clay balls, soft particles or other substances that would interfere with their free-draining properties.

Aggregates of crushed limestone shall be thoroughly washed and screened. Course aggregate containing crushed limestone shall have not more than 3 percent by weight of particles finer than the No. 4 sieve. Crushed limestone shall not be used for fine aggregates except in combination with other materials such that not more than 5 percent of the portion finer than the No. 4 sieve shall be crushed limestone.

Aggregates shall be tested for soundness according to ASTM Method C 88, and shall have a weighted average loss in five cycles of not more than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is used.

3. GRADING

Drainfill and filter aggregates shall conform to the specified grading limits after being placed in the work, and after being compacted if compaction is specified. Grading shall be determined by ASTM Method C 136. The percentage of material finer than the No. 200 sieve shall be determined by the method in ASTM Designation C 117.

4. STORING AND HANDLING

Drainfill and filter aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by mixing with other materials.

MATERIAL SPECIFICATION

522. AGGREGATE FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of fine aggregate and coarse aggregate for use in the manufacture of portland cement concrete.

2. QUALITY

Aggregate shall conform to the requirements of ASTM Specification C-33 for the specified sizes. Aggregates that fail to meet any requirement may be accepted only when: (1) the specified alternate conditions of acceptance can be proved prior to the use of the aggregates on the job and within a period of time such that no work under the contract will be delayed by the requirements of such proof; or, (2) the specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

3. REACTIVITY WITH ALKALIES

The potential reactivity of aggregates with the alkalies in cement shall be evaluated by petrographic examination and, where applicable, the chemical method of test, ASTM Designation C 289, or by the results of previous tests or service records of concrete made from similar aggregates from the same source. The standards for evaluating potential reactivity shall be as described in ASTM Specification C 33, Appendix A1.

Aggregates indicated by any of the above to be potentially reactive shall not be used, except under one of the following conditions:

a. Applicable test results of mortar bar tests, made according to ASTM Method C 227, are available which indicate an expansion of less than 0.10 percent at six months in mortar bars made with cement containing not less than 0.8 percent alkalies expressed as sodium oxide; or

b. Concrete made from similar aggregates from the same source has been demonstrated to be sound after 3 years or more of service under conditions of exposure to moisture and weather similar to those anticipated for the concrete under these specifications.

Aggregates indicated to be potentially reactive, but within acceptable limits as determined by mortar bar test results or service records, shall be used only with "low alkali" cement, containing less than 0.60 percent alkalies expressed as sodium oxide.

4. STORING AND HANDLING

Aggregate of each class and size shall be stored and handled by methods that prevent segregation of particles sizes or contamination by intermixing with other materials.

MATERIAL SPECIFICATION

523. ROCK FOR RIPRAP

1. SCOPE

This specification covers the quality of rock to be used in the construction of rock riprap.

2. QUALITY

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to subrounded in shape. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment.

Except as provided below, the rock shall have the following properties:

a. Bulk specific gravity (saturated surface-dry basis) not less than 2.5.

b. Absorption not more than 2 percent.

c. Soundness: Weight loss in 5 cycles not more than 10 percent when sodium sulfate is used or 15 percent when magnesium sulfate is used.

The bulk specific gravity and absorption shall be determined by ASTM Method C 127. The test for soundness shall be performed by ASTM Method C 88 for coarse aggregate modified as follows:

The test sample shall not be separated into fractions. It shall consist of 5000 ± 300 grams of rock fragments, reasonably uniform in size and shape and weighing approximately 100 grams each, obtained by breaking the rock and selecting fragments of the required size.

After the sample has been dried, following completion of the final test cycle and washing to remove the sodium sulfate or magnesium sulfate, the loss of weight shall be determined by subtracting from the original weight of the sample the final weight of all fragments which have not broken into three or more pieces.

The report shall show the percentage loss of weight and the results of the qualitative examination.

Rock that fails to meet the requirements stated in a, b, and c above, may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

3. GRADING

The rock shall conform to the specified grading limits after it has been placed in the riprap.

MATERIAL SPECIFICATION

531. PORTLAND CEMENT

1. SCOPE

This specification covers the quality of portland cements.

2. QUALITY

Portland cement shall conform to the requirements of ASTM Specification C 150 for the specified types of cement, except that, when Type I portland cement is specified, Type IS portland blast-furnace slag cement or Type IP portland-pozzolan cement conforming to the requirements of ASTM Specification C 595 may be used unless prohibited in the specifications.

If air-entraining cement is to be used, the Contractor shall furnish the manufacturer's written statement giving the source, amount and brand name of the air-entraining addition.

3. STORAGE AT THE CONSTRUCTION SITE

Cement shall be stored in such a manner as to be protected from weather, dampness or other destructive agencies. Cement that is partially hydrated or otherwise damaged will be rejected.

MATERIAL SPECIFICATION

532. AIR-ENTRAINING ADMIXTURES (FOR CONCRETE)

1. SCOPE

This specification covers the quality of air-entraining admixtures for concrete.

2. QUALITY

Air-entraining admixtures shall conform to the requirements of ASTM Specification C 260, except that the relative durability factor in the freezing and thawing test shall be not less than 95.

MATERIAL SPECIFICATION

533. WATER-REDUCING AND SET-RETARDING ADMIXTURES FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of water-reducing and set-retarding admixtures for portland cement concrete.

2. QUALITY

Water-reducing and set-retarding admixtures shall conform to the requirements of ASTM Specification C 494, except that resistance to freezing and thawing shall be determined in all cases, and the minimum relative durability factor shall be 95.

3. TYPES

Admixtures shall be Type A, Water-Reducing or Type D, Water-Reducing and Retarding , as defined in ASTM Specification C 494.

4. PERFORMANCE IN THE JOB MIX

When added in the manner and amount recommended by the manufacturer to the concrete used on the job, with no change in the cement content or proportions of the aggregates, admixtures shall have the following effects:

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

Type D: The time of initial setting, determined as prescribed in ASTM C 494, shall be from 1 to 3 hours longer with the admixture than without.

MATERIAL SPECIFICATION

534. CURING COMPOUND (FOR CONCRETE)

1. SCOPE

This specification covers the quality of liquid membrane-forming compounds suitable for spraying on concrete surfaces to retard the loss of water during the curing process.

2. QUALITY

The curing compound shall meet the requirements of ASTM Specification C 309.

Unless otherwise specified the compound shall be Type 2.

3. DELIVERY AND STORAGE

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

MATERIAL SPECIFICATION

535. PREFORMED EXPANSION JOINT FILLER

1. SCOPE

This specification covers the quality of preformed expansion joint fillers for concrete.

2. QUALITY

Preformed expansion joint filler shall conform to the requirements of ASTM Specification D 1752, Type I, Type II or Type III, unless bituminous type is specified. Bituminous type preformed expansion joint filler shall conform to the requirements of ASTM Specification D 994, or D 1751.

MATERIAL SPECIFICATION

536. SEALING COMPOUND FOR JOINTS IN CONCRETE AND CONCRETE PIPE

1. SCOPE

This specification covers the quality of sealing compound for filling joints in concrete pipe and concrete structures.

2. TYPE

The compound shall be a cold-application mastic, single component or multiple component type.

The single component type shall be a ready-mixed nondrying compound furnished in troweling consistency or in preformed rope or strip form.

The multiple component type shall be composed of two or more substances that are to be mixed prior to application.

3. QUALITY

Sealing compound shall conform to the requirements of one of the following specifications:

ASTM Specification D 1850; Concrete Joint Sealer, Cold-Application Type. Penetration, determined as specified in ASTM D 1850, shall be not greater than 120.

Federal Specification SS-S-210A; Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

ASTM Specification D-1190 concrete joint sealer, hot poured elastic type.

Federal Specification TT-S-227; Sealing Compound: Elastomeric Type Multi-Component (for Caulking, Sealing, and Glazing in Buildings and other Structures), Type II.

The compound shall be capable of being applied at a temperature of 70°F and shall be of such nature that it will adhere to dry, dust free concrete when applied either directly or over a suitable primer. After curing it shall be a resilient, adhesive material that is capable of filling joints and firm enough to prevent the entry of subsequently placed concrete or of earth during the bedding, cradling, or backfilling operations.

4. COMPOSITION AND PROPERTIES

The compound, if used for pipe having rubber gaskets, shall have a composition such that it will not cause deterioration of the rubber gaskets.

MATERIAL SPECIFICATION

537. NON-METALLIC WATERSTOPS

1. SCOPE

This specification covers non-metallic waterstops for use in joints of concrete structures.

2. CLASSIFICATION

a. Classes. Non-metallic waterstops shall be of the following classes, as specified:

Class I shall be made of either natural or synthetic rubber.

Class II shall be made of vinyl chloride polymer or copolymer.

b. Types. Non-metallic waterstops may be either split or solid and shall conform to the following types, as specified (see Figure 1):

Type A shall have ribbed anchor flanges and a smooth web. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type B shall have ribbed anchor flanges and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half the web thickness and (2) the inside diameter (D) specified in the contract. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type C shall have a single, circular, bulb-type anchor flange at each edge and a smooth web.

Type D shall have a single, circular, bulb-type anchor flange at each edge and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half the thickness of the web and (2) the inside diameter (D) specified in the contract.

Type E shall have ribbed anchor flanges and a web molded or extruded in the form of a round or U-shaped bulb of the dimensions specified in the contract. The web bulb shall be connected at the open end of the "U" by a thin membrane (having a thickness of not less than 1/64-inch or more than 1/5 the web thickness) designed to: (1) prevent infiltration of wet concrete into the bulb and (2) tear when expansion of the joint occurs. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges. Auxiliary positioning or nailing flanges may be provided so long as they do not interfere with the functioning of the web bulb.

Type F shall have ribbed anchor flanges with at least two extra heavy ribs (designed to resist displacement of the waterstop during placement of concrete) on each flange and a smooth web having a positioning or nailing flange attached at the center.

Type G shall be of special design conforming to the details shown on the drawings.

c. Sizes. Waterstops of Types A through F shall be of the sizes listed herein, as specified (see Table 1). Type G waterstops shall have the dimensions shown on the drawings.

3. PHYSICAL REQUIREMENTS

The extruded or molded materials shall exhibit the properties specified herein when tested by the methods specified in Section 4 of this specification.

a. Class I Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.2.

(3) The tensile strength shall be not less than 2500 pounds per square inch.

(4) The ultimate elongation shall be not less than 450 percent.

(5) The compression set shall be not more than 30 percent.

(6) The water absorption (by weight) shall be not more than 5 percent.

(7) The decrease in tensile strength and ultimate elongation after aging shall be not more than 20 percent.

(8) There shall be no sign of failure due to brittleness at a temperature of minus 35°F.

b. Class II Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.4.

(3) The tensile strength shall be not less than 1400 pounds per square inch.

(4) The ultimate elongation of the web shall be not less than 280 percent and that of the flanges shall be not less than 200 percent.

(5) There shall be no sign of failure due to flange brittleness at a temperature of 0°F nor of web brittleness at a temperature of minus 35°F.

(6) The decrease in either tensile strength or ultimate elongation after accelerated extraction shall be not greater than 15 percent.

(7) As a result of the effects of alkalies:

(a) After immersion for 7 days, the sample shall exhibit no loss of weight and not more than 0.25 percent increase in weight, and the hardness (Shore A) of the treated sample shall differ from that of the untreated sample by not more than plus 5 points or minus 5 points.

(b) After immersion for 30 days, the sample shall exhibit no loss of weight and not more than 0.40 percent increase in weight, and the dimensions of the treated sample shall not differ from those of the untreated sample by more than one percent.

4. TEST METHODS

Testing shall be done by the methods cited herein. All cited test methods are included in Federal Test Method Standard No. 601.

a. Hardness shall be determined by Method 3021.

b. Specific gravity shall be determined by Method 14011.

c. Tensile strength shall be determined by Method 4111.

d. Ultimate elongation shall be determined by Method 4121.

e. Compression set shall be determined by Method 3311.

f. Water absorption shall be determined by Method 6631.

g. Tensile strength and ultimate elongation after aging shall be determined by Method 7111.

h. Brittleness shall be determined by Method 5311-1.

i. Accelerated extraction shall be accomplished by Method 6111 under the following conditions:

(1) Samples shall be not less than 1/16-inch nor more than 1/8-inch in thickness;

(2) The immersion medium shall be a solution made by dissolving 5 grams of chemically pure sodium hydroxide and 5 grams of chemically pure potassium hydroxide in one liter of distilled water;

(3) The samples shall be immersed in the medium for 14 days at a temperature of 145° ± 5°F;

(4) During the immersion period, air shall be gently bubbled through the medium from a 1/4-inch glass tube at a rate of about one bubble per second;

(5) Fresh medium shall be substituted every day;

(6) Samples need not be dipped in acetone.

j. The effects of alkalies shall be determined by Method 6251 under the following conditions:

(1) Sample shall be not more than 1/4-inch in thickness;

(2) The immersion medium shall be as described in (i), above;

(3) Fresh medium shall be substituted every 7 days.

(4) The samples shall be immersed in the medium for a period of 30 days;

(5) Samples need not be dipped in acetone.

5. CONDITION

Waterstops shall be extruded or molded in such a manner that the material is dense and homogeneous throughout and free from voids, tears, thins, indentations, or other imperfections. Unless otherwise specified, waterstops shall be symmetrical in shape and uniform in dimensions and shall be furnished in continuous strips at least 50 feet long. Factory splices shall have a tensile strength equal to at least one-half that of the unspliced section.

6. PACKAGING AND STORING

Waterstops shall be packaged and stored by methods that will protect them from prolonged exposure to direct sunlight or excessive heat.

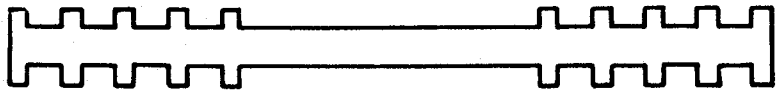
TABLE 1. SIZES OF WATERSTOPS

Size Designation	Web Thickness (T) (Inches)	Width (W) (Inches)
1	1/16	5 1/4
2	3/32	3 3/4
3	3/32	4
4	3/32	5 1/4
5	3/32	6
6	1/8	4
7	1/8	5 1/4
8	1/8	6
9	5/32	4
10	5/32	4 1/2
11	5/32	9
12	3/16	4
13	3/16	5
14	3/16	6
15	3/16	9
16	1/4	6
17	1/4	9
18	3/8	5
19	3/8	6
20	3/8	9
21	1/2	6
22	1/2	9
23	1/2	12

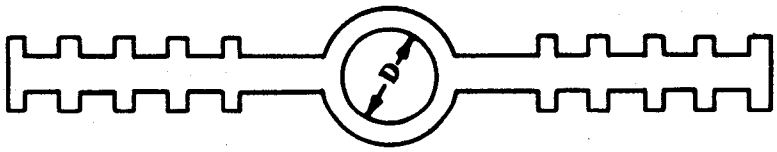
FIGURE 1

TYPES OF NON-METALLIC WATERSTOPS

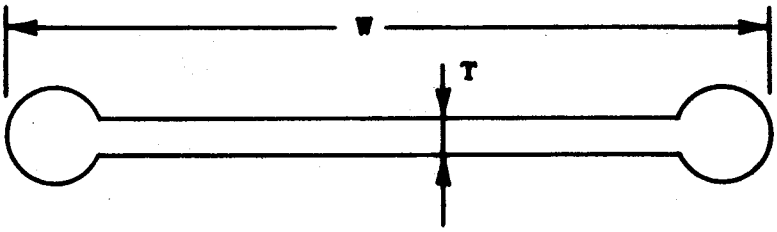
TYPE A



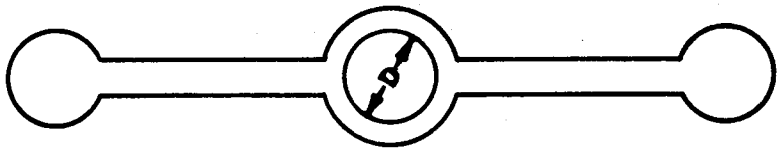
TYPE B



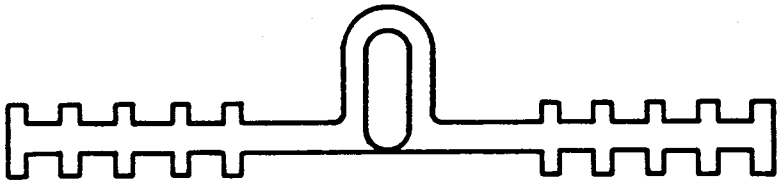
TYPE C



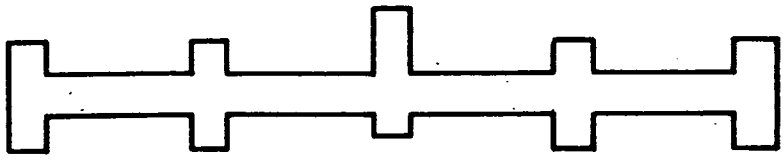
TYPE D



TYPE E



TYPE F



MATERIAL SPECIFICATION

538. METAL WATERSTOPS

1. SCOPE

This specification covers the quality of materials for metal waterstops.

2. MATERIALS

Metal waterstops shall be made of copper or galvanized steel as specified. Waterstops that require forming of the metal involving sharp bends shall be made of copper which shall be soft enough to stand being bent cold through 180 degrees at an inside radius equal to its thickness without cracking.

3. QUALITY

Metal for waterstops shall conform to the requirements of the applicable ASTM standard specifications below:

Copper - ASTM Specification B 152

Zinc-coated (Galvanized) steel - ASTM Specification A 526

MATERIAL SPECIFICATION

539. STEEL REINFORCEMENT (FOR CONCRETE)

1. SCOPE

This specification covers the quality of steel reinforcement for reinforced concrete.

2. QUALITY

All reinforcement shall be free from rust, oil grease, paint or other deleterious matter.

Steel bars for concrete reinforcement requiring bends shall be deformed billet-steel bars conforming to ASTM Specification A 615, Grade 40 or Grade 60.

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

Deformed Billet-Steel Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM Designation A 615.

Rail-Steel Deformed Bars for Concrete Reinforcement (Grade 50 or Grade 60) - ASTM Designation A 616.

Axle-Steel Deformed Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM Designation A 617.

Fabricated steel bar mats shall conform to the requirements of ASTM Specification A 184.

Welded steel wire fabric reinforcement shall conform to the requirements of ASTM Specification A 185.

Welded deformed steel wire fabric for concrete reinforcement shall conform to the requirements of ASTM Specification A 497.

Cold-drawn steel wire reinforcement shall conform to the requirements of ASTM Specification A 82.

Deformed steel wire for concrete reinforcement shall conform to the requirements of ASTM Specification A 496.

3. DIMENSIONS OF WELDED WIRE FABRIC

Gauges, spacing and arrangement of wires in welded steel wire fabric shall be as defined in ACI Standard 315 of the American Concrete Institute for the specified style designations.

4. STORAGE

Steel reinforcement stored at the site of the work shall be stored above the ground surface on platforms, skids or other supports and shall be protected from mechanical injury and corrosion.

MATERIAL SPECIFICATION

541. REINFORCED CONCRETE PRESSURE PIPE

1. SCOPE

This specification covers the quality of reinforced concrete pressure pipe and fittings.

2. DESIGN AND FABRICATION

The pipe and fittings shall be designed to withstand the specified external load and internal pressure. The pipe, the materials used in its manufacture, and the methods of fabrication shall conform to the requirements of the following specifications applicable to the specified type of pipe.

a. Steel Cylinder Type, Prestressed: AWWA Standard C301 for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.

b. Steel Cylinder Type, Not Prestressed: AWWA Standard C300 for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.

c. Noncylinder Type, Not Prestressed: AWWA Standard C302 for Reinforced Concrete Pressure Pipe, Noncylinder Type, for Water and Other Liquids.

d. Low Head Pressure Pipe: ASTM Specification C361.

Sections 1.5 and 1.6 of AWWA Standards C300, C301 and C302 shall not apply.

3. STEEL REINFORCEMENT

The steel reinforcements shall conform to the requirements of the specifications cited in Section 2 for the specified type of pipe, except that elliptical reinforcing cages or other reinforcements that require special orientation of the pipe during placement will not be allowed.

4. JOINTS

The pipe joints shall conform to the requirements of the applicable specification for the pipe. They shall be bell-and-spigot type or double-spigot-and-sleeve type and shall have a positive groove in the spigot to contain the rubber gasket. The size and shape of the groove shall be such that it will prevent displacement of the gasket by either internal or external water pressure when the joint is in any position within the required range of movement capability. Joint sleeves, also referred to as "collars" or "coupling bands," shall conform to the requirements for bell rings in the applicable pipe specification.

The joints shall be constructed so as to permit relative movement of the adjoining pipe sections with no reduction of watertightness. The joint length and the limiting angle defining the required capability of relative movement at each joint shall be no less than specified.

Joint length refers to the permissible axial movement in the joint, and is defined as the maximum distance through which the spigot can move, relative to the bell or sleeve, from the fully engaged to the fully extended condition of the joint when the adjoining pipe sections are in parallel, concentric alignment. The joint is considered to be fully engaged when the spigot is inserted as far as it will go into the bell or sleeve, and fully extended when it is inserted the least amount that will insure full confinement of the gasket and complete watertightness.

Joint length specified for double-spigot joints refers to the permissible movement in each of the spigot-to-sleeve connections, not the sum of the two.

The limiting angle of the joint is defined as the maximum deflection angle between adjoining pipe sections the joint will permit before the outer surface of the spigot comes into direct contact with inside of the mating bell or sleeve. If both spigot-to-sleeve connections of a double-spigot joint permit angular movement, the limiting angle of the joint is the sum of the two deflection angles permitted by the two connections.

5. GASKETS

The pipe joint gaskets shall conform to the requirements of the specifications cited in Section 2 of this specification. They shall be endless rubber gaskets having circular cross section. The cross-sectional diameter of the gaskets shall conform to the pipe manufacturer's recommendation for the type and size of pipe furnished.

6. MARKING

All pipe sections and special fittings shall be marked by the manufacturer with the manufacturer's name or trademark, the date of manufacture, the nominal size, design head, design external load and the structure site for which it was designed and manufactured.

7. INSPECTION, TESTING, AND CERTIFICATION

The pipe shall be inspected by methods prescribed in the specifications cited herein, except that external crushing strength tests required as a basis for certification shall be performed by the three-edge bearing method described in ASTM Methods C497.

The three-edge bearing load shall be defined as:

a. For pipe conforming to ASTM Specification C361, AWWA Standard C300 or AWWA Standard C302, the load required to produce a 0.01-inch crack one foot long; or,

b. For pipe conforming to AWWA Standard C301, the load required to produce a 0.001-inch crack one foot long or the load 10 percent greater than the specified three-edge bearing load, whichever occurs first.

The technical materials including test data and other information shall include:

a. The pipe manufacturer's supporting data of the design strength of the pipe, consisting of:

   (1) For types of pipe for which design curves have been approved by the Soil Conservation Service, (a) a copy of the appropriate design curve marked to show the resultant concrete core stress and corresponding three-edge bearing load of the pipe furnished; and (b) a specification sheet for the pipe furnished showing all data and dimensions needed to compute the resultant concrete core stress; or

   (2) Results of external crushing strength tests on pipe or specimen (at least 2 feet in length) of equivalent size and design and composed of equivalent materials.

b. The pipe manufacturer's supporting data of the hydrostatic tests required by the reference specification appropriate to the type of pipe furnished.

c. The pipe manufacturer's supporting data of current typical test reports on steel and steel wire reinforcing and compression tests of the concrete used in the manufacture of the pipe.

d. Such drawings and descriptions of the pipe joint as may be necessary to show that the joint conforms to the specified requirements.

MATERIAL SPECIFICATION

581. METAL

1. SCOPE

This specification covers the quality of steel and aluminum alloys.

2. STRUCTURAL STEEL

Structural steel shall conform to the requirements of ASTM Specification A 36.

High-strength low-alloy structural steel shall conform to ASTM Specification A 242 or A 588.

Carbon steel plates of structural quality to be bent or formed cold shall conform to ASTM Specification A 283, Grade C.

Carbon steel sheets of structural quality shall conform to ASTM Specification A 570, Grade D or A 611, Grade D.

Carbon steel strip of structural quality shall conform to ASTM Specification A 570, Grade C.

3. COMMERCIAL OR MERCHANT QUALITY STEEL

Commercial or merchant quality steel shall conform to the requirements of the applicable ASTM specifications listed below:

Product	ASTM Specification
Carbon steel bars	A 575, Grade M 1015 to Grade M 1031
Carbon steel sheets	A 569
Carbon steel strip	A 569
Zinc-coated carbon steel sheets	A 526

4. ALUMINUM ALLOY

Aluminum alloy products shall conform to the requirements of the applicable ASTM specifications listed below. Unless otherwise specified, alloy 6061-T6 shall be used.

Product	ASTM Specification
Standard structural shape	B 308
Extruded structural pipe and tube	B 429

Extruded bars, rods, shapes and tube	B 221
Drawn seamless tubes	B 210
Rolled or cold-finished bars, rods and wire	B 211
Sheet and plate	B 209

5. Bolts

Steel bolts shall conform to the requirements of ASTM Specification A 307. If high-strength bolts are specified they shall conform to the requirements of ASTM Specification A 325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Specification A 153; except that bolts 1/2 inch or less in diameter may be coated with electrodeposited zinc or cadmium coating conforming to the requirements of ASTM Specification B 633, Service Condition SC 3 or ASTM Specification A 165, Type TS, unless otherwise specified.

6. RIVETS

Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Specification A 502, Grade 1. Unless otherwise specified, aluminum alloy rivets shall be Alloy 606-T6 conforming to the requirements of ASTM Specification B 316.

7. WELDING ELECTRODES

Steel welding electrodes shall conform to the requirements of American Welding Society specification AWS A5.1. "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."

☆U.S. Government Printing Office : 1986 -180-917/40702

MATERIAL SPECIFICATION

582. GALVANIZING

1. SCOPE

This specification covers the quality of zinc coatings applied to iron and steel products.

2. QUALITY

Zinc coatings shall conform to the requirements of ASTM Specification A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products or as otherwise specified in the items of work and construction details of the Construction Specification.

ASTM A 123 covers both fabricated and unfabricated products e.g., assembled steel products, structural steel fabrications, large tubes already bent or welded before galvanizing, and wire work fabricated from uncoated steel wire. It also covers steel forgings and iron castings incorporated into pieces fabricated before galvanizing or which are too large to be centrifuged (or otherwise handled to removed excess galvanizing bath metal). Items to be centrifuged or otherwise handled to remove excess zinc shall meet the requirements of ASTM A 153, except: Bolts, screws and other fasteners 1/2 inch or less in diameter may be coated with electrodeposited zinc or cadmium coating conforming to the requirements of ASTM Specification A 165, Type TS, or ASTM Specification B 633, Service Condition SC-3 unless otherwise specified.

MATERIAL SPECIFICATION

584. STRUCTURAL TIMBER AND LUMBER

1. SCOPE

This specification covers the quality of structural timber, lumber and plywood.

2. GRADING

Structural timber and lumber shall be graded in accordance with the grading rules, applicable to the specified species, adopted by a lumber grading or inspection bureau or agency recognized as being competent and that conform to the basic principles of ASTM Methods D 245. The material supplied according to the commercial grading rules shall be of equal or greater stress value than the specified stress-grade.

Plywood shall conform to the requirements of Product Standard PS 1-74 for the grade, species or group, and type specified.

3. QUALITY

All materials shall be sound wood free from decay. No boxed heart pieces of Douglas fir or redwood shall be used in stringers, floor beams, caps, posts, sills or other principal structural members. Boxed heart pieces are defined as timber so sawed that at any section in the length of a sawed piece the pith lies entirely inside the four faces.

4. HEARTWOOD REQUIREMENTS

All timber and lumber specified for use without preservative treatment shall contain not less than 75 percent heartwood on any diameter or on any side or edge, measured at the point where the greatest amount of sapwood occurs. This requirement shall not apply to timber and lumber for which pressure treatment with wood preservative is specified.

5. SIZES

The sizes specified are nominal sizes. Unless otherwise specified the material shall be furnished in American Standard dressed sizes.

6. MARKING

Each piece of timber and lumber shall be legibly stamped or branded with an official grade mark. Plywood shall be legibly stamped with an official mark designating the grade, type and surface finish as described in the cited Product Standard.

MATERIAL SPECIFICATION

585. WOOD PRESERVATIVES AND TREATMENT

1. SCOPE

This specification covers the quality of wood preservatives and methods of treatment of wood products.

2. TREATING PRACTICES

Treating practices and sampling, inspection and test procedures shall conform to the requirements of Federal Specification TT-W-571, "Wood Preservation: Treating Practices."

3. PRESERVATIVES

The wood shall be treated with the specified type of preservative. Wood preservatives shall conform to the requirements of the applicable specifications listed in Federal Specification TT-W-571.

4. QUALITY OF TREATED MATERIALS

Treated lumber, timber, piles, poles, or posts shall be free from heat checks, water bursts, excessive checking, results of chafing or from any other damage or defects that would impair their usefulness or durability for the purpose intended. The use of "s" irons will not be permitted. Holes bored for tests shall be filled with tight fitting treated plugs.

5. MARKING

Each treated wood item delivered to the job site shall be marked as specified in Federal Specification TT-W-571 unless otherwise specified.

MATERIAL SPECIFICATION

591. FARM FIELD FENCING MATERIALS

1. SCOPE

This specification covers the quality of materials used in the construction of farm field fences.

2. WIRE GAUGE

When the size of steel wire is designated by gauge number, the diameter shall be as defined for U.S. Steel Wire Gauge.

3. FENCING

Barbed wire, woven wire and wire netting fencing shall conform to the requirements of Federal Specification RR-F-221 for the specified types and styles of fencing. Barbed wire and woven wire shall have zinc coating of at least 0.50 ounce per square foot of wire surface unless otherwise specified.

4. STAYS, FASTENERS, AND TENSION WIRE

Stays and fasteners shall conform to the requirements of Federal Specification RR-F-221 unless otherwise specified. Tension wires shall have a tensile strength not less than 58,000 pounds per square inch. Stays, fasteners and tension wire shall have Class 3 zinc coating as specified in ASTM Specification A 641.

5. WOOD FENCE POSTS AND BRACES

Wood posts shall be of black locust, red cedar, osage orange (Bois d'Arc), redwood, pressure treated pine or other wood of equal life or strength. At least half the diameter or diagonal dimension of red cedar or redwood posts shall be in heartwood. Pressure treatment shall conform to Material Specification 585. The posts shall be sound, new, free from decay, with all limbs trimmed substantially flush with the body. They shall be substantially straight throughout their length.

Wood braces shall be of material equal to or better than construction grade Douglas fir. They shall be pressure treated in conformance with Material Specification 585.

6. STEEL FENCE POSTS AND BRACES

Steel fence posts and braces shall conform to the requirements of Federal Specification RR-F-221. Posts with punched tabs for fastening the wires shall not be used.

7. CONCRETE FENCE POSTS

Concrete fence posts shall be manufactured to the specified requirements of size, shape, and strength.

8. PANEL GATES

Panel gates shall be the specified types, sizes, and quality and shall include the necessary fittings. The fittings shall consist of not less than two hinges and two latches or galvanized chains for fastening. Latches shall be of such design that a padlock may be used for locking. All fittings shall be equivalent to the gate manufacturer's standard.

9. WIRE GATES

Wire gates shall be the type shown on the drawings, constructed in accordance with these specifications at the locations and to the dimensions shown on the drawings. The materials shall conform to the kinds, grades, and sizes specified for new fence, and shall include the necessary fittings and stays.

10. STAPLES

Staples used to fasten fence wire to wood posts shall be 9-gage galvanized wire with a minimum length of 1-1/2 inches for soft woods and a minimum length of one inch for close-grain hardwoods.

11. GALVANIZING

All iron and steel fencing materials, except as otherwise specified, shall be zinc coated by the hot dip process, except that clips, bolts, and other small hardware may be protected by electrodeposited zinc or cadmium coating.

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