

PRELIMINARY
SPECIFICATIONS

for

VINEYARD ROAD RETARDING STRUCTURE

Williams Chandler W.P.P.
Pinal County, Arizona



A320.501

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. 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 locations approved by the Engineer or otherwise removed from the site.

5. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the cleared and grubbed areas will be measured to the nearest 0.1 acre. Payment for clearing and grubbing will be made at the contract unit price and shall 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, each tree, snag and log 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. Diameter shall be determined by dividing the measured circumference by 3.14.

Payment will be made only for clearing, grubbing and disposal of each tree 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.

Payment for clearing, grubbing and disposal of each tree, snag and log will be made at the contract unit price for its size designation as determined by the following schedule:

<u>Measured Diameter</u> <u>(At breast height)</u>	<u>Size</u> <u>Designation</u>
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 summation 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, snags and logs and brush, shrubs, stumps, roots and rubbish.

(Method 3) 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 and shall 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.

XERO COPY XERO COPY XERO COPY

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 1. Clearing and Grubbing

1. This item shall consist of the clearing and grubbing of the construction area of the embankment, borrow area, the area between the embankment and borrow area, and construction area of the diversions, emergency spillway, ~~outlet channel~~ *floodway* and other appurtenant structures within the limits shown on the drawings.
2. The work shall also include the clearing of grass and sod and weeds from designated areas.
3. Measurement and payment will be made in accordance with Method 1.

CONSTRUCTION SPECIFICATION

4A EXCAVATION

1. SCOPE

The work shall consist of the excavation of all materials necessary for the construction of the work.

2. CLASSIFICATION

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

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the combined or separate use of heavy ripping equipment and wheel tractor-scrappers and 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 not more than 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.

The class of excavation will be determined by the Engineer on the basis of his determination of the character of the materials to be excavated and the prevailing site conditions.

The presence of isolated boulders or rock fragments larger than one cubic yard in size will not in itself be considered 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 tractor-mounted, heavy duty, single-tooth, ripping attachment mounted on a tractor having a power rating of at least 200 net horsepower (at the flywheel).

Wheel tractor scraper shall be defined as a self-loading and unloading scraper having a struck bowl capacity of at least 12 yards.

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

3. UNCLASSIFIED EXCAVATION

Items of excavation 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. USE OF EXCAVATED MATERIALS

All suitable materials removed from the specified excavations may be used in the construction of the specified earth or rock filled portions of the permanent works. The suitability of materials for specific purposes will be determined by the Engineer.

5. DISPOSAL OF WASTE MATERIALS

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

6. SPECIAL REQUIREMENTS FOR STRUCTURE AND TRENCH EXCAVATION

The side slopes necessary to maintain the stability of excavated surfaces may not necessarily coincide with the pay limits specified for structure excavation or trench excavation. Such works shall be so excavated, braced and supported as to safeguard the work and workmen, to provide that ground adjacent to the excavation will not slide or settle and to prevent damage to adjacent existing improvements. When such bracing and supporting is required the width of the excavation shall be adjusted to allow for the space occupied by the sheeting, bracing or other supporting installations. The Contractor shall furnish, place and subsequently remove such supporting installations.

Such excavations 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 earth fill is placed or any piles are driven within the limits of the excavation.

7. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified

excavations are insufficient to construct the specified fill portions of the permanent works, additional materials shall be obtained from the designated borrow areas. The Engineer shall designate the extent of borrow pits within the limits of the designated borrow areas and the limits of the depth of cut in all parts of the borrow pits.

Borrow pits shall be excavated and finally dressed in a manner to prevent the creation of residual hazards or unsightly conditions by reason of steep or unstable side slopes.

8. OVEREXCAVATION OF STRUCTURE SUBGRADE

Excavation in rock beyond the limits of the specified cross sections and elevations shall be corrected by filling the resulting voids to the specified contours and elevations with portland cement concrete, Class 2500 or better.

Excavation in earth beyond the limits of the specified cross sections and elevations shall be corrected by filling the resulting voids to the specified contours and elevations with approved compacted earth fill.

9. DIVERSION AND REMOVAL OF WATER

The Contractor shall furnish, install, maintain, operate and subsequently remove all temporary facilities and equipment necessary to divert or impound surface water and remove ground water from the site of the work in accordance with the provisions of Construction Specification 25.

10. 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 will be measured within the specified limits 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.

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

(Method 2) The pay 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 ex-

cept that where structure excavation is performed within a trench, channel or roadway or in areas designated for other previous excavation, the upper limit shall be the planes of the bottoms and side slopes of those trenches or channels or the modified ground surface resulting from the previous excavation.

- b. The lower limit shall be the elevation of the bottom of the proposed footings, floor slabs, pipe cradles and bedding except that for structures underlain by a continuous drainage blanket the lower limit shall be the elevation of the bottom of the drainage blanket.
- c. For cradled pipe conduits, box culverts or structures with vertical walls, the lateral limits shall be the vertical planes 18 inches outside of and parallel to the neat lines of the footings, floor slabs or pipe cradles. For structures with sloping sidewalls extending outward beyond the plan limits of the floor slab, the lateral limits shall be the planes of the bottom surfaces of the proposed side walls.
- d. When it is required to perform structure excavation in new embankment or other fill, the upper limit shall be the planes of the upper surfaces of the fill at the time the excavation is made.

(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 other previous excavation the upper limit shall be the modified ground surface resulting from the previous excavation.
- b. The lower and lateral limits shall be the true surface of the completed excavation.

(Method 5) 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 other previous excavation the upper limit shall be the modified ground surface resulting from the previous excavation.
- b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

(Applies To All Methods)

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. No compensation will be made for the removal and disposal of materials that may come into an excavation from outside the designated limits for any reason.

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.



XERO COPY XERO COPY XERO COPY XERO COPY

11. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. General

1. All excavated materials for all types of excavation will be unclassified.
2. When it is determined by the Engineer that the subgrade is too wet, unstable or the material is unsuitable for embankment or structure foundations, it shall be removed to the depth and extent determined by the Engineer. Removal of unsuitable materials and refilling of voids resulting therefrom will be paid for only where such unstable subgrade is not the result of inadequate pumping or drainage by the Contractor. Materials used or work performed by the Contractor beyond the contract requirements in order to stabilize subgrade so that it will withstand travel of his equipment, shall be at the Contractor's own expense. Payment for excavation of such material ordered by the Engineer will be made at the contract unit price for the type of excavation done. Payment for refilling the excavation ordered by the Engineer shall be made at the contract unit price for the type of fill placed.

B. Bid Item 2. Excavation, channel.

1. This item consists of the excavation of the Emergency Spillways, the diversion ditches into the reservoir, and outlet channel from the Principal Spillway including excavation for riprap.

It does not include grader ditches as shown on the drawings.

2. Finished surfaces shall not vary more than 0.2 feet above or ~~0.5~~^{0.3} feet below grade except on the crest section of the emergency spillways where the finished surface shall not be more than 0.2 feet below or 0.1 above grade.
3. Measurement for payment will be made in accordance with Method 5. The excavation of ditches indicated on the drawings as grader ditches will not be measured and paid for as a separate item. The cost therefor shall be considered as included in the contract unit price paid for Bid Item 2., Channel Excavation.

C. Bid Item 3. Excavation Trench

1. This item shall consist of the excavation for the cutoff trench, the principal spillway pipeline, cradle, and collars, and the gated outlets, pipelines and collars and any material unsuitable for the foundation of the ~~dam~~^{embankment} that has been ordered removed by the Engineer.
2. The final depths and extent of the cutoff trench will be determined in the field by the Engineer.
3. Measurement for payment will be made in accordance with Method 4.

D. Bid Item 4. Excavation Structure

1. This item of work consists of the excavation for the inlet and outlet structures for the principal spillway and gated outlet pipes. It does not include the excavation for the principal spillway outlet pipe, cradle and cutoff collars and the gated outlet pipes and collars.

3. Measurement for payment will be made in accordance with Method 3.

E. Subsidiary Item. Excavation, Borrow

1. This item shall consist of the excavation from the borrow areas shown on the drawings that is required to construct the embankments, including the minimum borrow channel and inlet channels to the principal spillway and gated outlets, and excavation for stock ponds in the borrow area.
2. The borrow area shall be excavated to construct a graded minimum borrow channel as shown on the drawings. Borrow material required in excess of material in this minimum borrow channel shall be obtained by extending the width of the channel from the embankment and in ~~no case~~ ^{not} by excavating below the bottom of the borrow channel unless excavating for a stock pond or otherwise authorized by the Engineer.
3. If during excavation of the borrow area coarse material is exposed that in the opinion of the Engineer requires further excavation and/or blanketing with selected material such excavation will be paid for only if it is determined by the Engineer to be unsuitable for earth fill embankment. When such excavation material is unsuitable and wasted it shall be measured and paid for as trench excavation.
4. Borrow excavation will not be paid for as a separate item. The cost therefor will be considered as included in the contract price paid for Earth Fill Bid Item 5 and 6;

CONSTRUCTION SPECIFICATION

5A EARTH FILL

1. SCOPE

The work shall consist of the construction of all earth fills necessary for construction of the works.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing and disposition of materials within 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 from the materials prior to compaction of the fill.

The types of materials to be used in the various parts of the permanent works are listed and described in the construction details and drawings.

3. PLACEMENT

Fill shall not be placed until the required excavation and preparation of the underlying foundation is completed and inspected and approved by the Engineer.

The fill shall be so constructed that the distribution of materials throughout each specified zone will be essentially homogeneous and free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material in the zone. No fill shall be placed upon a frozen surface nor shall snow, ice or frozen material be incorporated in the fill.

Embankment fill shall be placed in approximately horizontal layers extending the entire length and width of the embankment. Unless otherwise specified, the elevation of the embankment surface shall be increased at approximately the same rate at all points regardless of the number of zones or types of material being placed, except that: (1) the boundary surfaces of drain fills shall be protected as specified in Construction Specification 7, and (2) during construction the surface of the fill shall be maintained with a crown or cross-slope of not less than 2 percent to insure effective surface drainage. Where sectional construction is authorized the additional requirements specified in Section 6 of this specification shall apply.

The thickness of each layer of fill shall be not greater than that required to achieve the specified compaction and in no case shall exceed that specified for the designated type of fill.

Materials placed on the fill by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness prior to compaction.

Adjacent to structures fill shall be placed in a manner adequate to prevent damage to the structure and to allow the structure to gradually and uniformly assume the backfill loads. Hand compacted backfill shall be placed in layers not thicker than 4 inches. The height of the backfill shall be increased at approximately the same rate on all sides of the structure during placement.

4. CONTROL OF MOISTURE CONTENT

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 discing, blading or other approved methods prior to compaction of the layer.

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

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

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

5. COMPACTION

The Contractor shall furnish and operate the types and kinds of equipment necessary to compact the fill materials in the specified manner or to the specified density.

For the purpose of this specification, compaction requirements are classified as follows:

- a. Class A compaction is the compaction of the fill to such a degree that the fill matrix attains a density at least equal to the specified percentage of the maximum density obtained in compaction tests of the fill matrix. The fill

XERO COPY XERO COPY XERO COPY

except that, when directed by the Engineer, excavation of unsuitable embankment material in the graded minimum borrow channel or unsuitable material described in paragraph 3 will be measured and paid for as trench excavation.

matrix is defined as that fraction of the fill material having a maximum size equal to that used in the compaction test method specified for the type of fill. The compaction test method and the percent compaction required in each part of the works are specified in the construction details and drawings.

- b. Class P compaction is the compaction of the fill by four passes per layer of fill of a pneumatic tired roller weighing at least 50 tons (static service weight).
- c. Class S compaction is the compaction of the fill by either:
(1) the routing of the hauling and spreading equipment over the fill in such a manner that every point on the surface of each layer of fill will be traversed by not less than one tread track of the loaded equipment traveling in a direction parallel to the main axis of the fill; or,
(2) equivalent methods approved by the Contracting Officer.
- d. Class T compaction is the compaction of the fill by means of a tamping roller. The characteristics of the roller, the number of passes per layer of fill and the towing speed shall be as specified in the construction details.
- e. Class V compaction is the compaction of the fill by four passes per layer of fill of a smooth-wheel vibrating roller at least 72 inches wide, weighing at least one ton (static service weight) per foot of width and capable of exerting a dynamic impact of at least 20,000 pounds at the rate of at least 1200 times per minute.
- f. Class X compaction is the compaction of the fill by either:
(1) four passes per layer of a crawler-type tractor weighing at least 40,000 pounds; (2) two passes per lift of a smooth-wheel vibrating roller at least 72 inches wide, weighing at least one ton (static service weight) per foot of width and capable of exerting a dynamic impact of at least 20,000 pounds at the rate of at least 1200 times per minute; or, (3) two passes of a pneumatic tired roller weighing at least 50 tons (static service weight).

The compaction equipment shall traverse the entire surface of each layer of material the number of times required to accomplish the specified compaction.

Adjacent to structures, compaction of fill shall be accomplished by means of hand tamping or manually directed power tampers or plate vibrators. Heavy equipment, except vibrating rollers, shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure.

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 precast conduits prior to 7 days after placement of the concrete cradle; 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.

Compaction of fill adjacent to structures may begin after the expiration of the following minimum time intervals after placement of concrete:

Walls and counterforts	10 days
Conduits, cast-in-place (with inside forms in place)	7 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Antiseep collars and cantilever outlet bents	3 days

6. SPECIAL REQUIREMENTS FOR SECTIONAL CONSTRUCTION OF EMBANKMENTS

When sectional (or phase) construction of embankments is authorized, the work shall be accomplished in the following manner:

Each section of the embankment that is constructed in the first phase shall be so placed that a slope not steeper than 3 feet horizontal to 1 foot vertical is maintained at the end of the embankment section adjacent to the gap in construction or closure section.

Prior to placement of the closure sections the surfaces of completed fills and excavations that will be in contact with the closure fill shall be stripped of all loose material, scarified, moistened and recompacted as necessary.

During placement of the closure fill each layer shall be spread in a manner that will insure good bond between the two sections of fill when the new fill is compacted.

7. 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

matrix is defined as that fraction of the fill material having a maximum size equal to that used in the compaction test method specified for the type of fill. The compaction test method and the percent compaction required in each part of the works are specified in the construction details and drawings.

- b. Class P compaction is the compaction of the fill by four passes per layer of fill of a pneumatic tired roller weighing at least 50 tons (static service weight).
- c. Class S compaction is the compaction of the fill by either:
(1) the routing of the hauling and spreading equipment over the fill in such a manner that every point on the surface of each layer of fill will be traversed by not less than one tread track of the loaded equipment traveling in a direction parallel to the main axis of the fill; or,
(2) equivalent methods approved by the Contracting Officer.
- d. Class T compaction is the compaction of the fill by means of a tamping roller. The characteristics of the roller, the number of passes per layer of fill and the towing speed shall be as specified in the construction details.
- e. Class V compaction is the compaction of the fill by four passes per layer of fill of a smooth-wheel vibrating roller at least 72 inches wide, weighing at least one ton (static service weight) per foot of width and capable of exerting a dynamic impact of at least 20,000 pounds at the rate of at least 1200 times per minute.
- f. Class X compaction is the compaction of the fill by either:
(1) four passes per layer of a crawler-type tractor weighing at least 40,000 pounds; (2) two passes per lift of a smooth-wheel vibrating roller at least 72 inches wide, weighing at least one ton (static service weight) per foot of width and capable of exerting a dynamic impact of at least 20,000 pounds at the rate of at least 1200 times per minute; or, (3) two passes of a pneumatic tired roller weighing at least 50 tons (static service weight).

The compaction equipment shall traverse the entire surface of each layer of material the number of times required to accomplish the specified compaction.

Adjacent to structures, compaction of fill shall be accomplished by means of hand tamping or manually directed power tampers or plate vibrators. Heavy equipment, except vibrating rollers, shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure.

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 precast conduits prior to 7 days after placement of the concrete cradle; 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.

Compaction of fill adjacent to structures may begin after the expiration of the following minimum time intervals after placement of concrete:

Walls and counterforts	10 days
Conduits, cast-in-place (with inside forms in place)	7 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Antiseep collars and cantilever outlet bents	3 days

6. SPECIAL REQUIREMENTS FOR SECTIONAL CONSTRUCTION OF EMBANKMENTS

When sectional (or phase) construction of embankments is authorized, the work shall be accomplished in the following manner:

Each section of the embankment that is constructed in the first phase shall be so placed that a slope not steeper than 3 feet horizontal to 1 foot vertical is maintained at the end of the embankment section adjacent to the gap in construction or closure section.

Prior to placement of the closure sections the surfaces of completed fills and excavations that will be in contact with the closure fill shall be stripped of all loose material, scarified, moistened and recompacted as necessary.

During placement of the closure fill each layer shall be spread in a manner that will insure good bond between the two sections of fill when the new fill is compacted.

7. 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

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. General

1. Maximum dry density of fill materials will be determined by laboratory procedures outlined in ASTM Designation D698 Method A.
2. During the compaction and filling operations, the abutments at the level of the fill surface, the surface of the fill, and the materials being placed shall be maintained within a moisture content range of between 3 percent below and 2 percent above optimum moisture.
3. The maximum size of rock fragments incorporated in the fill shall be six (6) inches.
4. Sectional construction of all embankments will be permitted.

B. Bid Item 5. Earth Fill Embankment

1. This item shall consist of the earth fill required for the construction of the embankment of ~~Rittenhouse~~ *Vingard Road* Floodwater Retarding Structure, including the refilling of the cutoff trench and the backfill of the concrete pipe cradle and collars of the gated outlet. It also includes the ramp crossings shown on the drawings, the earthfill dikes along the emergency spillways, diversion dikes as shown the drawings and any blanket fill that may be required over coarse material exposed in the borrow excavation.
2. After completion of all required clearing and grubbing the foundation area of the dam shall be moistened to a minimum

XERO COPY XERO COPY XERO COPY

depth of six (6) feet. After the moistening of the foundation, the excavation of the cutoff trench and the removal of unsuitable foundation materials, the foundation area shall be loosened thoroughly by scarifying or discing to a maximum depth of 8 inches, except where the requirements are waived by the engineer. Roots, rock over 6 inches in diameter or other debris turned up in the loosening process, shall be removed and the entire surface area of the section of foundation shall be compacted to the same density as hereinafter specified for the dam embankment. Compaction operations shall be conducted when the moisture range in the foundation is within the range specified for earth fill embankment.

3. The compaction of the earth fill for dam embankment shall be Class A and be compacted to 95 percent of maximum dry density.
4. The thickness of each layer of fill placed in the embankments shall not be greater than eight (8) inches before compaction.
5. Unless otherwise authorized by the engineer, the cutoff trench shall be excavated not less than 100 feet or more than 250 feet beyond the end of the section of fill to be immediately placed.
6. The top width of the finished dam shall be graded with an eight (8) inch slope from the downstream to the upstream face of the dam.
7. Haul ramps constructed for the convenience of the contractor for placing the fill material in the embankments shall be removed after completion of the work unless otherwise directed by the Contracting Officer.

CONSTRUCTION SPECIFICATION

8B CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing and curing portland cement concrete as required in the construction of the work.

2. CLASSES OF CONCRETE

Concrete shall be classified as follows:

<u>Class of Concrete</u>	<u>Compressive Strength at 28 days (p.s.i.)</u>	<u>Maximum Net Water Content (gallons/bag)</u>	<u>Minimum Cement Content (bags/cu.yd.)</u>
5000	5000	---	---
4000	4000	---	---
3000	3000	---	---
2500	2500	---	---
5000X	----	5	7
4000X	----	6	6
3000X	----	7	5
2500X	----	8	4½

For the concrete to conform to the strength requirements of these specifications, the average of all the strength tests representing each class of concrete, as well as the average of any 5 consecutive strength tests representing each class of concrete, shall be equal to or greater than the specified strength and no strength test shall have a value less than 80 percent of the specified strength.

3. AIR CONTENT AND CONSISTENCY

The air content (by volume) of the concrete at the time of placement shall be:

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

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

<u>Type of Structure</u>	<u>Slump (Inches)</u>
Massive sections, pavements and floors	2" ± 1/2"
Heavy slabs, beams, walls (over 12 in.)	3" ± 1/2"
Columns, light beams, thin slabs, thin walls (less than 12 in.)	4" ± 1/2"

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. Such admixtures shall conform to the requirements of Material Specification 121. The cement content of the retarded mix shall be the same as that required in the mix if no admixture were used.

4. DESIGN OF THE CONCRETE MIX

For Class 5000, Class 4000, Class 3000 and Class 2500 concrete the Contractor will be responsible for the design of the concrete mixtures. Prior to any placement of concrete he shall furnish the Engineer a statement of the mix proportions (including admixtures, if any) for each specified class of concrete. The statement shall include reports of laboratory tests (performed not more than 90 days previously) showing that the proportions selected will produce concrete of adequate quality, strength and consistency. After the job mix has been so stated, neither the source, character or grading of the aggregates nor the type or brand of cement shall be changed without prior notice to the Engineer. For this purpose, proof of strength shall be based on at least three (3) strength tests (nine cylinders) of specimens prepared by the methods specified in either ASTM Designation C31 or Test Method 231, Federal Specification SS-R-406. In the event that such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has approved the revised job mix.

For Class 5000X, Class 4000X, Class 3000X, and Class 2500X concrete, the mix proportions and batch weights will be determined by the Engineer by preparation of trial mixes using the materials

accepted for use in the work. During the course of the work the Engineer will adjust the mix properties 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 shall be changed without prior notice to the Engineer. In the event that such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has designated a revised mix.

5. INSPECTING AND TESTING FRESH CONCRETE

The Engineer will inspect and test concrete at the time of delivery by any of the following methods:

	<u>ASTM Designation</u>	<u>Fed. Spec. SS-R-406 Method No.</u>
Sampling	C 172 ¹	---
Slump test	---	232.0 ¹
Air Content	C 231 ¹ or C 173 ¹	233.0 ¹
Test Cylinders	C 31	---
Compressive Strength	C 39 ²	229.0 ²
Unit Weight	---	233.0

¹Except that for the purpose of determining uniformity of consistency or when the time required to discharge a batch exceeds 30 minutes, individual samples shall be taken separately as needed.

²For each strength test, 3 standard test specimens shall be made. The test result shall be the average of the strengths of the 3 specimens, except that if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be discarded and the strengths of the remaining 2 specimens shall be averaged. Should more than one specimen representing a test show such defects, the entire test shall be discarded.

The Engineer shall have free entry at all times while work on the contract is being performed, to all parts of the manufacturer's plant and equipment which concern the manufacture of the material ordered. Proper facilities shall be provided for the Engineer to inspect ingredients and processes used in the manufacture and delivery of the concrete as well as for securing samples to determine

whether the concrete is being furnished in accordance with these specifications. All tests and inspections shall be so conducted as not to interfere unnecessarily with the manufacturing and delivery of the concrete.

6. CONCRETE MATERIALS

Portland cement shall conform to the requirements of Material Specification 100 for the specified type. One brand only of any type of cement shall be used. The temperature of the cement at the time it is introduced into the mixer shall not exceed 170°F.

Aggregates shall conform to the requirements of Material Specification 101. The size grading of coarse aggregates shall be as specified in the construction details.

Water shall be clean and free from injurious amounts of oil, acid alkali, organic matter or other deleterious substances. The water shall be subject to comparison with distilled water by means of soundness, time-of-setting, and strength tests of specimens made of 1:3 mortar consisting of cement of standard quality, standard sand and water (one series of specimens mixed with distilled water; another, mixed with the water being tested). Any indication of unsoundness, marked change in time-of-setting, or a reduction of more than 10 percent in strength from results obtained with specimens mixed with distilled water shall be sufficient cause for rejection of the water under test.

Air-entraining admixtures shall conform to the requirements of Material Specification 122.

Water-reducing, set-retarding admixtures shall conform to the requirements of Material Specification 121.

7. MEASURING CONCRETE MATERIALS

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.

Aggregate shall be measured by weight. Batch weights shall be based on dry materials and shall be the required weights of dry materials plus the total weight of moisture (both absorbed and surface) contained in the aggregate.

Water shall be measured by volume or by weight. The device for the measurement of the water shall be readily adjustable and shall

- XERO COPY XERO COPY XERO COPY
8. Backfill around and over the principal spillway pipeline, cradle and collars and the gated outlet pipeline and collars shall be compacted with manually directed power equipment in layers not greater than 4 inches thick before compaction.
 9. Measurement for payment will be made in accordance with Method 2. The initial measurement for payment will be made after foundation preparation.

C. Bid Item 6. Structure Backfill

1. This item shall consist of the required backfill for the ~~P.W.D. outlet structure and inlet structure~~ ^{inlet and outlet of the principal spillway} and inlet and outlet structures of the gated outlets. It does not include the backfill around the principal spillway outlet pipe, cradle and cutoff collars, and the gated outlet pipes and collars. *It also includes backfill for the corrugated metal pipes at stations 12+00 and 24+16 on the floodway.*
2. Materials shall be placed and spread in layers not more than four (4) inches thick after compaction.
3. The compaction of earth fill for backfill shall be Class A and be compacted to 90 percent of maximum dry density.
4. Measurement and payment will be made in accordance with Method 3.

be capable of being set to deliver the required amount and to cut off the flow automatically when this amount has been discharged. Under all operating conditions, the device shall have an accuracy within one percent of the quantity of water required for the batch. The device shall be so arranged that the measurements will not be affected by variable pressures in the water supply line. Measuring tanks shall be of adequate capacity to furnish the maximum mixing water required 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. 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 three percent. When admixtures are used in small quantities in proportion to the cement, as in the case of air-entraining admixtures, mechanical dispensing equipment may be used.

8. BATCHING PLANT

Bins with adequate separate compartments for fine aggregates and for each required size of coarse aggregate shall be provided in the batching plant. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that, as the quantity desired in the weighing hopper is being approached, the material may be added slowly and shut off with precision. Weighing hoppers shall be constructed so as to eliminate accumulations of tare materials and to discharge fully. A port or other opening for removing an overload of any of the several materials from the hopper shall be provided.

Scales for weighing aggregates and cement shall be of either the beam type or the springless dial type. They shall be accurate within one percent under operating conditions. Ten 50-pound weights shall be available for checking accuracy. All exposed fulcrums, clevises, and similar working parts of scales shall be kept clean. When beam-type scales are used, provision shall be made for indicating to the operator that the required load in the weighing hopper is being approached; the device shall indicate at least the last 200 lbs. of load and 50 lbs. overload. All weighing and indicating devices shall be in full view of the operator while charging the hopper and he shall have convenient access to all controls.

9. CONCRETE MIXERS AND AGITATORS

Mixers may be central-plant mixers or truck mixers. Agitators may be truck agitators and truck mixers operated at a speed of rotation

designated by the manufacturer as agitating speed. Each mixer and/or agitator shall have attached thereto, in a prominent place, a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's rated capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades. Central-plant mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed. Truck mixers shall be equipped with reset counters, or electrically actuated counters, by which the number of revolutions of the drum or blades may be readily verified.

The mixer, when loaded to capacity, shall be capable of combining the ingredients of the concrete within the specified time into a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity. The agitator, when loaded to capacity, shall be capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity. The Engineer will, from time to time, make slump tests of individual samples taken at approximately the beginning, the midpoint and end of a load and if the slumps differ by more than two inches, the mixer or agitator shall not be used unless the condition is corrected. All mechanical details of the mixer or agitator, such as water measuring and discharge apparatus, condition of blades, speed of rotation of the drum, general mechanical condition of the unit and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

Mixers and agitators shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or to wear of blades. The pick-up and throw-over blades shall be replaced when any part of section indicates wear in excess of one inch from the original height of the manufacturer's design. A copy of the manufacturer's design showing dimensions and arrangements of blades shall be available to the Engineer at the plant at all times.

10. MIXING AND AGITATING CONCRETE

Mixers and agitators shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation. Maximum capacities, expressed as percentages of the gross volume of the drum or container, shall not exceed 63.25 percent for truck mixing, 70 percent for shrink mixing, and 80 percent for agitating.

When concrete is mixed at a central plant 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. If dual-drum mixers are used, the time consumed in transferring the batch from one drum to the other shall not be included as part of the mixing time. 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 the 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. When mixing is begun during or immediately after charging, a portion of the mixing water not in excess of that required to produce the minimum acceptable slump shall be added ahead of, or with, the other ingredients.

When concrete is partially mixed at a central plant and the mixing is completed in a truck mixer (shrink mix), 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.

When an agitator, or a 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.

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

11. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete the forms and subgrade shall be cleaned and free of chips, sawdust, debris, water, extraneous oil, mortar, or other objectional or deleterious substances or coatings. Faults or seams in rock shall be cleaned to a depth of 12 inches and to firm rock on the sides. Rock surfaces shall

be cleaned by air-water cutting, wet sand blasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be clean, firm and damp. Placement of concrete on mud, dried earth or uncompacted fill will not be permitted.

When concrete is to be placed over a drain the contact surface of the drain fill shall be covered with a layer of asphalt impregnated building paper or polyvinyl sheeting prior to placement of the concrete. Forms for weepholes must be set in a manner that insures their extension through protective layers.

Forms for exposed surfaces shall be coated with a non-staining form oil. Forms shall be oiled before placement to prevent excess oil from splashing or dripping onto steel or construction joints. After oiling forms, excess oil shall be removed. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed.

Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete.

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

12. CONVEYING CONCRETE

Under ordinary conditions the concrete shall be delivered to the site and discharged into the forms within 1½ 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 degrees F. or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. 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. In the conveying and placing of concrete, vertical drops in excess of 5 feet will not be permitted except where suitable equipment is used that prevents segregation of aggregates.

13. PLACING CONCRETE

No concrete shall be placed until the subgrade, forms and reinforcing steel have been inspected and approved. No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer of his intention to place concrete.

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 so regulated that the concrete may be consolidated with a minimum of lateral movement.

Internal stays and braces, serving temporarily to hold the forms in correct shape and alignment prior to placement of concrete at their locations, shall be removed when the concrete has been placed to an elevation such as to render their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

14. CONSOLIDATING CONCRETE

The concrete shall be consolidated by means of internal type mechanical vibrators capable of transmitting vibration to the concrete at frequencies not less than 6000 impulses per minute. The intensity of vibration shall be such as to visibly affect a mass of concrete with 1-inch slump over a radius of at least 18 inches. Vibrators shall be applied vertically to the concrete at points uniformly spaced and not farther apart than 18 inches. They shall be inserted and removed slowly and at a uniform rate of movement. The vibration at any one point shall be of sufficient duration and intensity to thoroughly consolidate the concrete but not so long as to cause segregation or localized grout pockets.

The Contractor shall provide a sufficient number of vibrators to properly consolidate each batch immediately after it is placed in the forms. Vibration shall be applied at the point of deposit and in the areas of freshly deposited concrete. Vibration shall not be applied directly or through reinforcement to sections or layers of concrete that have hardened to the degree that the concrete ceases to be plastic under vibration. 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 surfaces and dense concrete along form surfaces, in corners and around embedded items.

15. LAYERS

Formed concrete shall be placed in horizontal layers not more than 20 inches in thickness. All slab concrete shall be placed in one continuous layer to design thickness unless otherwise specified. Each layer shall be consolidated to insure monolithic bond with the preceding layer. Whenever possible each layer shall be placed and consolidated before the preceding layer has taken initial set. If

initial set begins between two consecutive batches the Contractor shall discontinue the placing of concrete and shall shape and prepare the top surface of the last layer in the same manner as for Construction Joints, Section 16 of this specification. When less than a complete horizontal layer is placed in one operation it shall be terminated in a vertical bulkhead. Where a feather edge might be produced at a construction joint, as in the top surface of a sloping wall, an insert form shall be used to block out a portion of the layer so that the resulting edge thickness in the next layer is not less than 6 inches.

Prior to the placement of the next lift all accumulations of mortar splashed upon the reinforcing steel and forms shall be removed. Dried mortar chips and dust shall not be puddled into unset concrete.

16. CONSTRUCTION JOINTS

Construction joints shall be made only at locations shown on the drawings. If locations of such joints are not shown on the drawings, or in case of emergency, construction joints shall be placed in locations selected by the Engineer. As each lift is completed the top surface shall be immediately and carefully protected from any condition that will adversely affect the hardening of the concrete. New concrete shall not be placed against a construction joint until at least 12 hours after completion of the preceding lift. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. Shear plates shall conform to the requirements of Material Specification 117 for structural carbon steel plates.

Construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by means of washing and scrubbing with a wire brush or wire broom and shall be kept clean and damp until the new concrete is placed. The new concrete shall be placed directly on the cleaned and washed surface.

17. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be made only at locations shown on the drawings. When open 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 open 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. Preformed expansion joint filler shall conform to the requirements of Material Specification 106 for the specified types and classes.

All expansion and contraction joints shall be carefully tooled or formed and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

18. WATERSTOPS

Waterstops shall be held firmly in the correct position as the concrete on one side of the joint is placed. All 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. Waterstops shall conform to the requirements of Material Specification 107 for the specified kinds.

19. FINISHING FORMED SURFACES

Immediately after the removal of the forms:

- a. All fins and irregular projections shall be removed from all surfaces to be exposed to air or water in the finished structure.
- b. On all surfaces, the holes produced by the removal of form ties, cone-bolts, and she-bolts shall be prepared and filled in the following manner:
 - (1) The interior surfaces of the holes shall be cleaned of all defective concrete and roughened to the degree required to assure an effective bond. The interior surfaces of the holes shall be kept continuously wet (by means of wet packings of burlap or caulking cotton) for at least three hours prior to the placement of the concrete filling. Immediately prior to the placement of the concrete filling the hole must be thoroughly cleaned so as to leave a surface completely free of chipping dust and all other foreign material.
 - (2) The holes shall be filled with a dry-pack mortar consisting of one part portland cement, 3 parts sand that will pass a No. 16 sieve, and water just sufficient to produce a consistency such that the filling is at the point of becoming rubbery when the material is solidly packed. The dry pack mortar shall be placed in layers having a compacted thickness of about 3/8 inch. Each layer shall be solidly compacted over its entire surface by means of a hardwood stick and a hammer. The surface of each layer shall be scratched to facilitate bonding with the next layer. One layer may follow another immediately unless appreciable rubberiness develops, in which

case placement shall be delayed 30 to 40 minutes. Under no circumstances shall alternate layers of wet and dry material be used. The holes shall not be over filled. The resulting surfaces shall be true and uniform in texture and color.

- (3) Steel finishing tools shall not be used. Water shall not be added to the surface during finishing.

- c. All other defects shall be corrected as prescribed in Section 21 of this specification.

20. FINISHING UNFORMED SURFACES

After the concrete has been consolidated it shall be given a wood float finish. When the floating has been completed and the excess water removed, the Contractor shall test the surface for trueness by means of a straightedge.

21. REMOVAL OR REPAIR OF CONCRETE

When concrete fails to conform to the requirements of this specification or is honeycombed, damaged or otherwise defective the Contracting Officer will direct the Contractor to remove and replace the structure or structural member containing the defective concrete or, where feasible, to correct or repair the defective parts. The corrective action required and the required extent of removal, replacement or repair will be determined by the Engineer in consideration of the extent of the defects noted and the effect of partial removals and repairs on the structural integrity and appearance of the structure.

When repair of defective concrete is authorized by the Contracting officer the following provisions shall apply to the conduct of the work:

- a. The Contractor shall begin the repair of formed concrete within 24 hours after removal of the forms.
- b. Prior to starting the repair work the Contractor shall obtain the Engineer's approval of his plan for effecting the repair.
- c. The Contractor shall perform the repair work only in the presence of the Engineer.
- d. In reinforced concrete, defects that are not deeper than the reinforcing steel and that have a surface area less than 0.5 square foot and a least surface dimension not greater than 1.25 times the depth of the defect shall be repaired by the method prescribed in Section 19.

- e. In plain concrete, defects that are not deeper than 4 inches, do not extend entirely through the concrete section, and that have a surface area less than one square foot and a least surface dimension not greater than 1.25 times the depth of the defect shall be repaired by the method prescribed in Section 19.
- f. All other defects shall be repaired by the appropriate methods prescribed in Chapter VII of the Concrete Manual, Bureau of Reclamation, U. S. Department of Interior.

22. MOIST CURING

Concrete surfaces exposed to air shall be kept continuously moist throughout the curing period by means of sprinkling, flooding or fog spraying or by means of covering with continuously moistened canvas, burlap, straw, sand or other approved material. Where wooden forms (except plywood) are used and left in place during curing, the wood shall be kept wet. Water for curing shall be clean and free from any substances that will cause discoloration of the concrete. Construction joints or other surfaces on which concrete is to be placed shall be moist cured.

23. USE OF CURING MEMBRANE

Except when the requirements of Section 29 of this specification apply, the concrete may be coated with a curing compound conforming to the requirements of Material Specification 104 in lieu of moist curing. The compound shall be applied to unformed surfaces as soon as free water has disappeared. Formed surfaces shall be thoroughly wetted after removal of forms and kept wet until necessary repair of the concrete surface is completed. Curing compound shall not be applied to any concrete surface until all repairs and finishing are completed.

All surfaces to which bond is required, such as construction joints, shear plates, reinforcing steel and other embedded items, shall be protected from the application of the compound.

The compound shall be applied in a two-coat continuous operation. Each coat shall be sprayed on at a uniform rate of not less than one gallon of compound per 200 square feet of concrete surface. The second coat shall be applied at approximately right angles to the direction of application of the first coat. The membrane shall be protected from damage during the curing period. Surfaces that are subjected to heavy rainfall or running water within 3 hours after the membrane is applied or otherwise damaged during the curing period shall be resprayed in the same manner as for the original application.

24. LENGTH OF THE CURING PERIOD

Curing shall begin as soon as the concrete has set. The length of the curing period shall be determined by the average minimum daily temperature recorded during the curing period.

<u>Average Minimum Daily Temp. (°F)</u>	<u>Minimum Length of Curing Period</u>
70° of higher	5 days
60°	6 days
50°	7 days
40°	9 days
Less than 40°	See Section 28

25. FORMS

Forms shall be of wood, plywood, steel or other approved material and shall be built mortar tight and of sufficient rigidity to prevent distortion by the pressure of the concrete or other construction loads. The forms and associated falsework shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the specified dimensions and contours. The design of the forms shall take into account the effect of vibration of the concrete as it is placed.

Forms shall be constructed and maintained so as to prevent warping and separation and the opening of joints due to shrinkage of lumber or yielding of metal. Forms for exposed surfaces shall be made of dressed lumber, metal or plywood of uniform thickness and the form surfaces shall be smooth and free from holes, dents, sags or other irregularities.

26. TIES AND SPACERS

Metal ties or anchorages within the forms shall be equipped with cones and shall be so constructed as to permit their removal to a depth of at least one inch without injury to the concrete. Wire form ties or wooden spacers will not be permitted.

27. REMOVAL OF FORMS

Forms shall not be removed without the approval of the Engineer. Form removal shall be accomplished in the presence of the Engineer by methods adequate to prevent damage to the concrete. Supports shall be removed in such a manner as to permit the

concrete to uniformly and gradually take the stresses due to its own weight. Forms shall not be removed before the expiration of the following minimum time intervals after placement of the concrete, exclusive of days when the minimum temperature is below 40°F:

<u>Element</u>	<u>Time</u>
Arch or beam centering	14 days
Deck slabs; conduits (inside forms)	14 days
Conduits (outside forms)	3 days
Columns, bearing walls	7 days
Walls, non-bearing	24 hours
Sides of beams	24 hours

28. CONCRETING IN COLD WEATHER

Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40°F unless facilities are provided to insure the adequate protection of the concrete.

The temperature of the concrete at the time of placing shall be not less than 50°F nor more than 90°F. The temperature of all aggregates and mixing water shall be not more than 150°F when introduced into the mixer.

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

Methods of insulating, housing and heating the structure shall conform to the "Recommended Practice for Winter Concreting," ACI Standard No. 604.

During conveyance of the concrete from the mixer to the place of deposit the concrete shall be protected by means of insulated or heated containers as necessary to maintain the temperature of the concrete at not less than 50°F nor more than 90°F.

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

When dry heat is used to protect curing concrete, means of maintaining ambient humidity shall be provided.

29. CONCRETING IN HOT WEATHER

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 at any time during the curing period the following provisions shall also apply to the conduct of the work:

- a. The Contractor shall apply effective means to maintain the temperature of the concrete below 90°F during mixing, conveying, and placing. Such means shall conform to the "Recommended Practice for Hot Weather Concreting," ACI Standard No. 605.
- b. The concrete shall be placed in the work immediately after mixing. Truck mixing shall be delayed until only time enough remains to accomplish it before the concrete is placed.
- c. Concrete surfaces exposed to the air shall be continuously moistened by means of fog sprays during the periods of time between placement and finishing and between finishing and the application of moist curing methods.
- d. Finishing of slabs and other flat surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay. Curing methods shall be applied as soon as the concrete has hardened sufficiently to allow the placement of the cover and the application of water.
- e. Concrete surfaces exposed to the air shall be covered and kept continuously wet during at least the first 36 hours of the curing period. After 36 hours, the Contractor may elect to apply curing compound in lieu of further moist curing.
- f. Steeply sloping and vertical formed surfaces shall be kept completely and continuously wet prior to and during form removal by the application of water to the top surfaces in such a manner that it will pass down between the form and the concrete. Forms shall not be removed for at least 36 hours after the concrete has hardened. White pigmented curing compound shall be applied as soon as the forms are removed.

30. 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

shown on the drawings, and the volume of each type and class of concrete will be computed to the nearest 0.1 cubic yard. Measurement of concrete placed against the sides of an excavation without the use of intervening forms will be made only to the neat lines or pay limits shown on the drawings. 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.

(Method 1) Payment for each type and class of concrete will be made at the contract unit price for that type and class of concrete. The payment for concrete shall constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to the completion of the concrete work such as joint fillers, waterstops, dowels or dowel assemblies and shear plates but not including reinforcing steel. Methods of payment for furnishing and placing reinforcing steel are included in Construction Specification 9.

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

Measurement of and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 9.

Measurement of bagged cement will be the actual count of the number of bags of cement used at the mixer. Measurement of bulk cement will be the summation of the batch weights of cement used at the mixer. One barrel will be considered equivalent to four bags of bagged cement or 376 pounds of bulk cement. 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 the furnishing and handling of the cement.

Payment will be made only for cement used in concrete accepted for 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 31 of this specification.

31. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Materials

1. All concrete shall be class 3000X.
2. Cement shall be Type II, or Type III where high early strength is required and approval is given by the Engineer.
3. Coarse aggregate shall be size number 467 ($1\frac{1}{2}$ " to number 4).
4. Joint filler shall be Type I.

B. Bid Item 7. Concrete

1. This item consists of the reinforced concrete required for the construction of the concrete pipe cradle, collars, inlet and P.W.B. outlet structure of the principal spillway, and inlet, outlet, concrete *cradle and* collars, pedestals *and anchor blocks* of the gated outlets.
2. Measurement and payment for all concrete will be made in accordance with Method 2. No deduction in volume of concrete will be made for the space occupied by the reinforcing steel.

C. Bid Item 8. Cement

1. This item consists of furnishing of cement used in the concrete paid for under Bid Item 7.
2. Measurement and payment for cement will be made in accordance with Method 2. To compute the actual amount of cement used in the concrete accepted for payment, the difference between the yardage of concrete delivered to the job and the yardage accepted for payment will be multiplied by the amount of

CONSTRUCTION SPECIFICATION

9. PLACING 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 103. 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 three 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 or improper bends will be rejected.

5. SPLICING BAR REINFORCEMENT

Unless otherwise specified on the drawings, splices of reinforcing bars shall provide an overlap equal to at least 30 times the diameter of the smaller bar in the splice but not less than 12 inches.

6. SPLICING WELDED WIRE FABRIC

Welded wire fabric shall be spliced in the following manner:

a. Adjacent sections shall be spliced end to end by either:

- (1) Overlapping the two pieces of fabric one full mesh (measured from the ends of the longitudinal wires)

in one piece to the ends of the longitudinal wires in the other piece) and securing the two pieces together with wire ties placed at intervals of 18 inches; or,

- (2) Overlapping the two pieces of fabric so that the end crosswire of each piece comes in contact with the next-to-end crosswire of the other piece and securing the two pieces together only as required to keep the fabric in place and to prevent it from curling.

b. Adjacent sections of fabric shall be spliced side to side by either:

- (1) Placing the two selvage wires (the longitudinal wires at the edges of the fabric) one along side and overlapping the other and securing the two pieces together with wire ties placed at intervals of 3 feet; or,
- (2) Placing each selvage wire in the middle of the first mesh of the other section of fabric and securing it to the other section at intervals of 10 feet by means of wire ties placed on the selvage wires alternately at intervals of 5 feet.
- (3) Placing each selvage wire in contact with the next-to-edge longitudinal wire and securing them together only as required to keep the fabric in place or to prevent it from curling.

7. PLACING

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. 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. Metal chairs that may be exposed at the lower face of slabs or beams shall be galvanized as specified for iron and steel hardware in Material Specification 119. 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.

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

XERO COPY XERO COPY XERO COPY

cement per cubic yard and deducted from the actual measured quantity per cubic yard and deducted from the actual measured quantity of cement measured at the plant. The volume of concrete per batch and the amount of cement per cubic yard will be determined by the Engineer by tests made in accordance with ASTM Designation C-138.

reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by the Engineer.

8. 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 9-1, 9-2, and 9-3. 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, cutting, bending, cleaning and securing all reinforcement.

(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 9-1. 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.

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.

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.

SCS-WEST

TABLE 9-1. STANDARD REINFORCING BARS

Bar Size No.	2	3	4	5	6	7	8	9	10	11
Wt. (lb./ft.)	0.167	0.376	0.668	1.043	1.502	2.044	2.670	3.400	4.303	5.313

TABLE 9-2. RECTANGULAR WELDED WIRE FABRIC

Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.
24-1414	16	312- 711	39	48- 912	23
212- 04	169	312- 812	32	48-1012	20
212- 15	144	412- 26	69	48-1112	17
212- 26	124	412- 37	59	48-1212	14
212- 37	107	412- 48	51	48-1214	12
212- 48	91	412- 59	43	612-3/04	91
212- 59	77	412- 610	36	612-2/04	78
212- 610	66	412- 711	31	612- 00	81
212- 711	56	412- 810	27	612- 03	72
312- 04	119	412- 812	25	612- 11	69
312- 15	102	412- 912	22	612- 14	61
312- 26	87	412-1012	19	612- 22	59
312- 37	75	412-1112	16	612- 25	52
312- 48	64	412-1212	13	612- 33	51
312- 59	54	48- 711	33	612- 44	44
312- 610	46	48- 812	27	612- 66	32
				612- 77	27

(9-5)

11-5-64

TABLE 9-3. SQUARE WELDED WIRE FABRIC

Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.
2 x 2 - 10/10	60	4 x 4 - 14/14	11
2 x 2 - 12/12	37	6 x 6 - 0/0	107
2 x 2 - 14/14	21	6 x 6 - 1/1	91
2 x 2 - 16/16	13	6 x 6 - 2/2	78
3 x 3 - 8/8	58	6 x 6 - 3/3	68
3 x 3 - 10/10	41	6 x 6 - 4/4	58
3 x 3 - 12/12	25	6 x 6 - 4/6	50
3 x 3 - 14/14	14	6 x 6 - 5/5	49
4 x 4 - 4/4	85	6 x 6 - 6/6	42
4 x 4 - 6/6	62	6 x 6 - 7/7	36
4 x 4 - 8/8	44	6 x 6 - 8/8	30
4 x 4 - 10/10	31	6 x 6 - 9/9	25
4 x 4 - 12/12	19	6 x 6 - 10/10	21
4 x 4 - 13/13	14		

9. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 9. Reinforcing Steel

1. This item consists of the furnishing and placing of reinforcing steel in all reinforced concrete structures as shown on the drawings.
2. Measurement and payment will be made in accordance with Method 1.

CONSTRUCTION SPECIFICATION

11. 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. PIPE

Reinforced concrete pressure pipe, fittings and accessories shall conform to the requirements of Material Specification 109.

3. CONCRETE

Portland cement concrete for bedding and cradles shall conform to the requirements of Construction Specification 8 for the specified class of concrete.

4. JOINT COMPOUND

Joint compound shall conform to the requirements of Material Specification 102.

5. EXPANSION JOINT FILLER

Expansion joint filler shall conform to the requirements of Material Specification 106.

6. EXCAVATION

Excavation required for the installation of the principal spillway conduit shall be accomplished in the manner specified in Construction Specification 4. The foundation surface on which the conduit will be supported shall be shaped to accommodate the concrete bedding or cradle as shown on the drawings.

7. PLACING CONCRETE

Concrete used for bedding or in the construction of the cradle shall be placed in the manner prescribed in Construction Specification 8. Concrete blocks or wedges used to temporarily support the pipe during placement of bedding or cradle shall be manufactured of a class of concrete equal to or better than that used in the bedding or cradle.

8. LAYING THE PIPE

Bell and spigot pipe shall be laid with the bell upstream. The pipe shall be set to the specified line and grade and temporarily supported on precast concrete blocks or wedges.

Just before the joint is connected the connecting surfaces of bells, spigots and/or coupling bands, sleeves or collars shall be thoroughly cleaned and dried, and the rubber gasket and the inside surface of the bell or coupling band, sleeve or collar 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.

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.

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 gage. 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.

9. 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 filled with joint compound.

10. PRESSURE TESTING

Pressure testing of the completed conduit will not be required.

11. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the quantity of each size 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 and class of reinforced concrete pressure pipe will be made at the contract unit price for that size 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.

(Method 2) For items of work for which specific unit prices are established in the contract, the quantity of each size and class of pipe will be determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each size and class of reinforced concrete pressure pipe will be made at the contract unit price for that size 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.

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.

CONSTRUCTION SPECIFICATION

12. 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 110 or Material Specification 131, 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.

4. BACKFILL

Earth backfill shall be placed in the manner specified in Construction Specification 5 for fill adjacent to structures. Special care shall be taken to prevent lifting the pipe from the bedding by pressures exerted by tamping material under the haunches of the pipe.

5. 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 at which time they shall be removed by the Contractor.

6. 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.

7. REPAIR OF DAMAGED COATINGS

Breaks or scuffs in bituminous coatings that are less than 36 square inches in area may be repaired by the application of two coats of hot asphaltic paint conforming to the requirements for bituminous coatings contained in the references cited in Material Specifications 110 and 131. 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.

8. 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 gage 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 gage of pipe will be made at the contract unit price for that type, class, size and gage 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 gage 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 gage of pipe will be made at the contract unit price for that type, class, size and gage 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 3) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage 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 gage of pipe will be made at the contract unit price for that type, class, size and gage 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.

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 the specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 13 and 14. Corrugated Metal Pipe

1. This item shall consist of furnishing and placing of corrugated metal pipes in the floodway at stations 12/00 and 24/16, as shown on the drawings.
2. The pipe shall conform to requirements of Material Specification 110. The pipes shall be 14 gage, 24 inch and 12 gage, 42 inch diameter, Class I (annular corrugations) or Class II (helical corrugations), Shape I (circular) with type A bituminous coating in accordance with Federal Specification WW-P-00405.
3. Measurement and payment will be made in accordance with Method 1.

CONSTRUCTION SPECIFICATION

13. STEEL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and installing steel pipe complete with the fittings and appurtenances specified on the drawings.

2. MATERIALS

Steel pipe and fittings shall conform to the requirements of Material Specification 112 for the specified type.

Unless otherwise specified, special fittings and appurtenances shall be built of the same materials as those used in the manufacture of the pipe.

Welding rods shall conform to the requirements of Material Specification 117.

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 firmly and uniformly bedded throughout its entire length to the depth, and in the manner, specified on the drawings.

4. BACKFILL

Earth backfill shall be placed in the manner specified for structure backfill in Construction Specification 5. Special care shall be taken to prevent lifting the pipe from the bedding by pressures exerted by tamping material under the haunches of the pipe.

5. WELDED JOINTS

Surfaces to be welded shall be free from scale, grease, paint, other objectionable debris or coatings. Joint surfaces shall be free from fins or tears. Parts to be welded shall be brought in as close contact as possible and in no event separated more than one-quarter inch. If the separation is more than one-eighth inch, the size of the fillet weld shall be increased by the amount of the separation. The technique of welding used and the appearance and quality of the welds made shall conform to the "Code for Arc and Gas Welding" of the American Welding Society. When field joints are welded, special care shall be taken to avoid burning the protective coating.

6. COUPLED JOINTS

The ends of pipe to be coupled shall be so machined as to allow the coupling of the pipe sections without damage to, or displacement of the gaskets and to insure uniform end separation of the pipes in each coupling assembly. Machined ends of the pipe that receive the coupling sleeves shall be free from dents, gouges, rust, scale or protective coating. Rubber ring gaskets required for the proper assembly of the pipe and couplings shall conform to the pipe manufacturer's dimensions and tolerances and shall be of circular cross section without joints. Coupling followers shall be drawn up evenly to insure uniform pressure on the coupling gaskets.

7. FIELD COATING AND WRAPPING

When coated (or coated and wrapped) pipe is specified, joints shall be primed and coated (or coated and wrapped) in the manner specified in AWWA Standard Specification C 203, Section 4.

8. HANDLING THE PIPE

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coating. Coated pipe shall be handled in the manner specified in AWWA Standard Specification C 203, Section 4.

9. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the quantity of each type and size 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 and size of pipe will be made at the contract unit price for that type and size 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.

(Method 2) For items of work for which specific unit prices are established in the contract, the quantity of each type and size 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 and size of pipe will be made at the contract unit price for that type and size of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe, complete in place, 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.

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.

CONSTRUCTION SPECIFICATION

14. METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating and erecting metal work, including the metal parts of composite structures.

2. QUALITY OF MATERIALS

Unless otherwise specified, materials shall conform to the requirements of Material Specification 117. 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 119.

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 of the American Society of Civil Engineers Specifications for Structures of Aluminum Alloy applicable to the alloys specified for use in the work.

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 22 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:

<u>Material</u>	<u>Unit Weight</u> <u>Pounds per Cubic Foot</u>
Aluminum, cast or rolled	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 metals. 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 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.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 11. Steel Pipe

This item shall consist of furnishing and placing the steel pipe required for the construction of the gated outlets as shown on the drawings.

1. The pipe shall conform to the requirements of Material Specification 112 and ASTM Designation A139. The pipe shall be coated and wrapped in accordance with paragraph 7 of this specification and have coupled joints in accordance with paragraph 6 of this specification. The pipe shall be 12 inches in diameter and have a wall thickness of 0.1345 inches (10 gage).
2. Measurement and payment will be made in accordance with Method 1.

XERO COPY XERO COPY XERO COPY

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 11. Trash Rack

1. This item shall consist of the fabricating and erecting of the trash rack for the principal spillway inlet.
2. Structural steel shapes and plate shall be Grade B conforming to the requirements of Federal Specification QQ-S-741.
3. The three inch diameter steel pipe shall be Weight B, Class 1, conforming to the requirements of Federal Specification WW-P-406.
4. Measurement and payment will be made in accordance with Method 3.

CONSTRUCTION SPECIFICATION

17. LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of furnishing, transporting and placing rock in the construction of loose rock riprap revetments and blankets.

2. MATERIALS

The rock used in the construction of loose rock riprap revetments shall conform to the requirements of Material Specification 127. When filter layers or bedding layers are specified, the materials for such layers shall conform to the requirements of Material Specification 105. Spalls shall be composed of small fragments of the same type of rock as used in the riprap. At least 30 days prior to delivery of rock, filter materials or bedding materials, the Contractor shall designate in writing the source from which he intends to obtain the materials. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing.

3. SUBGRADE PREPARATION

Riprap shall not be placed until 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 with the greatest dimension

placed across the slope. Vertical joints between rocks shall be staggered. Spaces between the larger rocks shall be filled with smaller rocks and spalls. The 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. 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.

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

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

A. Bid Item 1⁵ Loose Rock Riprap

1. This item consists of the furnishing and placing of rock riprap at the outlet end of the principal spillway, ~~and adjacent to the drop spillway on the outlet channel at station 16/00, as shown on the drawings.~~
2. The rock shall be not larger than the thickness of the riprap shown on the drawings unless the contractor embeds the larger rock in the foundation so their top surface does not extend above the top of the riprap as shown on the drawings. When tested not less than 25 percent by weight must be retained on a 10 inch screen. The rock shall be reasonably well-graded from the maximum size to a minimum size passing a four inch screen and have enough small rock to fill the voids between the larger rock so the surface does not show void spots through the riprap.
3. The rock shall conform to the tests required for riprap as specified in Material Specification 127 except that before making the tests as specified, the test sample shall be run through 200 revolutions of the Los Angeles abrasion machine. The rock sample shall then be removed, cleaned and dried and the standard tests performed on the prepared sample.
4. The rock shall be placed in accordance with Section 4 of this specification, except some hand work will be required for

XERO COPY XERO COPY XERO COPY

final placement.

5. The tolerance for placing riprap shall be that the average top surface of the exposed rock shall not be more than three inches above or six inches below specified lines measuring perpendicular to the surface, provided the thickness of the riprap is not less than indicated on the drawings. Rocks over 9 inches in diameter that extend over 9 inches above the average surface of the riprap shall be removed or embedded.
6. Measurement and payment shall be made in accordance with Method 1. The specified limits for payment will be as shown on the drawings.

CONSTRUCTION SPECIFICATION

18. INSTALLING WATER CONTROL GATES

1. SCOPE

The work shall consist of furnishing and installing water control gates including gate stems, hoists, lifts and other necessary appurtenances.

2. MATERIALS

The gates furnished shall conform to the requirements of Material Specifications 128, 129 or 130 applicable to the type of gate furnished. All gates shall be furnished complete with hoisting equipment and other specified appurtenances.

3. INSTALLING GATES

The Contractor shall install the gates in a manner that will prevent leakage around the seats and binding of the gates during operation.

Surfaces of metal against which concrete will be placed shall be unpainted and free from oil, grease, loose mill scale, surface rust and other debris or objectionable coatings.

Anchor bolts, thimbles and spigot frames shall be secured in true position in the forms and held in alignment during the placement of concrete.

Concrete surfaces against which rubber seals will bear or against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.

When flat frames are installed against concrete, a layer of bedding mortar shall be placed between the frame and the concrete.

For radial gates, wall plates, sills and pin brackets shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

4. INSTALLING HOISTS AND LIFTS

Gate stems, stem guides and gate lifts shall be carefully aligned so that the stem shall be parallel to the guide bars or angles on the gate frame after installation.

Radial gate hoists shall be installed in correct alignment with relation to the gate shaft.

5. RADIAL GATE SEALS

On radial gates the rubber seals shall be installed in a manner such that when the gates are closed the seals shall contact the walls or wall plates throughout their entire length but shall not be distorted.

6. OPERATIONAL TESTS

After the gate and hoist (or lift) have been installed they shall be cleaned, lubricated and otherwise serviced by the Contractor in accordance with the manufacturer's instructions. The Contractor shall test the gate and hoist by operating the system several times throughout its full range of operation. He shall make any changes and adjustments as are necessary to insure satisfactory operation of the gate system.

7. MEASUREMENT AND PAYMENT

The number of each type, size and class of gate will be counted. Payment for furnishing and installing each type, size and class of gate shall be made at the contract unit price for that type, size and class of gate. 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 furnishing and installing anchor bolts and all specified appurtenances and fittings.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A Bid Item 16 Slide Gates:

1. This item of work shall consist of the furnishing and installing of the slide gate on the gated outlet, complete with frame stem, stem guides and gate lift and trash rack as shown on the drawings.

2. **Material:**

The gate shall conform to Material Specification 128, Class 20-10, Type MMS-2 (fitted with bronze seat facings). It shall be flat back and shall be complete with frame, stem, stem guides, lift, trash rack and incidentals as shown on the drawing.

CONSTRUCTION SPECIFICATION

22. 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 Federal Specification TT-P-86, Type II or Type III, Red Lead Base Paint.

Type 3 paint shall conform to the requirements of Federal Specification TT-P-86, Type I, Red Lead Base Paint.

Type 4 paint shall conform to the requirements of Federal Specification TT-P-636, Synthetic Primer.

Type 5 paint shall be prepared by mixing aluminum paste conforming to the requirements of Federal Specification TT-P-320, Type II, Class B with phenolic resin spar varnish conforming to the requirements of Federal Specification TT-V-119 at the rate of two pounds of aluminum paste per gallon of varnish. The paint shall be mixed at the time of use.

Type 6 paint shall be prepared by mixing aluminum paste conforming to Federal Specification TT-P-320, Type II, Class B with mixing varnish conforming to the requirements of Federal Specification TT-V-81, Type II, Class B at the rate of two pounds of aluminum paste per gallon of varnish. The paint shall be mixed at the time of use.

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 conform to the requirements of Federal Specification TT-P-641, Type III, Zinc Dust-Zinc Oxide Primer.

Paints of Types 1, 2, 3, 5 and 6 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 surface preparation shall consist of the removal of all grease and oil by means of steam cleaning or solvent cleaning methods and the 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.

Method 2 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 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 sand blasting 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 before 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 metal work 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 paint and two or more top coats of Type 5 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 paint and two top coats of Type 5 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 2, Type 3 or Type 4 paint and two top coats of Type 6 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 2 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 2 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 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 10 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.

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 brush 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 metal work all damages to shop applied prime 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.

Initial priming coats shall be applied by brush. All 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 of not more than 400 square feet per gallon for Paint Systems A and B and not more than 500 square feet per gallon for all other paint systems.

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.

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.

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 45°F. 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. Surfaces protected from adverse atmospheric conditions by special cover, heating or ventilation shall remain so protected until the paint is dry.

7. CERTIFICATION AND TESTS

The material certification shall include material identification, quantity, batch number and certified results of tests performed by the manufacturer or other laboratory covering all of the requirements of the specifications under which the material is furnished.

Acceptance of dry paint film thickness for Paint Systems A and H will be based on the measurement of paint film thickness by means of an Elcometer or other suitable dry film thickness gage.

8. PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for painting metalwork will be made 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

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

A. Subsidiary Item. Painting

1. This item shall consist of the painting of all exposed surfaces of the trash rack for the inlet of the principal spillway and inlet trash rack and gate assembly of the gated outlet of ~~Vineyard Road Dam.~~
2. Paint application shall be in accordance with Paint System A.
3. No separate payment will be made for painting. Compensation for painting will be included in the payment for Metal Work, Bid Item 11 and Slide Gate, Bid Item 13.

CONSTRUCTION SPECIFICATION

25. REMOVAL OF WATER

1. SCOPE

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

2. DIVERTING SURFACE WATER

The Contractor shall provide impounding works or diversions suitable to control and pass the streamflow and other surface waters through or around the site of the permanent works and borrow areas during construction. Unless otherwise specified, a diversion must discharge into the same natural drainageway in which its headworks are located.

3. DEWATERING THE SITE OF THE PERMANENT WORKS

The Contractor shall furnish, install, operate and maintain all facilities and equipment necessary to remove water from the various parts of the works during construction. Dewatering shall be accomplished in a manner that will result in all construction work being performed in the dry, except: (1) excavation that can be done under water to the specified limits and tolerances without adversely affecting any other part of the work; (2) any operation specifically exempted elsewhere in the contract. Dewatering of foundations shall be accomplished by methods that will prevent loss of fines from the foundation materials.

4. DEWATERING BORROW AREAS

Unless otherwise specified in Section 7, the Contractor shall maintain the borrow areas in drainable condition or otherwise provide for timely and effective removal of surface waters that accumulate, for any reason, within the borrow areas.

5. 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 to the flow of water to and through the spillways and outlet works or any other interference with the operation, or access to, the permanent works.

6. MEASUREMENT AND PAYMENT

For items of work for which specific prices are established in the contract, payment for diverting and dewatering will be made at the contract 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.

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.

(25-2)

MATERIAL SPECIFICATION

100. PORTLAND CEMENT

1. SCOPE

This specification covers the quality of portland cements.

2. QUALITY

Portland cement shall conform to the requirements of Federal Specification SS-C-192, for the specified types of cement, except that, whenever Type I portland cement is specified, portland blast furnace slag cement conforming to the requirements of Federal Specification SS-C-197 may be used in lieu thereof.

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.

4. INSPECTION, TESTING AND CERTIFICATION

Portland cement shall be inspected and tested by the methods prescribed in Federal Specification SS-C-192. For quantities of cement less than 300 barrels, the material certification shall include the manufacturer's certified statement of results of typical tests for chemical composition, compressive strength and autoclave expansion for each type of cement specified. For quantities of cement of 300 barrels or more, the material certification shall include the manufacturer's certified inspection record of examination and testing of the cement furnished. When the quantity of cement furnished exceeds 300 barrels the Contractor shall inform the Contracting Officer in writing, and prior to delivery of cement to the work site, concerning the mill (or mills) from which the cement will be obtained and the purchase order number, contract number or other designation that will identify the cement to be used by the Contractor. The manufacturer's certified inspection record shall identify the cement by the same designation.

(100-1)

XERO COPY XERO COPY XERO COPY XERO COPY

6. ITEMS OF WORK ON CONSTRUCTION DETAILS

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

A. Subsidiary Item: Diversion of Streamflow and Dewatering of the Worksite

1. This item shall consist of any dewatering that may be required from local runoff or any other source that may occur during the construction of the dam and appurtenances.
2. Diversion of streamflow and dewatering of the work site will be considered subsidiary to other related items of work and will not be paid for as a separate item. The cost therefor will be considered as included in the contract price paid for other related items of work.

MATERIAL SPECIFICATION

101. 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 Federal Specification SS-A-281 for the specified classes and sizes.

3. STORING AND HANDLING

Aggregate of each class and size shall be stored and handled by methods that prevent segregation of particle sizes or contamination by intermixing with other materials.

4. INSPECTION AND TESTING

Aggregate shall be inspected and tested by the methods prescribed in Federal Specification SS-A-281.

(101-1)

SCS-WEST

11-5-64

MATERIAL SPECIFICATION

102. JOINT COMPOUND FOR CONCRETE AND CLAY PIPE

1. SCOPE

This specification covers the quality of joint compound for filling joints in concrete pipe and clay pipe.

2. TYPE

The compound shall be a cold-application mastic, single component or multiple component type.

3. COMPOSITION AND PROPERTIES

The compound shall have a composition such that it will not cause deterioration of rubber gaskets and, after curing, shall be a resilient, adhesive material that is capable of filling pipe joints to prevent the entry of concrete or earth during the bedding, cradling or backfilling operations. It shall be capable of being applied at a temperature of 70°F.

- a. The single component type shall be a ready-mixed non-drying compound furnished in troweling consistency or in preformed rope or strip form.
- b. The multiple component type shall be composed of two or more substances that are to be mixed prior to application. The substances shall be of such a character that a homogeneous preparation can readily be obtained by combining the separate substances by mechanical or manual stirring without heating the blended material above 100°F. Immediately after preparation for use and shall remain in a condition suitable for application for at least 1 hour.

4. ADHESION TO CONCRETE

After curing, the compound shall be of such nature that it will adhere to dry, dust free concrete when applied either directly or over a suitable primer.

5. BOND

After curing, at least 2 of 3 samples of the compound shall not develop a crack, separation or other opening that is at any point deeper than 1/4 inch, in the compound or between the compound and the mortar block, when tested by the method specified in Section 7.

6. FLOW

After curing, the compound shall not show a flow in excess of 0.5 centimeter when tested by the method specified in Section 7.

7. SAMPLING, TESTING AND CERTIFICATION

Joint compound shall be sampled and tested by the methods specified in Federal Specification SS-R-406, Method 223.12, except that the extension test shall be conducted at a temperature not higher than 17°F. The material certification shall include the manufacturer's certified statement of results of typical bond tests and flow tests.

MATERIAL SPECIFICATION

103. 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 bar reinforcement shall conform to the requirements of Federal Specification QQ-S-632, Type II, Class B40.

Welded steel wire fabric reinforcement shall conform to the requirements of Federal Specification RR-W-375.

Cold-drawn steel wire reinforcement shall conform to the requirements of Federal Specification QQ-W-418.

Tie wire shall be cold-drawn black annealed wire and shall have a tensile strength of not less than 40,000 pounds per square inch.

3. 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.

4. INSPECTION, TESTING AND CERTIFICATION

Steel reinforcement shall be inspected and tested by the methods prescribed in the specifications cited herein. The material certification shall include the manufacturer's certified statement of results of typical tests for chemical composition, tensile strength, weld strength and bending properties as applicable to the type of material furnished.

(103-1)

MATERIAL SPECIFICATION

104. 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 Designation 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, the brand name and the manufacturer's batch number. The compound shall be stored in a manner such as to prevent damage to the containers and to protect water-emulsion types from freezing.

4. TESTING AND CERTIFICATION

Testing of curing compounds shall be done in accordance with ASTM Designation C 156. The material certification shall include the manufacturer's certified statement of results of typical tests for durability, reactance with concrete, drying time and moisture retention.

(104-1)

MATERIAL SPECIFICATION

106. PREFORMED EXPANSION JOINT FILLER

1. SCOPE

This specification covers the quality of preformed expansion joint fillers for concrete.

2. REQUIREMENTS

Preformed expansion joint filler shall conform to the requirements of Federal Specification HH-F-341 for the specified type and class of filler.

3. INSPECTION, TESTING AND CERTIFICATION

The joint filler shall be inspected and tested by the methods prescribed in Federal Specification HH-F-341. The material certification shall include the manufacturer's certified statement of results of typical tests of recovery, compression, extrusion, insolubility and expansion.

MATERIAL SPECIFICATION

107. WATERSTOPS

1. SCOPE

This specification covers the quality of materials from which waterstops can be fabricated or premolded. Waterstops shall be either copper, galvanized steel, galvanized iron, wrought iron, polyvinyl chloride plastic or rubber as specified.

2. COPPER

Copper sheets or strips used for waterstops shall conform to the requirements of ASTM Designation B 248.

3. STEEL

Galvanized iron or steel sheets used for waterstops shall conform to the requirements of Federal Specification QQ-S-775.

4. WROUGHT IRON

Wrought iron sheets used for waterstops shall conform to ASTM Designation A 162.

5. PLASTIC OR RUBBER

Non-metallic waterstops shall be either natural or synthetic rubber or vinyl chloride polymer or copolymer and shall exhibit the following properties when tested by the prescribed method of Federal Test Method Standard No. 601:

- a. The hardness (Shore A durometer) shall be 60 to 70 when tested by Method 3021;
- b. The tensile strength shall be at least 1400 pounds per square inch when tested by Method 4111;
- c. The ultimate elongation shall be at least 300 percent when tested by Method 4121;
- d. The compression set shall be not more than 30 percent when tested by Method 3311;
- e. The water absorption (by weight) shall be not more than 10 percent when tested by Method 6631;

- f. The decrease in tensile strength after aging shall be not more than 15 percent when tested by Method 7221;
- g. The decrease in ultimate elongation shall be not more than 20 percent when tested by Method 7221;
- h. There shall be no sign of failure due to brittleness at a temperature of minus 35⁰ F. when tested by Method 5311.

6. INSPECTION, TESTING AND CERTIFICATION

Waterstops shall be inspected and tested by the methods prescribed in the specifications and standards cited herein. The material certification shall include the manufacturer's certified statement of results of typical tests applicable to the type of waterstop furnished.

MATERIAL SPECIFICATION

109. 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 C 301;
- b. Steel Cylinder Type, Not Prestressed: AWWA Standard C 300;
- c. Noncylinder Type, Not Prestressed: AWWA Standard C 302;
- d. Low Head Pressure Pipe: ASTM Designation C 361.

Sections 1.6 and 1.7 of AWWA Standards C 300, C 301 and C 302 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 be of the bell and spigot type or the double spigot with collar, sleeve or coupling band type. Each joint shall conform to the requirements of the specification cited in Section 2 of this specification applicable to the kind of pipe furnished except that it shall incorporate a positive groove in the spigot or spigot ring to contain the gasket. The groove shall

be so proportioned as to prevent the displacement of the gasket by the action of either internal or external pressures under any condition of joint movement up to the required joint extensibility and joint deflectability.

For the purpose of this specification joint extensibility is defined as the effective watertight length of the joint measured from the center of the gasket to the point of flare of the bell ring or collar when the joint is fully engaged.

5. GASKETS

The pipe joint gaskets shall conform to the requirements of the specifications cited in Section 2 of this specification except that 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 finished pipe shall be inspected and tested by the methods specified in ASTM Designation C 361. External crushing strength tests shall be performed by the three edge bearing method.

The strength of the pipe, as determined by that method, shall be defined as:

- a. For noncylinder type pipe and nonprestressed cylinder type pipe, the load required to produce a 0.01 inch crack one foot long;
- b. For prestressed steel cylinder type pipe, the load required to produce a 0.001 inch crack one foot long.

The material certification shall include: (1) the manufacturer's certified statement of results of typical external crushing strength tests and hydrostatic tests (if applicable) performed on pipe of equivalent size and design and composed of equivalent materials, and, (2) such drawings and descriptions of the pipe joint as may be necessary to show that the pipe conforms to the requirements of this specification.

MATERIAL SPECIFICATION

110. ZINC-COATED IRON OR STEEL CORRUGATED PIPE

1. SCOPE

This specification covers the quality of zinc-coated iron or steel corrugated pipe and fittings.

2. PIPE

Zinc-coated iron or steel corrugated pipe and fittings shall conform to the requirements of Interim Federal Specification WW-P-00405 for the specified classes and shapes of pipe, and to the following additional requirements:

- a. Unless otherwise specified, circumferential shop riveted seams shall have a maximum rivet spacing of 6 inches, except that 6 rivets will be sufficient for 12-inch diameter pipe;
- b. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.
- c. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

3. COATINGS

Coatings shall conform to the requirements of Interim Federal Specification WW-P-00405 for the specified types of coatings.

(110-1)

4. INSPECTION, TESTING AND CERTIFICATION

The pipe shall be inspected and tested by the methods specified in Interim Federal Specification WW-P-00405, except that:

- a. The Engineer shall have free access to the shop for inspection purposes, and every facility shall be extended to him for this purpose; and
- b. Field inspection by the Engineer will include an examination of the pipes for deficiencies in lengths of sheets used, nominal specified diameters, net length of finished pipe, and any evidence of poor workmanship, and may include the taking of samples for chemical analysis and determination of weight of zinc coating.

For the purpose of inspection, the Contractor shall furnish to the Engineer an itemized statement of the sizes and lengths of pipe in each shipment.

The material certification shall include: (1) the sheet manufacturer's statement of typical chemical analysis of the base metal and certified results of typical weight of zinc coating tests, and, (2) the fabricator's certified results of typical coating tests and weld strength tests, if applicable.

(110-2)

SCS-WEST

11-5-64

MATERIAL SPECIFICATION

112. STEEL PIPE AND FITTINGS

1. SCOPE

This specification covers the quality of steel pipe and fittings.

2. PIPE

Steel pipe shall conform to the requirements of Federal Specification WW-P-406, ASTM Designation A 135, ASTM Designation A 139, or ASTM Designation A 134, whichever is specified.

3. FITTINGS

Threaded fittings shall conform to the requirements of Federal Specification WW-P-521 for the specified types and kinds.

Forged flanges, fittings and valves shall conform to the requirements of ASTM Designation A 181 for the specified grades of material.

4. INSPECTION, TESTING AND CERTIFICATION

Pipe and fittings shall be inspected and tested by the methods prescribed in the specifications cited herein. The material certification for pipe shall include the manufacturer's certified statement of results of typical hydrostatic pressure tests, weld strength tests and weight of zinc coating tests, as applicable to the type of pipe furnished. The material certification for fittings shall include the manufacturer's certified statement of results of typical malleability tests and aerostatic or hydrostatic pressure tests.

(112-1)

MATERIAL SPECIFICATION

117. STRUCTURAL METAL

1. SCOPE

This specification covers the quality of structural steel, structural iron and structural aluminum.

2. STRUCTURAL STEEL AND IRON

Unless otherwise specified, structural steel and iron products shall conform to the requirements of the following specifications:

- a. Structural carbon steel plates, shapes and bars shall conform to the requirements of Federal Specification QQ-S-741;
- b. Structural quality, hot-rolled carbon steel sheets shall conform to the requirements of Federal Specification QQ-S-699;
- c. Low carbon steel sheets and strips shall conform to the requirements of Federal Specification QQ-S-698.
- d. Zinc coated carbon steel sheets shall conform to the requirements of Federal Specification QQ-S-775;
- e. Steel castings shall conform to the requirements of Federal Specification QQ-S-681 for the specified classes of castings.
- f. Grey iron castings shall conform to the requirements of Federal Specification QQ-I-652 for the specified grades of castings.
- g. Malleable iron castings shall conform to the requirements of Federal Specification QQ-I-666 for the specified grades of castings.

3. STRUCTURAL ALUMINUM

Structural aluminum products shall conform to the requirements of ASTM Designation B 308 and the specifications included therein for the specified types and alloys.

(117-1)

4. BOLTS

Bolts shall conform to the requirements of Federal Specification FF-B-575 for the specified types, lengths and threads.

5. RIVETS

Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Designation A 141.

6. WELDING ELECTRODES

Steel welding electrodes shall conform to the requirements of ASTM Designation A 233 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. Bare electrodes shall be used to weld metal that is to be galvanized. Aluminum welding electrodes shall conform to the requirements of ASTM Designation B 285 for the specified classification.

7. INSPECTION, TESTING AND CERTIFICATION

Structural metals shall be inspected and tested by the methods prescribed in the specifications cited herein. The material certification shall include the manufacturer's certified copy of typical inspection records of examinations and tests.

MATERIAL SPECIFICATION

119. GALVANIZING

1. SCOPE

This specification covers the quality of zinc coatings applied to iron and steel products by the hot-dip process (galvanizing). This specification applies only to those products not covered in other material specifications.

2. QUALITY OF ZINC

The zinc used for coating shall be prime western spelter conforming to the requirements of ASTM Designation B 6.

3. QUALITY OF COATING

Zinc coatings shall conform to the requirements of the following specifications for the established classes of materials or, where applicable, the specified classes of coatings.

- a. Zinc coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strip shall conform to the requirements of ASTM Designation A 123;
- b. Zinc coatings on iron and steel hardware shall conform to the requirements of ASTM Designation A 153;
- c. Zinc coatings on assembled steel products shall conform to the requirements of ASTM Designation A 386.

4. INSPECTION, TESTING AND CERTIFICATION

Zinc coatings shall be inspected and tested by the methods prescribed in the specifications cited herein. The material certification shall include the manufacturer's certified statement of results of typical weight of zinc coating tests.

(119-1)

MATERIAL SPECIFICATION

121. WATER-REDUCING, SET-RETARDING ADMIXTURES
FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of water-reducing, set-retarding admixtures for portland cement concrete.

2. TYPES

The admixture shall be in liquid or powder form and shall be one of the following types:

- a. A calcium, sodium, potassium or ammonium salt of lignosulfonic acid;
- b. A hydroxylated carboxylic acid or its salt; or,
- c. A carbohydrate.

3. BASIS OF ACCEPTANCE

The basis of acceptance shall be the effect of the admixture on the properties of concrete as specified in Section 4 of this specification and as determined by the methods specified in Section 5 of this specification.

4. REQUIREMENTS

When added to concrete in powder or liquid form, in the manner prescribed by its manufacturer and in sufficient amount to retard the setting time not less than 50 percent, the retarding admixture shall cause the concrete to have the following properties in comparison with those of the reference (non-retarded) concrete:

- a. The water content for equal slump shall be decreased at least 5 percent;
- b. The air content of the retarded concrete, with or without an air-entraining admixture, shall not exceed 8 percent;
- c. The compressive strength at 28 days shall be increased at least 10 percent;
- d. The relative durability factor for the freezing and thawing test shall be not less than 95.

(121-1)

The reference concrete shall conform to the requirements of Class 3000X, as defined in Construction Specification 8, or an approved equivalent mix. Cement shall conform to the requirements of Material Specification 100. Aggregates shall conform to the requirements of Material Specification 101.

The retarded mix and the reference mix shall have equal cement content.

For determining setting time, it will be assumed that initial set is indicated by a penetration resistance of 500 pounds per square inch as measured by a Proctor-type penetrometer.

5. TESTS

Testing shall be accomplished by the use of the following standard test methods:

	<u>Method</u>
Sampling fresh concrete	ASTM C 172
Making and curing cylinders	Fed. Spec. SS-R-406, Method 231.0
Slump	Fed. Spec. SS-R-406, Method 232.0
Air content	ASTM C 231
Compressive strength	Fed. Spec. SS-R-406, Method 229.0
Freezing and thawing	Fed. Spec. SS-R-406, Method 234.1

6. CERTIFICATION

The material certification shall include the manufacturer's certified statement of results of typical tests for the admixture's effect on water content, air content, compressive strength and durability factor of concrete.

MATERIAL SPECIFICATION

122. 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 Designation C 260.

3. TESTING AND CERTIFICATION

Air entraining admixtures shall be tested by the methods prescribed in ASTM Designation C 260. The material certification shall include the manufacturer's certified statement of results of typical tests for the admixture's effect on bleeding, compressive strength and durability factor of concrete.

(122-1)

MATERIAL SPECIFICATION

127. ROCK FOR PERMANENT CONSTRUCTION

1. SCOPE

This specification covers the quality of rock to be used in the construction of permanent works.

2. GENERAL REQUIREMENTS

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.

Representative samples of the rock shall conform to the requirements specified herein for the designated type of rock construction when tested by the methods specified in Section 5 of this specification.

3. ADDITIONAL REQUIREMENTS FOR RIPRAP

Rock for riprap shall also conform to the following requirements:

- a. The bulk specific gravity (in the saturated, surface dry condition) shall be not less than 2.5.
- b. The soundness shall be such that the weight loss shall be not more than 10 percent after 5 cycles when tested by the sodium sulphate soundness test method.
- c. The resistance to abrasion shall be such that the weight loss shall be not more than 35 percent when tested in the Los Angeles abrasion machine.

4. ADDITIONAL REQUIREMENTS FOR ROCK FILL

Rock for embankment or blankets for slope protection shall also conform to the following requirements:

- a. The bulk specific gravity (in the saturated, surface dry condition) shall be not less than 2.4.

- b. The soundness shall be such that the weight loss shall be no more than 20 percent after 5 cycles when tested by the sodium sulphate soundness test method.
- c. The resistance to abrasion shall be such that the weight loss shall be not more than 40 percent when tested in the Deval abrasion machine.

5. SAMPLING AND TESTING

Methods of sampling and testing shall conform to the standard methods contained in Federal Specification SS-R-406, as follows:

	<u>Method No.</u>
Sampling	101.01
Soundness	203.01
Abrasion (Deval)	208.0
Abrasion (Los Angeles)	208.11
Specific gravity	209.0

(127-2)

MATERIAL SPECIFICATION

128. SLIDE GATES (SLUICE GATES)

1. SCOPE

This specification covers the quality of slide gates (sluice gates) for water control.

2. CLASS OF GATE

The class of gate will be expressed as a numerical symbol composed of the minimum seating head and minimum unseating head which the gate must be built to withstand. The two numbers will be separated by a hyphen with the seating head listed first. For this purpose the heads shall be expressed in terms of feet of water.

3. QUALITY OF MATERIALS

Materials used in the manufacture of slide gates shall conform to the requirements of the following specifications:

Iron Casting shall conform to Federal Specification QQ-I-652, Class 25.

Structural steel shall conform to the requirements of Federal Specification QQ-S-741.

Cold rolled steel bars shall conform to the requirements of Federal Specification QQ-S-633, Composition No. C1018 or No. C1045.

Stainless steel shall conform to the requirements of Federal Specification QQ-S-763, Classes 302 or 303 or ASTM Designation A 276, Types 302 or 303.

Naval bronze shall conform to the requirements of ASTM Designation B 21.

Cast bronze shall conform to the requirements of Federal Specification QQ-B-726.

(128-1)

4. FRAME (OR SEAT)

The frame shall be cast iron and of the specified type. The front face shall be machined to receive the gate guides and the rear face shall be machined as required to match the specified attaching means.

When bronze seat facings are specified, dovetailed grooves shall be machined on the perimeter of the front face to receive the bronze seat facing.

5. GATE SLIDE (OR DISC)

The gate slide (or disc) shall be cast iron, rectangular in shape and shall have horizontal and vertical stiffening ribs of sufficient section to withstand the seating and unseating heads expressed by the gate class designation, as defined in Section 2 of this specification.

When bronze seating surfaces are specified, a dovetailed groove shall be machined on the perimeter of the slide face to receive the bronze seat facing.

Tongues or grooves shall be machined on the vertical side of the slide along its entire height to match the guide grooves or angles with a maximum clearance of 1/16 inch.

Wedges or wedge pads shall be cast as integral parts of the gate slide.

A nut pocket with reinforcing ribs shall be integrally cast on the vertical centerline and above the horizontal centerline of the slide. The pocket shall be of a shape adequate to receive a square-backed thrust nut or stem block and shall be built to withstand the opening and closing thrust of the stem.

6. GATE GUIDES

The gate guides shall be cast iron or structural steel and shall be built to withstand the total thrust of the gate slide due to water pressure and wedge action.

On cast iron guides grooves shall be machined to receive the machined tongue on the gate slide throughout the entire length of the guide.

The guides shall be of such length as to retain at least one-half the height of the gate slide when the gate is fully opened.

7. WEDGES AND WEDGE SEATS (OR BLOCKS)

Wedges and wedge seats shall be either cast iron or cast bronze, as specified, and shall have machine finished bearing surfaces.

Cast iron wedges shall be cast as integral parts of the gate slide. Bronze wedges shall be adjustably attached to the gate slide by means of suitable studs, set screws, bolts, nuts and washers.

Wedge seats shall be adjustably attached to the gate frame and gate guides by means of suitable studs, set screws, bolts, nuts and washers.

Adjusting bolts or screws shall be bronze.

Wedges and wedge seats shall be located and adjusted in a manner to insure accurate and effective contact.

8. SEAT FACINGS

Seat facings shall be either cast iron or naval bronze, as specified. Cast iron facings shall be machined to a smooth finish to insure proper contact. Naval bronze facings shall be pressed or impacted into the machined dovetailed grooves on the gate slide and frame and machined to a smooth finish to insure proper contact.

9. YOKE

When a self-contained gate is specified, the yoke shall be cast iron and of such design as to capably withstand the loads resulting from operation of the gate. The yoke shall be provided with machined pads for connecting to the ends of the gate guides. The yoke shall be provided with a machined pad to receive the stem thrust cap or handwheel lift.

10. FLUSH BOTTOM SEAL

When a flush bottom sealing gate is specified, a solid, square-corner type rubber seal shall be provided at the bottom of the gate opening. It shall be securely fastened either to the bottom of the slide or to the frame. Metal surfaces bearing on the

(128-3)

rubber seal shall be machined and rounded as necessary to prevent cutting of the seal during gate operation.

11. GATE STEM AND HOIST (OR LIFT)

The gate stem and hoist (or lift) shall be of the specified type, size and capacity. The gate stem shall be furnished in sections as necessary to permit reasonable ease in installation. Couplings shall be threaded and bolted to the stem.

Provision shall be made to prevent stem rotation within the thrust nut at the connection with the gate slide.

Stop collars shall be provided to prevent over-travel in closing the gate.

12. STEM GUIDES

Stem guides shall be of the specified type.

13. WALL THIMBLE

When a wall thimble is specified it shall be cast iron and of the section, type and depth specified. The front flange shall be drilled and tapped to accurately receive the gate attachment studs.

Permanent type gaskets to be installed between the thimble and the gate flange shall be furnished with the thimble.

14. INSTALLATION INSTRUCTIONS

The manufacturer shall supply complete installation data, instructions for adjustments and drawings or templates showing the location of anchor bolts for each gate.

15. PAINTING

Gates and accessories shall be painted by the systems designated on the drawings and as defined in Construction Specification 22.

16. CERTIFICATION

The material certification shall include the name of the manufacturer, the manufacturer's model number (for standard catalog items) or the

(128-4)

maximum seating and unseating heads for which the gate is designed together with such drawings and materials data as may be necessary to show that the gate conforms to the requirements of this specification.

(128-5)

ARIZONA STATE OFFICE
 BY _____ DATE _____
 ✓ BY _____ DATE _____

BID SCHEDULE
 STRUCTURE VINEYARD ROAD DAM

Item No.	Work and Material.	Spec. No.	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	2	685	Ac.	\$55.00	\$ 37,675.00
2	Excavation Channel	4A	107,550	Cu.Yd.	0.18	19,359.00
3	Excavation Trench	4A	320,020	Cu.Yd.	0.18	57,603.60
4	Excavation Structure	4A	365	Cu.Yd.	3.00	1,095.00
5	Earth Fill Embankment	5A	1,152,400	Cu.Yd.	0.29	334,196.00
6	Structure Backfill	5A	43	Cu.Yd.	3.00	129.00
7	Concrete	8B	121	Cu.Yd.	65.00	7,865.00
8	Cement	8B	182	Bbls.	5.00	910.00
9	Reinforcing Steel	9	8,410	Lbs.	0.20	1,682.00
10	Reinforced Concrete Pipe	11	100	Lin.Ft.	40.00	4,000.00
11	Corrugated Metal Pipe (42")	12	32	Lin.Ft.	20.00	640.00
12	Corrugated Metal Pipe (24")	12	400	Lin.Ft.	10.00	4,000.00
13	Steel Pipe	13	---	---	---	---
14	Trash Rack	14	1	ea.	2000.00	2,000.00
15	Rock Riprap	17	170	Cu.Yd.	16.00	2,720.00
16	Slide Gate	18	4	ea.	1120.00	4,480.00
						\$478,354.60

12. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 10. Reinforced Concrete Pipe

1. This item shall consist of the furnishing and installing of the reinforced concrete pipe in the principal spillway of Vinyard Road ~~Dam~~ *Floodwater Retarding Structure.*
2. The pipe shall be a 54" diameter reinforced concrete pipe conforming to AWWA Standard 300, 301, or 302. The pipe shall be reinforced to withstand an external lineal load of 5800 pounds per lineal foot when tested in accordance with Section 7 of Material Specification 109.
3. The joint shall be designed to have a minimum joint extensibility of 2 inches as described in Section 4 of Material Specification 109.
4. The pipe shall be manufactured by a centrifugal force process.
5. Measurement and payment will be made in accordance with Method 1.