BID SCHEDULE

WILLIAMS-CHANDLER WATERSHED

RITTENHOUSE FLOODWATER RETARDING STRUCTURE

SCS-85 (Rev.)
11-65

U. S. Dept. of Agriculture
Soil Conservation Service

APPLICABILITY OF THE NONDISCRIMINATION PROVISIONS

The Nondiscrimination Provisions are not applicable to contracts (1) not exceeding $10,000, except that for standard commercial supplies or raw materials not exceeding $100,000, (2) where work is to be performed entirely outside the United States and no recruitment of workers within the United States is involved, or (3) specifically exempted by the rules and regulations of the Secretary of Labor.

The bidder agrees, if this bid exceeds $10,000, TO COMPLY with the Nondiscrimination Provisions applicable to contracts in excess of $10,000.

The bidder further agrees, if a contract is awarded for less than $10,000 but is later increased to exceed $10,000 by bilateral modification, TO COMPLY with the Nondiscrimination Provisions.

NONDISCRIMINATION PROVISIONS

(The following clause is applicable unless this contract is exempt under the rules and regulations of the Secretary of Labor issued pursuant to Executive Order No. 11246 of September 24, 1965 (30 FR 12319)).

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clause of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Federal financially assisted contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

SPECIAL PROVISIONS

1. Clauses 3, 4 and 26 of Form SCS-43 "General Provisions (Construction Contracts) P.L. 566" are to be deleted and the following clauses added to General Provisions:

CHANGES

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(i) in the specifications (including drawings and designs);

(ii) in the method or manner of performance of the work;

(iii) in the Contracting Local Organization-furnished facilities, equipment, materials, services, or site; or

(iv) directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation, or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: Provided, however, That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: And provided further, That in the case of defective specifications for which the Contracting Local Organization is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Contracting Local Organization. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

DIFFERING SITE CONDITIONS

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) Subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefor may be extended by the Contracting Local Organization.

(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

SUSPENSION OF WORK

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Contracting Local Organization.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

CONSTRUCTION SPECIFICATION

2. CLEARING AND GRUBBING

1. SCOPE

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

2. MARKING

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

3. REMOVAL

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

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

The 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.

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.

(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract.

WEATHER

(a) The Contracting Officer may order suspension of the work in whole or in part, due to weather or effects of weather, for such time as he considers it unfavorable for satisfactory prosecution of the work.

(b) When the Contracting Officer orders suspension under (a) of this clause, the contract completion date shall be extended a full calendar day for each calendar day during suspension of the work if:

(1) All work is suspended except minor items as may be designated in this contract (work of an emergency, protective or maintenance nature may be performed at any time); and

(2) The hours lost in any one workday of the authorized workweek through suspension equal one-half or more of the hours of an authorized workday.

(c) If the Contracting Officer orders suspension of work as provided in (b) of this clause and the hours lost in the workday immediately preceding a nonworkday equal one-half or more of the hours in an authorized workday, the contract completion date shall be extended a full calendar day for each nonworkday during suspension of the work.

(d) When the Contracting Officer orders any suspension of the work under this clause, the Contractor shall not be entitled to any cost or damages resulting from such suspension.

(e) When the contract completion date is extended under this clause, the contract shall be modified in writing accordingly.

NONCOMPLIANCE WITH CONTRACT REQUIREMENTS

(a) The Contracting Officer may order suspension of the work in whole or in part for such time as he deems necessary because of the failure of the Contractor to comply with any of the requirements of this contract, and the contract completion date shall not be extended on account of any such suspension of the work.

(b) When the Contracting Officer orders any suspension of the work under (a) of this clause, the Contractor shall not be entitled to any costs or damages resulting from such suspension.

(c) The rights and remedies of the Contracting Local Organization provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

2. Hours of Work: A workweek comprising 5 eight-hour days (Monday through Friday) was used as a basis for setting the performance time. The Contractor shall obtain prior approval of the Contracting Officer to perform work under this contract other than during such workdays and/or hours. Construction operations of short duration which must be carried through to completion, such as pouring concrete or pumping, are excluded from the above requirements.

3. Liquidated Damages: If the work, or any part thereof, is not completed within the time agreed upon in this contract or any extension thereof, the Contractor shall be liable to the Contracting Local Organization in the amount of $263 per day for each and every calendar day the completion of the work is delayed beyond the time provided in this contract, as fixed and agreed liquidated damages and not as a penalty; and the Contracting Local Organization shall have the right to deduct from and retain out of moneys which may be then due or which may become due and payable to the Contractor, the amount of such liquidated damages; and if the amount so retained by the Contracting Local Organization is insufficient to pay in full such liquidated damages, the Contractor shall pay to the Contracting Local Organization the amount necessary to effect payment in full of such liquidated damages.

4. No bid will be accepted or contract awarded unless the contractor is registered under the applicable provisions of Arizona Statutes, with the registrar of contractors of the State of Arizona.

5. Minor Items of Work: The following bid items are designated as minor items of work in this contract (see Clause 26, General Provisions):

Item No. 1 - Clearing and Grubbing

6. In no event will the 5% differential be allowed in evaluating bids as provided by Arizona Revised Statutes 34-241; the provisions of Arizona Revised Statutes 34-244 being applicable.

CONSTRUCTION SPECIFICATION

3A STRUCTURE REMOVAL

1. SCOPE

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

2. MARKING

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

3. REMOVAL

All structures marked for removal shall be removed to the specified extent and depth.

4. SALVAGE

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

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations approved by the Engineer or otherwise removed from the site.

6. MEASUREMENT AND PAYMENT

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

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

(Applies To Both Methods)

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.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 1, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing the construction area for the embankment, borrow area, the area between the embankment and borrow area, construction area of the diversions, emergency spillway, outlet channel and appurtenant structures and the removal of grass, sod and weeds, within the limits shown on the drawings.

(2) Woody vegetation (trees and brush) obtained from the operations described above shall be placed in loose piles outside the downstream toe of the embankment.

(3) Measurement and payment will be made in accordance with Method 1. Compensation will include payment for Subsidiary Item, Structure Removal.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item, Structure Removal

(1) This item shall consist of the removal and salvage of fences from the construction area. Fences are located at the following centerline stations: 48+50, 96+60, and 149+95.

(2) This work will not be measured for payment. Compensation for the performing the work will be included in the payment of Bid Item 1, Clearing and Grubbing.

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-scrapers 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 (not elevating) 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 the 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. 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 neat lines and grades shown on the drawings.

(Method 3) - The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where 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 bottom 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.

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

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. General

(1) All excavations 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 following work:

(a) Excavation for the emergency spillways, as shown on the drawings.

(b) Excavation for the diversion drains into the reservoir, as shown on the drawings.

(c) Excavation for the outlet channel from the principal spillway including the excavation required for placing the riprap.

(d) Excavation of an emergency spillway for the stock pond located near the center of Section 14, T2S, R8E. This excavation shall be completed as staked in the field and as directed by the Engineer.

(2) Finished surfaces shall not vary more than 0.2 ft. above or 0.3 ft. below grade except on the crest section of the emergency spillways where the finished surface shall be not more than 0.2 ft. below or 0.1 ft. above grade.

(3) Measurement and payment will be made in accordance with Method 5. Compensation will include payment for the required work specified under Subsidiary Item, Excavation Grader Ditches.

C. Subsidiary Item, Excavation, Grader Ditches

(1) This item shall consist of excavating the grader ditches shown on the drawings.

(2) The ditches shall be excavated to the widths, lines and grades as staked in the field.

(3) This work will not be measured for payment. Compensation will be included in the payment for Bid Item 2, Excavation, Channel.

D. 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 outlet pipelines, bedding and collars. This item also includes any material unsuitable for the foundation of the 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.

E. 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 outlets, the drain inlet pipeline outlet channel Station 15+90 and the drop structure at outlet channel Station 16+00. It does not include the excavation for the principal spillway outlet pipe, cradle and cutoff collars and the gated outlet pipes, bedding and collars.

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

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

F. 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.

(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 not by excavating below the bottom of the borrow channel, unless authorized by the engineer.

(3) If coarse material is exposed during excavation of the borrow area, the engineer may require further excavation and/or blanketing with select material. Such excavation will be paid for only if the Engineer determines that the material is unsuitable for earth fill embankment. When such excavation material is unsuitable and wasted, it shall be measured and paid for as trench excavation, Bid Item 3.

(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; 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. **Compaction by means of drop weights operating from a crane or hoist of any type will not be permitted.**

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14 days after placement of the concrete; (2) over cradled 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

or removed and replaced by acceptable fill. The bottoms of such excavations shall be finished flat or gently curving and at the sides of such excavations the adjacent sound fill shall be trimmed to a slope not steeper than 3 feet horizontal to 1 foot vertical extending from the bottom of the excavation to the fill surface. Replacement of fill shall be accomplished in the manner specified for closure section in Section 6 of this specification.

8. TESTING

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

Densities of fill requiring Class A compaction will be determined by the Engineer by the methods prescribed in ASTM Designation D 1556 (or by equivalent methods), except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample prior to computation of density. The density so computed will be used to determine the percent compaction of the fill matrix.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earth fill will be measured within the specified zone boundaries or limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. In embankments, no deduction in volume will be made for embedded pipe conduits less than 36 inches in diameter.

(Method 1) The quantity of earth fill will be measured as the computed volume of fill placed between the measured surfaces of the specified excavations and the measured surfaces of the completed fill.

(Method 2) The quantity of earth fill will be measured as the computed volume of fill placed between the measured surfaces of the specified excavations and the specified neat lines of the fill surface.

(Method 3) The quantity of earth fill will be measured as the computed volume of earth fill placed between the specified pay limits for excavation and the measured surfaces of the completed fill.

(Method 4) The quantity of earth fill will be measured as the computed volume of fill placed between the specified pay limits of excavation and the specified neat lines of the fill surface.

(Applies To All Methods)

Payment for each type and compaction class of earth fill 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 performance of the work.

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

BID SCHEDULE

WILLIAMS-CHANDLER WATERSHED

RITTENHOUSE FLOODWATER RETARDING STRUCTURE

Item No.	Work or Material	Spec. No.	Quantity	Unit	Unit Price	Amount
1.	Clearing & Grubbing	2	440	acre	$ 20.00	$ 8,800.00
2.	Excavation Channel	4A	182,800	cu.yd.	$ 0.15	$ 27,420.00
3.	Excavation Trench	4A	163,700	cu.yd.	$ 0.15	$ 24,555.00
4.	Excavation Structure	4A	450	cu.yd.	$ 2.50	$ 1,125.00
5.	Earth Fill Embankment	5A	829,400	cu.yd.	$ 0.25	$ 207,350.00
6.	Structure Backfill	5A	640	cu.yd.	$ 2.50	$ 1,600.00
7.	Concrete	8B	200	cu.yd.	$ 45.00	$ 9,000.00
8.	Cement	8B	300	Bbls.	$ 4.00	$ 1,200.00
9.	Reinforcing Steel	9	19,000	Lbs.	$ .16	$ 3,040.00
10.	Reinforced Concrete Pipe 33"	11	144	lin.ft.	$ 25.00	$ 3,600.00
11.	Reinforced Concrete Pipe 24"	11	270	lin.ft.	$ 20.00	$ 5,400.00
12.	Corrugated Metal Pipe 18"	12	26	lin.ft.	$ 6.00	$ 156.00
13.	Trash Rack	14	1	each	$ 500.00	$ 500.00
14.	Loose Rock Riprap	17	130	cu.yd.	$ 4.50	$ 585.00
15.	Slide Gate 24"	18	2	each	$ 500.00	$ 1,000.00
16.	Fences	21	3,370	ft.	$ 0.09	$ 303.30

TOTAL BID - RITTENHOUSE FRS. $ 295,634.30

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details 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 2 percent below and 3 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 Floodwater Retarding Structure, including the refilling of the cutoff trench. It also includes the ramp crossings shown on the drawings, the earthfill dikes along the emergency spillways diversion dikes as shown on 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 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 for dam embankment.

7. PAYMENTS TO CONTRACTOR--Continued
specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned, a release may also be required of the assignee.

8. MATERIAL AND WORKMANSHIP

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number, and other identifying data and information respecting the perfomance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

9. INSPECTION AND ACCEPTANCE

(a) Except as otherwise provided in this contract, inspection and test by the Contracting Local Organization of material and workmanship required by this contract shall be made at reasonable times and at the site of the work, unless the Contracting Officer determines that such inspection or test of material which is to be incorporated in the work shall be made at the place of production, manufacture, or shipment of such material. To the extent specified by the Contracting Officer at the time of determining to make off-site inspection or test, such inspection or test shall be conclusive as to whether the material involved conforms to the contract requirements. Such off-site inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Contracting Local Organization after

9. INSPECTION AND ACCEPTANCE--Continued
acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Contractor Local Organization not to conform to the contract requirements, unless in the public interest the Contracting Local Organization consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Contracting Local Organization (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with Clause 5 of these General Provisions.

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Contracting Local Organization shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

(e) Should it be considered necessary or advisable by the Contracting Local Organization at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or non-conforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Contracting Local Organization shall be made as promptly as practicable after completion and inspection of all work required by this contract. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Contracting Local Organization's rights under any warranty or guarantee.

10. SUPERINTENDENCE BY CONTRACTOR

The Contractor shall give his personal superintendence to the work or have a competent foreman or superintendent, satisfactory to the Contracting

10. SUPERINTENDENCE BY CONTRACTOR--
Continued

Officer, on the work at all times during progress, with authority to act for him.

11. PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the Contracting Local Organization, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire construction work, except for any completed unit of construction thereof which theretofore may have been accepted.

12. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Contracting Local Organization. The Contracting Local Organization assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Contracting Local Organization are expressly stated in the contract.

13. OTHER CONTRACTS

The Contracting Local Organization may undertake or award other contracts for additional work, and the Contractor shall fully cooperate with such other contractors and Contracting Local Organization employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Contracting Local Organization employees.

14. PATENT INDEMNITY

Except as otherwise provided, the Contractor agrees to indemnify the Contracting Local Organization and its officers, agents and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Contracting Local Organization of supplies furnished or construction work performed hereunder.

15. ADDITIONAL BOND SECURITY

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Contracting Local Organization, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Contracting Local Organization, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Contracting Local Organization and of persons supplying labor or materials in the prosecution of the work contemplated by this contract.

16. LAND RIGHTS

(a) Adequate land rights needed in order to perform the work under this contract, as far as can be determined, have been acquired by or on behalf of the Contracting Local Organization. The right to enter, remove, or otherwise make use of adjacent property, roads, utility lines, fences, and other improvements not included within the land rights provided shall be the sole responsibility of the Contractor.

(b) Where the right of ingress and egress is not defined on the drawings, the Contracting Officer shall designate the right-of-way to be used.

17. RECORDS OF TEST PITS AND BORINGS

The Contracting Local Organization does not represent that the available records show completely the existing conditions and does not guarantee any interpretation of these records. The Contractor assumes all responsibility for deductions and conclusions as to the nature of rock and other materials to be excavated, the difficulties of making and maintaining the required excavations and of doing other work affected by the geology of the site of the work, and for the final preparation of the foundations for the spillway, dikes, and other structures.

18. MATERIALS TO BE FURNISHED BY THE CONTRACTOR

(a) Unless otherwise specified in this contract, the Contractor shall furnish all materials required for the completion of the contract.

(b) Unless otherwise waived in writing by the Contracting Officer, the Contractor shall furnish the Contracting Local Organization with certifications dated and signed by the manufacturer and/or supplier to the effect that the items listed therein meet the requirements of this contract. Such certifications shall be furnished prior to the use of the material in any part of the construction and shall identify the project on which the material is to be used.

19. FENCES

(a) Existing fences to be removed by the Contractor are indicated on the drawings. The Contractor shall not be required to replace or relocate such fences. Fences to be salvaged, as indicated on the drawings, shall be removed and the materials salvaged by the Contractor for the landowner.

(b) Permanent fences to be constructed are indicated on the drawings and listed in the bid schedule. The Contractor shall bear all costs for the

GENERAL PROVISIONS

(CONSTRUCTION CONTRACTS)
P.L. 566

1. DEFINITIONS

Terms used or referred to herein are defined as follows:

(a) Contracting Local Organization: The organization or agency awarding the contract.

(b) Contracting Officer: The person who is designated and authorized to enter into and administer this contract on behalf of the Contracting Local Organization or his duly appointed successor or authorized representative.

(c) Engineer: The person or his representative who is responsible for determining that the construction work conforms to the technical requirements as set forth in the drawings and specifications.

2. SPECIFICATIONS AND DRAWINGS

The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided.

3. CHANGES

The Contracting Officer may, at any time, by written order, and without notice to the sureties, make changes in the drawings and/or specifications of this contract if within its general scope. If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the contract, an equitable adjustment shall be made and the contract modified in writing accordingly. Any claim of the Contractor for adjustment under this clause must be asserted in writing within 30 days from the date of receipt by the Contractor of the notification of change unless the Contracting Officer grants a further period of time before the date of final payment under the contract. If the claim is not disposed of by agreement, it shall be decided by the Contracting Officer as provided in Clause 6 of these General Provisions; but nothing provided in this clause shall excuse the Contractor from proceeding with the prosecution of the work

3. CHANGES--Continued

as changed. Except as otherwise provided in this contract, no charge for any extra work or material will be allowed.

4. CHANGED CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (a) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (b) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of this contract, an equitable adjustment shall be made and the contract modified in writing accordingly. Any claim of the Contractor for adjustment hereunder shall not be allowed unless he has given notice as above required; or unless the Contracting Officer grants a further period of time before the date of final payment under the contract. If the claim is not disposed of by agreement, it shall be decided by the Contracting Officer as provided in Clause 6 of these General Provisions.

5. TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Contracting Local Organization may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Contracting Local Organization may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Contracting Local Organization resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Contracting

5. TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS--Continued

Local Organization so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Contracting Local Organization in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Contracting Local Organization does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Contracting Local Organization in its contractual capacity, acts of another contractor in the performance of a contract with the Contracting Local Organization, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment under the contract), notifies the Contracting Officer in writing of the causes of delay.

The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, such an extension is justified.

(e) The rights and remedies of the Contracting Local Organization provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

6. CLAIMS

Any claim by the Contractor arising by virtue of this contract which is not disposed of by agreement shall be submitted in writing, together with any written and oral evidence in support thereof, to the Contracting Officer for decision. Before making a decision the Contracting Officer shall notify the Contractor that any additional written and/or oral evidence in support of the claim may be presented to the Contracting Officer within 30 days from receipt by the Contractor of such notification, or within such further period of time as may be granted by the Contracting Officer. The Contracting Officer shall make his decision in

6. CLAIMS--Continued

writing and mail or otherwise furnish a signed copy thereof to the Contractor. Pending the decision of the Contracting Officer the Contractor shall proceed diligently with the performance of this contract.

7. PAYMENTS TO CONTRACTOR

(a) The Contracting Local Organization will pay the contract price as hereinafter provided.

(b) The Contracting Local Organization will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize any of the remaining progress payments to be made in full. Also, whenever the work is substantially complete, the Contracting Officer, if he considers the amount retained to be in excess of the amount adequate for the protection of the Contracting Local Organization, at his discretion, may release to the Contractor all or a portion of such excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other similar division of the contract on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Contracting Local Organization, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Contracting Local Organization to require the fulfillment of all of the terms of the contract.

(e) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid after the Contractor shall have furnished the Contracting Local Organization with a release, if required, of all claims against the Contracting Local Organization arising by virtue of this contract, other than claims in stated amounts as may be

19. FENCES--Continued
construction and removal of fences which he requires during construction.

20. WATER
The Contractor shall provide and maintain at his own expense an adequate supply of water suitable for construction purposes.

21. ACCIDENT PREVENTION AND SAFETY MEASURES
The Contractor shall comply with the accident prevention and safety measures in the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, Inc., in effect on the date of issuance of the Invitation for Bids and local and State laws, regulations, and codes relative to safety and sanitation.

22. LIGHTING REQUIREMENTS
When work is carried on between the hours of sunset and sunrise, the construction areas shall be adequately lighted to provide safe working conditions while work is in progress. The lighting plan shall be acceptable to the Contracting Officer.

23. WORKWEEK--CONSTRUCTION SCHEDULE
(a) The Contractor shall, prior to commencement of work, submit to the Contracting Officer for approval the hours and days in which he proposes to carry on the work. The Contractor shall, within 10 days following the commencement of work, prepare and submit to the Contracting Officer for approval a construction schedule showing the order in which the Contractor proposes to carry on the work indicating the periods during which he will perform work on each item listed in the bid schedule. If the Contractor fails to submit the construction schedule within the time herein specified or fails to submit a revised construction schedule within the time specified by the Contracting Officer, the Contracting Officer may withhold approval of progress payment estimates until such time as the Contractor submits the required construction schedule.

(b) If, in the opinion of the Contracting Officer, the Contractor falls behind the construction schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to either increase the number of shifts, days or hours of work, or the amount of construction plant, or all of them, and to submit for approval such revised construction schedule as may be deemed necessary to show the manner in which the agreed rate of progress will be regained, all without additional cost to the Contracting Local Organization.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with Clause 5 of these General Provisions.

24. SUBCONTRACTORS
(a) Work shall not be subcontracted in whole or in part without the prior written approval of the Contracting Officer. The request shall be in writing with the name of the proposed subcontractor and a description of the work to be done.

(b) If at any time the Contracting Officer determines that any subcontractor is incompetent or undesirable, he shall notify the Contractor accordingly and the Contractor shall take immediate steps for cancellation of the subcontract.

(c) Subcontracting by subcontractors shall be subject to the above requirements.

(d) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the Contracting Local Organization.

25. SURVEYS
(a) Unless otherwise stated in the Invitation for Bids, the work to be done shall be staked out by the Contracting Local Organization. If the Contracting Local Organization does the staking, the Contractor shall notify the Contracting Officer in advance of any staking required in order that such work can be properly scheduled.

(b) Bench marks shall be preserved by the Contractor, and in the case of their destruction or removal by him or his employees they shall be replaced by the Contracting Local Organization at the Contractor's expense.

(c) Survey stakes destroyed or removed by the carelessness of the Contractor or his employees shall be replaced by the Contracting Local Organization at the Contractor's expense. Stakes removed or destroyed in the due course of the work shall be replaced by the Contracting Local Organization without cost to the Contractor.

(d) If the Contractor finds any errors or omissions in the layout as given by survey points or staking, he shall immediately inform the Contracting Officer in writing.

26. SUSPENSION OF WORK
(a) The Contracting Officer may order suspension of the work in whole or in part for such time as he deems necessary due to weather or such other conditions as he considers unfavorable for the satisfactory prosecution of the work.

(b) When the Contracting Officer orders suspension of the work due to weather or such other conditions as he considers unfavorable for the satisfactory prosecution of the work, the contract completion date shall be extended a full calendar day for each calendar day during suspension of the work if:

(1) All work is suspended (except minor items designated in the contract and work of an emergency, protective or maintenance nature); and

(2) The hours lost in any one calendar day through such suspension equal one-half or more of the hours in an authorized work day.

(c) The Contracting Officer may order suspension of the work in whole or in part for such time as he deems necessary because of the failure of the Contractor to comply with any of the provisions of this

26. SUSPENSION OF WORK--Continued
contract, and the contract completion date shall not be extended on account of any such suspension of the work.

(d) When the Contracting Officer orders any suspension of the work under the provisions of this clause, the Contractor shall not be entitled to any costs or damages resulting from delays due to such suspension of the work.

(e) When the contract completion date is extended under the provisions of this clause, the contract shall be modified in writing accordingly.

27. CLEAN-UP WORK

(a) During construction the Contractor shall keep the site in an orderly condition, free and clear from all rubbish and debris. Care shall be taken to prevent spillage when hauling is being done on private or public roads and any such spillage or debris resulting from the Contractor's operations shall be immediately cleaned up.

(b) Upon completion of the work the Contractor shall remove from the vicinity of the work all plant, buildings, rubbish, unused materials, concrete forms and other like material belonging to him or used under his direction during the construction, and in the event of his failure to do so, the same may be removed by the Contracting Local Organization at the expense of the Contractor.

28. QUANTITY VARIATIONS

(a) Where the quantity of work shown for an item in the bid schedule, including any modification

28. QUANTITY VARIATIONS--Continued
thereof, is estimated, no adjustment of the contract price nor of the performance time shall be made for overruns or underruns which are within 25 percent of the estimated quantity of any such item.

(b) For overruns of more than 25 percent, the Contracting Officer shall re-estimate the quantity for the item, establish an equitable contract price for the overrun of more than 25 percent, adjust contract performance time equitably, and modify the contract in writing accordingly; this clause to thereafter be applicable to the total re-estimated item quantity.

(c) For underruns of more than 25 percent, the Contracting Officer shall determine the quantity for the item, establish an equitable contract price therefor, adjust contract performance time equitably, and modify the contract in writing accordingly.

29. ASSIGNMENT

The Contractor shall not assign in whole or in part this contract without the prior written consent of the Contracting Local Organization. The Contractor shall not assign any moneys due or to become due to him under this contract without the prior written consent of the Contracting Local Organization.

30. FEDERAL, STATE, AND LOCAL TAXES

Except as otherwise provided, contract unit prices shall include all applicable Federal, State, and local taxes.

(3) The compaction of the earth fill for the dam embankment shall be Class A and be compacted to at least 95 percent of maximum dry density.

(4) 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 topped with a four (4) inch camber as shown on the construction drawings.

(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.

(8) Measurement for payment will be made in accordance with Method 2. The initial survey 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 following items:

(a) Inlet and outlet structures of the principal spillway.

(b) Gated outlets and the drain inlet pipeline at outlet channel Sta 15+00.

(c) Drop structure at outlet channel Sta 16+00.

(d) Around and over the principal spillway pipeline including the cradle and collars.

(e) Around and over the gated outlet pipeline including the collars.

(2) Material shall be placed and spread in layers not more than four (4) inches thick after compaction.

(3) Compaction shall be Class A. The material shall be compacted to at least 95 percent of maximum dry density.

(4) Measurement and payment will be made in accordance with Method 3.

(a) Measured surfaces of the completed fill for items numbered 1(a), 1(b) and 1(c) will be a vertical line located 18 inches outside the neet lines of the concrete structures or pipe surfaces.

(b) Measured surfaces of the completed fill for items numbered 1(d) and 1(e) will be a vertical or horizontal line located 2 feet outside the neet lines of the Concrete Cradles, Collars, and/or pipe surfaces.

CONSTRUCTION SPECIFICATION

8B. CONCRETE

1. SCOPE

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

2. 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 in any single structure as defined in Section 26.

Aggregates shall conform to the requirements of Material Specification 101 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 26.

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

Air-entraining admixtures shall conform to the requirements of Material Specification 122. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that in the cement.

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

Shear plates shall conform to the requirements of Material Specification 117 for structural quality or commercial or merchant quality steel. Structural quality shall be used if specifically designated in the drawings or specifications.

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

Waterstops shall conform to the requirements of Material Specifications 107 and 140 for the specified kinds.

Curing compound shall conform to the requirements of Material Specification 104.

3. CLASSES OF CONCRETE

Concrete shall be classified as follows:

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

4. AIR CONTENT AND CONSISTENCY

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

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

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

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

5. DESIGN OF THE CONCRETE MIX

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

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

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

After the job mix has been designated, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer. If such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has designated a revised job mix.

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

6. INSPECTING AND TESTING

The following tests will be performed by the method indicated:

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

[1]Fresh concrete will be sampled according to ASTM Method C 172 except as follows:

(1) When a sample is made up of portions taken at intervals and mixed for testing, the time between taking and using the portions may be extended, provided they are tightly covered to prevent loss of moisture and initial set does not take place.

(2) Tests of a portion of a batch may be made on samples representative of that portion for any of the following purposes:

a. Determining uniformity of the batch.

b. Checking compliance with requirements for slump and air content when the batch is

discharged over an extended period of time.

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

[2]For each strength test of specimens made according to ASTM Designation C 31, 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 the 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 to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture and delivery of the concrete.

7. HANDLING AND MEASUREMENT OF MATERIALS

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

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

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

Cement - plus or minus 1.0 percent

Aggregates - plus or minus 2.0 percent

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

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

Aggregates shall be measured by weight. 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.

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

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

8. MIXERS AND MIXING

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

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

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

different times of mixing. For this purpose the testing program and uniformity requirements shall be as set forth in ASTM Designation C 94.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point.

Batch mixing at the site. For concrete mixed at the site of the work with paving mixers or stationary construction mixers, the time of mixing after all cement and aggregates are in the mixer drum shall be not less than 1 1/2 minutes.

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

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

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

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

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

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

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

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

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

Truck-mixed concrete. When concrete is mixed in a truck mixer loaded to its maximum capacity, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100. If the batch is at least

1/2 cubic yard less than maximum capacity, the number of revolutions at mixing speed may be reduced to not less than 50. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The mixing operation shall begin within 30 minutes after the cement has been added to the aggregates and the water shall be added during mixing. When mixing is begun during or immediately after charging, a portion of the mixing water shall be added ahead of, or with, the other ingredients.

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

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

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

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

9. FORMS

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

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one inch without injury to the concrete.

10. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted.

Unless otherwise specified, when concrete is to be placed over drain fill, the contact surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl sheeting prior to placement of the concrete. Forms for weepholes shall extend through this layer into the drain fill.

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

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

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within 1 1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85°F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable, by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.

12. PLACING

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

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

No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications before concrete is delivered for placing.

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

13. LAYERS

Unless otherwise specified, slab concrete shall be placed to design thickness in one continuous layer. Formed concrete shall be placed in horizontal layers not more than 20 inches thick. Hoppers and chutes, pipes or "elephant trunks" shall be used as necessary to prevent splashing of mortar on the forms and reinforcing steel above the layer being placed.

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

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

14. CONSOLIDATING

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

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

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

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

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

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

15. CONSTRUCTION JOINTS

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

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

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

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

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by either

20. FINISHING UNFORMED SURFACES

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

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

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

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

21. CURING

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Wood forms (except plywood) left in place during the curing period shall be kept wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

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

Except as otherwise specified in Section 24, and except for construction joint surfaces, concrete may be coated with curing compound in lieu of the continued application of moisture.

The compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed.

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

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

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

22. REMOVAL OR REPAIR

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

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

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

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

Except as otherwise approved by the Engineer, the appropriate methods described in Chapter VII of the Concrete Manual, Bureau of Reclamation, U. S. Department of the Interior, shall be used. If approved in writing by the Contracting Officer, proprietary compounds for adhesion or as patching ingredients may be used. Such compounds shall be used in accordance with the manufacturer's recommendations.

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

23. CONCRETING IN COLD WEATHER

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

a. The temperature of the concrete at time of placing shall not be less than 50°F nor more than 90°F. The temperature of neither aggregates nor mixing water shall be more than 100°F when combined with the cement.

b. When the daily minimum temperature is less than 40°F, concrete structures shall be insulated or housed and

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

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

16. EXPANSION AND CONTRACTION JOINTS

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

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

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

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

17. WATERSTOPS

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

18. REMOVAL OF FORMS

Forms shall be removed only when the Engineer is present and shall not be removed without his approval. Forms shall be removed in

such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

Forms 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 of air adjacent to the concrete is below 40°F:

Element	Time
Arch or beam bottom forms and temporary supports	14 days
Deck slabs; conduits and spillway risers (inside forms)	14 days
Conduits and spillway risers (outside forms); Small structures	3 days
Columns, bearing walls	7 days
Nonbearing walls with no side load; side of beams	24 hours

19. FINISHING FORMED SURFACES

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

Immediately after the removal of forms:

All bulges, fins, form marks or other irregularities which in the judgment of the Engineer will adversely affect the appearance or function of the structure shall be removed. All form bolts and ties shall be removed to a depth at least 1 inch below the surface of the concrete. The cavities produced by form ties and all other holes of similar size and depth shall be thoroughly cleaned and, after the interior surfaces have been kept continuously wet for at least 3 hours, shall be carefully packed with a dry patching mortar (preshrunk) mixed not richer than 1 part cement to 3 parts sand.

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

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

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

heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F nor more than 90°F for the duration of the curing period.

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

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

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

24. CONCRETING IN HOT WEATHER

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

a. The Contractor shall maintain the temperature of the concrete below 90°F during mixing, conveying, and placing. Methods used shall conform to "Recommended Practice for Hot Weather Concreting," ACI Standard 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. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying during the time between placement and finishing, and after finishing.

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

e. Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied as specified in subsection g, below.

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

g. If moist curing is discontinued before the end of the curing period, white pigmented curing compound shall be applied immediately, following the procedures specified in Section 21.

25. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, concrete will be measured to the neat lines shown on the drawings, and the volume 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 item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to completion of the concrete work, such as joint fillers, waterstops, dowels or dowel assemblies and shear plates, but not including reinforcing steel.

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

(Method 2)

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

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

Cement will be measured by dividing the volume of concrete accepted for payment by the yield of the applicable job mix.

The yield will be determined by the procedure specified in ASTM Designation C 138. If the amount of cement actually used per batch exceeds the amount in the job mix specified by the Engineer, the measurement will be based on the latter. One barrel of cement will be considered equal to 4 bags or 376 pounds. Payment for each type of cement will be made at the contract unit price for furnishing and handling that type of cement and such payment will constitute full compensation for all materials, labor, equipment, storage, transportation and all other items necessary and incidental to furnishing and handling the cement.

(Applies to Both Methods)

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 26 of this specification.

26. 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.

(3) Coarse aggregate shall be size number 467 (1½" to number 4).

(4) Joint filler shall be Type I, except that the joint filler between the antiseep collar and the 18" thick concrete Section that contacts with the cradle and barrel of the conduit and the filler between the collars and the conduit of the 24" gated outlet shall be Type II non-bituminous Class A sponge rubber ½" thick and of the width shown on the drawings, in accordance with Material Specification 106 and Federal S pecification HH-F-341.

(5) Curing compound shall be Type I or Type II.

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 outlet structure of the principal spillway, and the inlet, outlet, concrete bedding and collars, pedestals and anchor block of the gated outlets and the drop structure in the outlet channel at Station 16+00.

(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. No payment will be made for additional cement added for the convenience of the contractor.

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

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. The area of reinforcement required in splice overlaps will be included in the measurement for payment.

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.

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

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.

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 and 11. Reinforced Concrete Pipe

(1) This item shall consist of the furnishing and installing of the reinforced concrete pipe in the principal spillway and in the gated outlet pipelines of the Rittenhouse Floodwater Retarding Structure.

(2) The principal spillway pipe shall be a 33" diameter reinforced concrete pipe conforming to AWWA Standard 300, 301, 302 or ASTM C361-66T. The pipe shall be reinforced to withstand an external load of 8250 pounds per lineal foot when tested in accordance with Section 7 of Material Specification 109.

(3) The gated outlet pipelines shall be 24" diameter reinforced concrete pipe conforming to AWWA Standard 300, 301 or 302 or ASTMC 361-66T. The pipe shall be reinforced to withstand an external load of 6200 pounds per lineal foot when tested in accordance with Section 7 of Material Specification 109.

(4.) The joint shall be designed to have a minimum joint extensibility of 1" as described in Section 4 of Material Specification 109.

(5.) The pipe shall be manufactured by a centrifugal force process.

(6) Measurement and payment will be made in accordance with Method 1.

CONSTRUCTION SPECIFICATION

12. CORRUGATED METAL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and placing circular, arched or eliptical 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

Unless otherwise specified, 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 12. Corrugated Metal Pipe

(1.) This item shall consist of furnishing and placing of corrugated metal pipe in the outlet channel at station 15+80 as shown on the drawings.

(2.) The pipe shall conform to the requirements of Material Specification 110. The pipes shall be 14 gage, 18 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 except that the laid length shall be measured along the base of the pipe.

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:

Material	Unit Weight Pounds per Cubic Foot
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.

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 13. Trash Rack

(1) This item shall consist of the fabrication 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) The trash rack assembly shall be cleaned and painted in conformance with Specification 22, Cleaning and Painting Metalwork.

(5) 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 14. Loose Rock Riprap

(1) This item consists of the furnishing and placing of rock riprap at the outlet end of the principal spillway and the gated outlets, 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.

(3) The rock shall conform to the tests required for riprap as specified in Material Specification 127 except that 90% of all rock must meet the least dimension criteria.

(4) The rock shall be placed in accordance with Section 4 of this specification, except some hand work will be required for 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 when measured perpendicular to the surface except that either extreme shall not extend over an area greater than 100 square feet.

(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 specified in Section 8 or on the drawings. 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.

When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate frame and the thimble, in accordance with the recommendation of the gate manufacturer.

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.

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 15. Slide Gate - 24"

(1.) This item of work shall consist of the furnishing and installing of the slide gates on the gated outlet, complete with frames, stems, stem guides and gate lifts and trash racks 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.

(3.) The slide gate and appurtenances shall be cleaned and painted in conformance with Specification 22, Cleaning and Painting Metalwork

CONSTRUCTION SPECIFICATION

21. INSTALLING FARM FIELD FENCES

1. SCOPE

The work shall consist of furnishing and installing farm field fences, including gates and fittings.

2. MATERIALS

Materials for farm field fences shall conform to the requirements of Material Specification 118. All wooden posts shall be of the same species.

3. SETTING POSTS

For concrete or wooden posts, the diameter of the post hole shall be at least 6 inches larger than the diameter or side dimension of the butt of the post. For steel posts to be set in concrete the diameter of the post hole shall be at least 4 inches.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the post hole up to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12 inches and shall completely fill the post hole up to the ground surface. Backfill, either earth or concrete, shall be crowned up around posts at the ground surface.

No stress shall be applied to posts set in concrete until at least 24 hours after the concrete has set.

4. CORNER ASSEMBLY

Unless otherwise specified, corner assemblies shall be installed at all points where the fence alignment changes 5 degrees or more.

5. END PANELS

End panels shall be built at gates and fence ends.

6. PULL POST ASSEMBLY

Pull post assemblies shall be installed at the following locations:

a. In straight fence sections, at intervals of no more than 660 feet.

b. At any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 degrees (except as provided in Section 9 of this specification).

c. At the beginning and end of each curve.

7. ATTACHING FENCING TO POSTS

The fencing shall be stretched and attached to posts as follows:

a. The fencing shall be placed on the side of the post opposite the area being protected, except on curves.

b. The fencing shall be placed on the outside of curves.

c. The fencing shall be fastened to each end post, corner post and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.

d. The fencing shall be fastened to wooden line posts by means of staples. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Staples shall be driven diagonally with the grain of the wood and at a slight downward angle and shall not be driven so tightly as to bind the wire against the post.

e. The fencing shall be fastened to steel or concrete line posts with either two turns of 14 gage galvanized steel or iron wire or the post manufacturer's special wire clips.

f. Wire shall be spliced by means of a Western Union splice having not less than 8 wraps of each end about the other. All wraps shall be tightly wound and closely spaced.

8. STAYS

Stays shall be attached to the fencing in a manner to insure maintenance of the proper spacing of the fence wire strands.

9. CROSSINGS AT DEPRESSIONS AND WATERCOURSES

Where fencing is installed across small depressions or watercourses, either of the following methods of installation shall be used:

a. If the fence wire is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored by means of extra embedment or by special anchors as detailed on the drawings.

b. If the wire fence is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire.

10. MEASUREMENT AND PAYMENT

(Method 1) The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, including gate openings. Payment for each type and kind of fence will be made at the contract unit price for that type and kind of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work including fabricating and installing gates.

(Method 2) The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, excluding gate openings. Payment for each type and kind of fence will be made at the contract unit price for that type and kind of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work, except fabricating and installing gates. Payment for each type and size of gate will be made at the contract price each for fabricating and installing that type and size of gate.

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.

Type 11 paint shall conform to the requirements of Material Specification 139. The paint shall be mixed at the time of use.

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 removal of all dirt, rust, mill scale and other coatings by means of sandblasting, grit blasting or pickling. The finished surface shall uniformly expose the base metal and shall present an etched, but not polished or peened, appearance. Not more than 5 percent of the surface may exhibit very light shadows, light streaks, or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating.

Method 2 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.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item 16, Fences

(1) This item shall consist of the work at centerline Stations 48+50, 96+60 and 149+95 as follows:

(a) Installation of permanent fences. Such installations shall be made with salvaged fences materials or new materials as approved by the Contracting Officer and installed as shown on the drawings.

(b) Installation of a 12 ft wirefence gate across the crest of the embankment and at the fence crossings designated above as shown on the drawings.

(2) Fencing shall have two strands of Type I, Style 2, 12½ gage, barbed line wire with 14 gage, galvanized iron, round barbs with four points at 5 inch intervals. Woven wire fence shall be Type II, Style 4, No. 832-6-11 installed with the bottom wire 4 inches above ground level.

(3) All fence posts shall be of the type and size shown on the drawings.

(4) Measurement and payment will be made in accordance with Method 1. Compensation will include payment for Subsidiary Item, Temporary Fences.

B. Subsidiary Item, Temporary Fences

(1) This item shall consist of maintaining temporary fences at centerline Stations 48+50, 96+60 and 149+95 to prevent escapement of animals during the construction season.

(2) This item will not be measured for payment. Compensation for the required work will be included in the payment for Bid Item 16, Fences.

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 miximum particle size that will pass the No. 16 sieve (U. S. Standard) and a minimum size that will be retained on the No. 50 sieve (U. S. Standard). The equipment used for sandblasting shall be equipped with adequate separators and traps to insure that the compressed air shall be free of detrimental amounts of water and oil. Blast cleaned surfaces shall be brushed, blown or vacuum cleaned to remove any trace of blast products or abrasives prior to painting.

Surfaces that are not to be painted immediately after cleaning shall be treated with one brush coat of metal conditioner conforming to the requirements of Military Specification MIL-M-10578, except that surfaces cleaned by pickling in phosphoric acid solution shall not require such treatment.

Surfaces shall be thoroughly dry 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 metalwork will be designated as defined below:

Paint System A shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two priming coats of Type 1 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.

Paint System I shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two or more coats of Type 11 paint as necessary to provide a total dry paint film thickness of at least 16 mils.

5. APPLICATION OF PAINT

Surfaces shall be painted immediately after preparation (or within two days after preparation and treatment with metal conditioner) with at least one coat of the type of priming paint required by the specified paint system. Surfaces not required to be painted shall be protected against contamination and damage during the cleaning and painting operation.

Paints shall be thoroughly mixed at the time of application.

After erection or installation of the metalwork, all damages to shop applied costs shall be repaired and all bolts, nuts, welds and field rivet heads shall be cleaned and painted with one coat of the specified priming paint.

Except on surfaces accessible only to spray equipment, initial priming coats shall be applied by brush. All other coats may be applied by brush or spray. Each coat shall be applied in such a manner as to produce a paint film of uniform thickness with a rate of coverage within the limits recommended by the paint manufacturer.

The drying time between coats shall be as prescribed by the manufacturer of the paint but not less than that required for the paint film to dry through. The elapsed time between the application of the first and second prime coats of Paint System A shall not exceed 60 hours. In the application of Paint System I, if, for any reason, the first coat dries hard before the second

coat is applied or the elapsed time between coats exceeds 48 hours, the method of application must be modified in any of the following ways: (1) the first coat must be wiped down with MIBK with the application of the second coat following the wipedown by not more than 6 feet; or (2) the first coat must be lightly brush blasted or given a fog coat of the paint before application of the full second coat; or (3) a special bonding additive supplied by the paint manufacturer must be mixed with the paint applied in the second coat.

The finished surface of each coat shall be free from runs, drops, ridges, laps or excessive brushmarks and shall present no variation in color, texture and finish.

The surface of each dried coat shall be cleaned as necessary before application of the next coat.

Except for Paint System I, the first coat of each two-coat system shall be tinted for contrast. The first coat of red-lead paint shall be tinted by the addition or 3 ounces per gallon of 1B black pigment. The first cost of machinery paint shall be tinted off color with 3 ounces per gallon of a pigment suitable to the color of the paint.

6. ATMOSPHERIC CONDITIONS

Paint shall not be applied when the temperature of the item to be painted or of the surrounding air is less than 50°F. For Paint System I, the temperature of the coated surface must be maintained at not less than 50°F for 6 hours after the application of each coat. Painting shall be done only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation will result during the period of time required for application and drying. Surfaces protected from adverse atmospheric conditions by special cover, heating or ventilation shall remain so protected until the paint is dry.

7. TESTS

Acceptance of dry paint film thickness for Paint System A, H, and I 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 metal-work 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 the specification.

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.

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 outlets of Rittenhouse Floodwater Retarding Structure.

(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 Trash Rack, Bid Item 13 and Slide Gate, Bid Item 15.

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. 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 embankment 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

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.

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. Aggregates that fail to meet any requirement may be accepted only when: (1) the specified alternate conditions of acceptance can be proved prior to the use of the aggregates on the job and within a period of time such that no work under the contract will be delayed by the requirements of such proof; or, (2) the specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

3. 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 except that potential alkali reactivity may be determined by: (1) the method prescribed by ASTM Designation C289 (subject to the limitations of Section 17, therein) and (2) determination of the mineral constituents by petrographic examination. Unless otherwise specified, Test Method 206.1 of Federal Specification SS-R-406 will be applied only: (1) to materials that show potential reactivity when tested by ASTM Designation C289 or materials for which results of ASTM Designation C289 are not valid, and (2) when test results can be obtained within the time limits specified in Section 2 of this specification.

MATERIAL SPECIFICATION

102. SEALING COMPOUND FOR JOINTS IN CONCRETE AND CONCRETE PIPE

1. SCOPE

This specification covers the quality of sealing compound for filling joints in concrete pipe and concrete structures.

2. TYPE

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

The single component type shall be a ready-mixed nondrying compound furnished in troweling consistency or in preformed rope or strip form.

The multiple component type shall be composed of two or more substances that are to be mixed prior to application.

3. QUALITY

Sealing compound shall conform to the requirements of one of the following specifications:

ASTM Specification D 1850; Concrete Joint Sealer, Cold-Application Type. Penetration, determined as specified in ASTM D 1850, shall be not greater than 120.

Federal Specification SS-S-00210; Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

Federal Specification TT-S-227; Sealing Compound; Rubber Base, Two Component (For Calking, Sealing and Glazing in Building Construction), Type II.

4. COMPOSITION AND PROPERTIES

The compound, if used for pipe having rubber gaskets, shall have a composition such that it will not cause deterioration of the rubber gaskets.

The compound shall be capable of being applied at a temperature of 70°F and shall be of such nature that it will adhere to dry, dust free concrete when applied either directly or over a suitable primer. After curing it shall be a resilient, adhesive material that is capable of filling joints to prevent the entry of concrete or earth during the bedding, cradling or backfilling operations.

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.

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.

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.

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 C301, except that Section 2.6, Steel for Cylinders, paragraph 2.6.1 shall be:

> 2.6.1 Steel sheets for cylinders may be in coils or cut lengths, and shall meet the requirements of (1) the "Specifications for Hot-Rolled Carbon Steel Sheets, Commercial Quality" (ASTM Designation A 415), except that the maximum carbon content may be 0.25 percent and the minimum yield point shall be 27,000 psi or (2) the "Specifications for Flat-Rolled Carbon Steel Sheets of Structural Quality," Grade B or C (ASTM Designation A 245).

b. Steel Cylinder Type, Not Prestressed: AWWA Standard C300, except that Section 2.6, Steel for Cylinder, paragraph 2.6.1 shall be:

> 2.6.1 Steel sheets for cylinders may be in coils or cut lengths, and shall meet the requirements of (1) the "Specifications for Hot-Rolled Carbon Steel Sheets, Commercial Quality" (ASTM Designation A 415), except that the maximum carbon content may be 0.25 percent and the minimum yield point shall be 27,000 psi or (2) the "Specifications for Flat-Rolled Carbon Steel Sheets of Structural Quality," Grade B or C (ASTM Designation A 245).

c. Noncylinder Type, Not Prestressed: AWWA Standard C302.

d. Low Head Pressure Pipe: ASTM Designation C 361.

Sections 1.6 and 1.7 of AWWA Standards C300, C301 and C302 shall not apply.

3. STEEL REINFORCEMENT

The steel reinforcements shall conform to the requirements of the specifications cited in Section 2 for the specified type of pipe, except that elliptical reinforcing cages or other reinforcements that require special orientation of the pipe during placement will not be allowed.

4. JOINTS

The pipe joints shall be of the bell and spigot type or the double spibot 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 pipe shall be inspected by methods prescribed in the specifications cited herein, except that external crushing strength tests

required as a basis for certification shall be performed by the three-edge bearing method prescribed in ASTM Designation C 76.

The three-edge bearing load shall be defined as:

a. For pipe conforming to ASTM Designation C 361, AWWA Standard C300 or AWWA Standard C302, the load required to produce a 0.01-inch crack one foot long; or,

b. For pipe conforming to AWWA Standard C301, the load required to produce a 0.001-inch crack one foot long.

The material certification will include:

a. The pipe manufacturer's certified statement of the design strength of the pipe, consisting of:

   (1) For types of pipe for which design curves have been approved by the Soil Conservation Service: (a) a copy of the appropriate design curve marked to show the resultant concrete core stress and corresponding three-edge bearing load of the pipe furnished; and (b) a specification sheet for the pipe furnished showing all data and dimensions needed to compute the resultant concrete core stress; or

   (2) Results of typical external crushing strength tests performed on pipe of equivalent size and design and composed of equivalent materials, or

   (3) Results of external crushing strength tests performed on a specimen (at least three feet in length) of pipe identical in design and construction to the pipe furnished.

b. The pipe manufacturer's certified statement of results of the hydrostatic tests required by the reference specification appropriate to the type of pipe furnished.

c. The pipe manufacturer's certified statement of current typical test reports on steel and steel wire reinforcing and compression tests of the concrete used in the manufacture of the pipe.

d. Such drawings and descriptions of the pipe joints as may be necessary to show that the joint conforms to the specified requirements.

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.

MATERIAL SPECIFICATION

118. FARM FIELD FENCING MATERIALS

1. SCOPE

This specification covers the quality of materials used in the construction of farm field fences.

2. WIRE GAGE

When the size of steel wire is designated by gage number, the relation between the gage number and the diameter in inches shall be as prescribed in Federal Specification QQ-W-418.

3. FENCING

Barbed wire, woven wire and wire netting fencing shall conform to the requirements of Federal Specification RR-F-221 for the specified types of fencing.

4. STAYS, BRACING AND TENSION WIRE

Wire stays and bracing and tension wires shall be galvanized wire conforming to the requirements of Federal Specification QQ-W-418.

5. WOOD FENCE POSTS

Wood posts shall be of red cedar, osage orange (Bois d'Arc), redwood, pressure treated pine or other wood of equal life or strength. Red cedar posts having a minimum diameter of four inches shall have a heart of not less than two inches in diameter; with a minimum diameter of five inches, the heart shall not be less than three inches in diameter and with a minimum diameter of eight inches, the heart shall not be less than 5 inches in diameter. Except for red cedar, redwood, and osage orange, wood posts shall be pressure treated as specified in Material Specification 116. The posts shall be sound, new, free from decay, with all limbs trimmed substantially flush with the body. They shall be substantially straight throughout their length.

6. STEEL FENCE POSTS

The steel fence posts shall be "Tee" or "U" type with suitable corrugation, knobs, studs or grooves for fastening of line wires thereto. Posts with lugs or lips that are punched out of the post itself shall not be used. Steel posts shall have a minimum weight of 1.33 pounds per foot exclusive of anchor plate. The anchor plate shall weigh 0.67 pound or more, be so shaped as to give maximum holding power in ground, and must be tapered to facilitate driving. The plate shall be clamped, welded or riveted to the post in such a manner that it will not shear when the post is driven in ground. The steel posts shall have a minimum tensile strength of 70,000 pounds per square inch and a minimum yield point of 40,000 pounds per square inch.

7. CONCRETE FENCE POSTS

Concrete fence posts shall be manufactured to the specified requirements of size, shape, and strength.

8. TREATED TIMBER BRACES

Wood braces shall be pressure-treated lumber equal to construction grade Douglas fir. The braces shall be pressure-treated as specified in Material Specification 116.

9. PANEL GATES

Panel gates shall be the specified types, sizes, and quality and shall include the necessary fittings. The fittings shall consist of not less than two hinges and two latches or galvanized chains for fastening. Latches shall be of such design that a padlock may be used for locking. All fittings shall be equivalent to the gate manufacturer's standard.

10. WIRE GATES

Wire gates shall be the type shown on the drawings, constructed in accordance with these specifications at the locations and to the dimensions shown on the drawings. The materials shall conform to the kinds, grades, and sizes as specified for new fence, and shall include the necessary fittings and stays.

11. STAPLES

Staples used to fasten fence wire to wood posts shall be 9-gage galvanized wire with a minimum length of 1-1/2 inches for soft woods and a minimum length of one inch for close-grained hardwoods.

12. GALVANIZING

All ferrous metal parts of the fencing, except posts, shall be galvanized by the hot dip process, with the exception that clips, tie wires, bands or other fabric fasteners may be protected by other non-corrosive plating. The weight and uniformity of zinc coating on the parts shall be in accordance with Material Specification 119.

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.

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.

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:

	Method
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

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.

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.

5. SAMPLING AND TESTING

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

	Method No.
Sampling	101.01
Soundness	203.01
Abrasion (Los Angeles)	208.11
Specific gravity	209.0

MATERIAL SPECIFICATION

128. SLIDE GATES (SLUICE GATES), METAL, MODERATE DUTY

1. SCOPE

This specification covers the quality of moderate duty, metal slide gates (sluice gates) for water control.

2. CLASS AND TYPE OF GATE

The class of gate will be expressed as a numerical symbol composed of the seating head and 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.

The gates shall be of the specified types as defined below:

Type MMS-1 gates shall have cast iron seat facings.

Type MMS-2 gates shall be fitted with bronze seat facings.

3. QUALITY OF MATERIALS

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

Iron castings shall conform to Federal Specification QQ-I-652, Class 30 or higher.

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-634, Composition No. C1018 or C1045, in the condition and finish appropriate to structural or operational requirements.

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.

Rubber for gaskets and seals shall conform to the requirements of ASTM Designation D 735, Type R, Grade 805.

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.

5. GATE SLIDE

The gate slide 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.

Tongues or grooves shall be cast or machined on the vertical sides of the slide along its entire height to match the guide grooves or angles.

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 flat-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 galvanized structural steel and shall be built to withstand the total thrust of the gate slide due to water pressure and wedge action. Structural steel guides shall be galvanized in accordance with the requirements of Material Specification 119.

On cast iron guides, grooves shall be machined to receive the 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)

Pads for supporting wedges, wedge seats and wedge loops (or stirrups) shall be cast as integral parts of the slide, frame or guides.

Wedges and wedge seats shall have smooth bearing surfaces. Wedges may be cast as integral parts of the slide. Removable wedges and wedge seats shall be fastened to the slide, frame or guides by means of suitable studs, set screws or bolts. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact. Adjusting bolts or screws shall be bronze.

MATERIAL SPECIFICATION

140. NON-METALLIC WATERSTOPS

1. SCOPE

This specification covers non-metallic waterstops for use in joints of concrete structures.

2. CLASSIFICATION

a. Classes. Non-metallic waterstops shall be of the following classes, as specified:

Class I shall be made of either natural or synthetic rubber.

Class II shall be made of vinyl chloride polymer or copolymer.

b. Types. Non-metallic waterstops may be either split or solid and shall conform to the following types, as specified (see Figure 1):

Type A shall have ribbed anchor flanges and a smooth web. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type B shall have ribbed anchor flanges and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half the web thickness and (2) the inside diameter (D) specified in the contract. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type C shall have a single, circular, bulb-type anchor flange at each edge and a smooth web.

Type D shall have a single, circular, bulb-type anchor flange at each edge and a smooth web containing a hollow, tubular center bulb having: (1) a wall thickness equal to at least one-half the thickness of the web and (2) the inside diameter (D) specified in the contract.

Type E shall have ribbed anchor flanges and a web molded or extruded in the form of a round or U-shaped bulb of the dimensions specified in the contract. The web bulb shall be connected at the open end of the "U" by a thin membrane (having a thickness of not less than 1/64-inch or more than 1/5 the web thickness) designed to: (1) prevent infiltration of wet concrete into the bulb and (2) tear when expansion of the joint occurs. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges. Auxilliary positioning or nailing flanges may be provided so long as they do not interfere with the functioning of the web bulb.

Type F shall have ribbed anchor flanges with at least two extra heavy ribs (designed to resist displacement of the waterstop during placement of concrete) on each flange and a smooth web having a positioning or nailing flange attached at the center.

Type G shall be of special design conforming to the details shown on the drawings.

c. Sizes. Waterstops of Types A through F shall be of the sizes listed herein, as specified (see Table 1). Type G waterstops shall have the dimensions shown on the drawings.

3. PHYSICAL REQUIREMENTS

The extruded or molded materials shall exhibit the properties specified herein when tested by the methods specified in Section 4 of this specification.

a. Class I Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.2.

(3) The tensile strength shall be not less than 2500 pounds per square inch.

(4) The ultimate elongation shall be not less than 450 percent.

(5) The compression set shall be not more than 30 percent.

(6) The water absorption (by weight) shall be not more than 5 percent.

(7) The decrease in tensile strength and ultimate elongation after aging shall be not more than 20 percent.

(8) There shall be no sign of failure due to brittleness at a temperature of minus 35°F.

b. Class II Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.4.

(3) The tensile strength shall be not less than 1400 pounds per square inch.

(4) The ultimate elongation of the web shall be not less than 280 percent and that of the flanges shall be not less than 200 percent.

(5) The water absorption (by weight) shall be not more than one percent.

(6) There shall be no sign of failure due to flange brittleness at a temperature of 0°F. nor of web brittleness at a temperature of minus 35°F.

(7) The decrease in either tensile strength or ultimate elongation after accelerated extraction shall be not greater than 15 percent.

(8) As a result of the effects of alkalies:

(a) After immersion for 7 days, the sample shall exhibit no loss of weight and not more than 0.25 percent increase in weight, and the hardness (Shore A) of the treated sample shall differ from that of the untreated sample by not more than plus 5 points or minus 5 points.

(b) After immersion for 30 days, the sample shall exhibit no loss of weight and not more than 0.40 percent increase in weight, and the dimensions of the treated sample shall not differ from those of the untreated sample by more than one percent.

4. TEST METHODS

Testing shall be done by the methods cited herein. All cited test methods are included in Federal Test Method Standard No. 601.

a. Hardness shall be determined by Method 3021.

b. Specific gravity shall be determined by Method 14011.

c. Tensile strength shall be determined by Method 4111.

d. Ultimate elongation shall be determined by Method 4121.

e. Compression set shall be determined by Method 3311.

f. Water absorption shall be determined by Method 6631.

g. Tensile strength and ultimate elongation after aging shall be determined by Method 7111.

h. Brittleness shall be determined by Method 5311.

i. Accelerated extraction shall be accomplished by Method 6111 under the following conditions:

(1) Samples shall be not less than 1/16-inch nor more than 1/8-inch in thickness;

(2) The immersion medium shall be a solution made by dissolving 5 grams of chemically pure sodium hydroxide and 5 grams of chemically pure potassium hydroxide in one liter of distilled water;

(3) The samples shall be immersed in the medium for 14 days at a temperature of $145^{\circ} \pm 5^{\circ}F$;

(4) During the immersion period, air shall be gently bubbled through the medium from a 1/4-inch glass tube at a rate of about one bubble per second;

(5) Fresh medium shall be substituted every day;

(6) Samples need not be dipped in acetone.

j. The effects of alkalies shall be determined by Method 6251 under the following conditions:

(1) Samples shall be not more than 1/4-inch in thickness;

(2) The immersion medium shall be as described in (i), above;

(3) Fresh medium shall be substituted every 7 days.

(4) The samples shall be immersed in the medium for a period of 30 days;

(5) Samples need not be dipped in acetone.

5. CONDITION

Waterstops shall be extruded or molded in such a manner that the material is dense and homogeneous throughout and free from voids, tears, thins, indentations, or other imperfections. Unless otherwise specified, waterstops shall be symetrical in shape and uniform in dimensions and shall be furnished in continuous strips at least 50 feet long. Factory splices shall have a tensile strength equal to at least one-half that of the unspliced section.

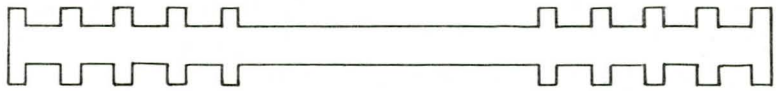
6. PACKAGING AND STORING

Waterstops shall be packaged and stored by methods that will protect them from prolonged exposure to direct sunlight or excessive heat.

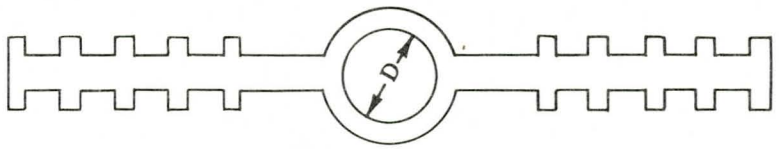
FIGURE 1

TYPES OF NON-METALLIC WATERSTOPS

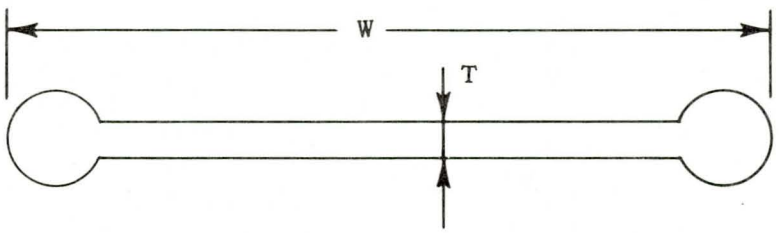
TYPE A



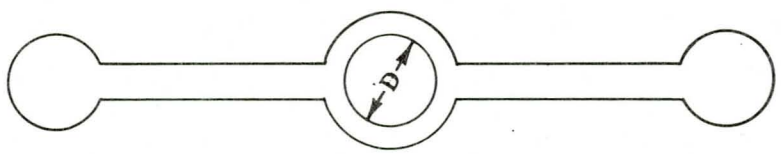
TYPE B



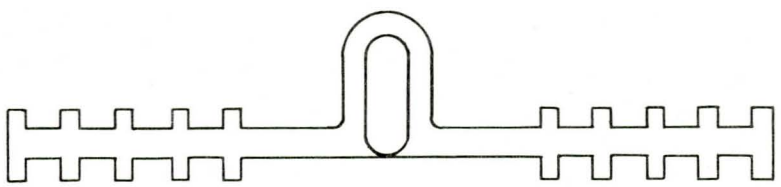
TYPE C



TYPE D



TYPE E



TYPE F

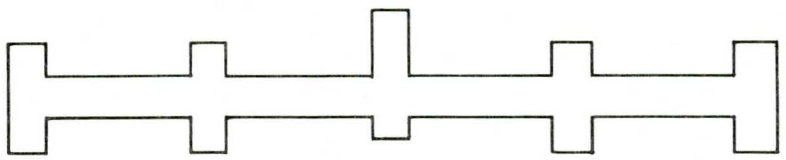


TABLE 1. SIZES OF WATERSTOPS

Size Designation	Web Thickness (T) (Inches)	Width (W) (Inches)
1	1/16	5 1/4
2	3/32	3 3/4
3	3/32	4
4	3/32	5 1/4
5	3/32	6
6	1/8	4
7	1/8	5 1/4
8	1/8	6
9	5/32	4
10	5/32	4 1/2
11	5/32	9
12	3/16	4
13	3/16	5
14	3/16	6
15	3/16	9
16	1/4	6
17	1/4	9
18	3/8	5
19	3/8	6
20	3/8	9
21	1/2	6
22	1/2	9
23	1/2	12