

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate proportioning of the ingredients of the mix.

Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

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

Water shall be measured, by volume or by weight, to an accuracy within one percent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of three percent.

7. STRENGTH TESTS

Standard tests of the strength of the concrete will be made by the Contractor from concrete test cylinders cast by the Technician in conformance with ASTM-C-31. The Contractor shall provide cylinder molds and shall have the cylinders tested by an approved laboratory--the Contractor bearing the costs of such testing.

One strength test shall consist of three standard cylinders made from a composite sample secured from a single load of concrete in accordance with ASTM-C-172 and tested at 28 days. The test results at 28 days shall be in the average of the strength of three specimens determined in accordance with ASTM-C-39, except that if one specimen show manifest evidence of improper sampling, molding or testing, it shall be discarded and the strengths of the remaining two specimens shall be averaged. Should more than one specimen representing a test show such defects, the entire test shall be discarded.

One strength test, consisting of three test cylinders, will be made for (1) each day's run or (2) for each 25 cubic yards of concrete place or fraction thereof.

A record shall be made of the particular load of concrete tested and the exact location in the work at which each load represented by a strength test is deposited.

In the event that concrete tested in accordance with the requirements stated above fails to meet the strength requirements of these specifications, the Technician will designate a new or adjusted mix.

8. MIXER 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 and of discharging the mix without segregation.

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.

a. Batch Mixing at the Site

The Contractor shall provide at the site of the work a modern and dependable batch-type mixing plant with a capacity consistent with the size of the job. Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering the concrete. The complete plan assembly shall include provisions to facilitate the inspection of all operations at all times.

b. Ready-Mixed Concrete

Ready-mixed concrete may be used if approved by the Technician. All mixing requirements specified herein for concrete mixed at the site shall be applicable to ready-mixed concrete.

c. Truck-Mixed Concrete

Truck mixers will be permitted, provided the use of this method will cause no violation of any applicable provisions of specifications for concrete contained herein. Truck mixer, unless otherwise authorized by the Technician, shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to insure the uniform distribution of materials throughout the mass. Each truck mixer shall be equipped with a tank of known capacity which shall be equipped with an accurate device for measuring the amount of water added.

d. Deliver Trucks

When truck ready-mixed or truck-mixed concrete is used, the Contractor shall submit to the Technician, with each mixer load, a certified delivery ticket giving the quantities of cement, fine aggregate, coarse aggregate, water, and admixtures, if any, contained in the batch and the time the cement was introduced to the aggregates.

9. FORMS

a. Material

Forms shall be of wood, steel, or other approved material. The type, size, shape, quality, and strength of all materials of which forms are made will be subject to approval of the Technician.

b. Construction

Forms shall be true to line and grade, mortar tight, and sufficiently rigid to prevent objectionable deformation under load. The form surfaces shall be smooth, free from irregularities, dents, sags, or holes when used for permanently exposed faces. Bolts and rods used for internal ties shall be so arranged that when the forms are removed, metal will be not less than one inch from any concrete surface. Wire ties will not be permitted.

c. Coating

Forms for exposed surfaces shall be coated with an approved non-sustaining form oil which shall be applied shortly before the concrete is placed. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling immediately before placement of the concrete, except that in freezing weather oil shall be used.

d. Preparation

Before any concrete is placed, the forms and subgrade shall be free of chips, dirt, sawdust, water, ice, snow, extraneous oil, mortar, or other harmful substances.

10. EMBEDDED ITEMS

Before concrete is placed, all embedded items will be firmly and securely fastened in place as indicated on the drawings or as required. Embedded items shall be free of oil and other foreign matter.

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

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within one and one-half hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. The Technician 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. Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation or loss of ingredients.

12. PLACING

a. General

Concrete shall not be placed until the subgrade, forms, and steel reinforcement have been inspected and approved. The Contractor shall give reasonable notice to the Technician each time he intends to place concrete.

There shall be no vertical drop greater than five feet except where suitable equipment is provided to prevent segregation and where specifically authorized by the Technician.

The concrete shall be deposited as closely 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.

Immediately after the concrete is placed in the forms it shall be consolidated by spading, hand tamping, or vibration as necessary to insure smooth surfaces and dense concrete. Each layer shall be consolidated to insure monolithic bond with the

preceding layer. All concrete-placing equipment and methods shall be subject to approval.

b. Lifts in Concrete

Unless specifically authorized or directed by the Technician, 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. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. In case of any delay between placing of batches that allows previously placed concrete to take initial set, the Contractor shall discontinue the placement of concrete and make a construction joint satisfactory to the Technician before proceeding with the placing operations. He shall remove whatever portion of the previously placed concrete that is deemed necessary for the proper formation of the construction joint.

c. Concrete on Rock Foundation

Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, mud, objectionable coatings, debris, loose semi-detached or unsound rock or fragments. Faults or seams shall be cleaned to a depth satisfactory to the Technician and to firm rock on the sides. Immediately before concrete is placed, all such rock surfaces shall be cleaned thoroughly by the use of high velocity air-water jets, wet sandblasting, or other means satisfactory to the Technician.

d. Concrete on Earth Foundations

Unless otherwise authorized, all concrete shall be placed upon clean, damp surfaces free from frost, ice, standing or running water, and never upon soft mud, dried porous earth, or upon fill that has not been subject to approved rolling and tamping until specified compaction has been obtained.

e. Placing Temperature

Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40 degrees F unless facilities are provided to prevent the concrete from freezing. The use of accelerators or antifreeze compounds will not be allowed.

Concrete, when deposited in the forms during cold weather, shall have a temperature of not less than 50 degrees F nor more than 90 degrees F. The materials shall be free from ice, snow, and frozen lumps before entering the mixer. All methods and equipment shall be subject to approval.

In hot weather, the Contractor shall apply effective means to maintain the temperature of the concrete below 90 degrees F during mixing, conveying, and placing.

13. CONSTRUCTION JOINTS

The placing of concrete will be accomplished so that construction joints occur at locations shown on the plans or as approved by the Technician. As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will adversely affect the hardening of the concrete. Joints shall be clean and kept damp until the new concrete is placed. Prior to placing the next lift, the joint shall be prepared by brooming a bedding layer of mortar of the same mix as that in the concrete into the old surface after it has been kept moist for several hours unless otherwise permitted.

14. EXPANSION OR CONTRACTION JOINTS

a. General

Joints shall be provided at the location(s) indicated on the drawings and according to the details shown or as otherwise approved. The methods and materials used shall be subject to approval and the materials shall conform to the specifications applicable.

b. Expansion Joint Filler

At all expansion joints shown on the plans, a premolded joint filler of the thickness specified shall be provided to prevent bond between, and allow for the expansion and contraction of, the adjacent part. The premolded joint filler shall be of the type and quality indicated on the plans.

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

c. Dowel Bar Assembly

When called for on the plans, smooth steel dowel bars shall be installed at the expansion joints. The dowel bars shall be of the type, size, and length as specified and shall be installed with an approved metal expansion chamber in proper alignment to insure a workable expansion device. The premolded expansion joint filler at these expansion joints shall be held in a true vertical plane by means of a header board. The header board shall remain in place for a minimum of 30 minutes after the concrete had been placed on one side, or until the concrete had set sufficiently to prevent sloughing, before the header board is removed and the work of placing concrete continued.

d. Waterstops

Waterstops shall be installed in joints as shown on the drawings or as otherwise directed. All joints in metal waterstops shall be soldered, brazed, or welded. Joints in rubber or plastic water stops shall be cemented, welded, or vulcanized as recommended by the manufacturer.

Adequate provisions shall be made to support and completely protect the waterstops during the progress of the work. Waterstops shall be of the type, material, and quality indicated on the plans.

15. REMOVAL OF FORMS

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

<u>Element</u>	<u>Time</u>
Beams, arches--supporting forms and shoring	14 days
Conduits, deck slabs--supporting (inside) forms and shoring	7 days
Conduits (outside forms), sides of beams, small structures	24 hours
Columns, walls, spillway risers--with side or vertical load	7 days

Columns, walls, spillway risers--with no side or vertical load:

Concrete supporting more than 30 feet of all in place above it 7 days

Concrete supporting no more than 20 feet of wall in place above it 24 hours

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

16. FINISHING

Defective concrete, honeycombed areas, and voids left by the removal of tie rods, shall be repaired immediately after the removal of forms unless otherwise authorized or directed. Voids left by removal of tie rods shall be reamed and completely filled with dry-patching mortar. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails, and anchors.

All fins and irregular projections shall be removed from surfaces to be exposed to view or water on the completed structure.

All unformed surfaces of concrete to be exposed in the completed work shall have a wood float finish without additional mortar. All joints, edges, and external corners that will be exposed to view shall be chambered or finished with molding tools.

17. CURING AND PROTECTION

a. General

All concrete shall be cured for a period of not less than seven consecutive days by an approved method, or combination of methods. The curing process shall be done so as to prevent loss of moisture from the concrete for the duration of the entire curing period. Unhardened concrete shall be protected from heavy rains and flowing water. All concrete shall be adequately protection from damage.

b. Moist Curing

Concrete shall be moist cured by maintaining all surfaces continuously (not periodically) wet for the

duration of the entire curing period. Moisture shall be maintained by sprinkling, flooding, fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand, or other approved material.

Water for curing shall be clean and free from any elements which will cause straining or discoloration of the concrete.

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.

Formed surfaces shall be thoroughly moistened and the curing compound applied as soon as free water disappears. The curing compound may be applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied in a two-coat continuous operation by approved spraying equipment and at a coverage of not less than one gallon per 150 square feet of surface area. The second coat shall be applied to overlap the first coat in a direction at approximately right angles to the direction of the first application.

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

Concrete surfaces which are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All concrete surfaces on which curing compound has been applied shall be adequately protected for the duration of the entire curing period from any damage that would disrupt the continuity of the curing membrane.

c. Cold Weather

The air and forms in contact with the concrete shall be maintained at temperature above 40 degrees F for at least 5 days and at a temperature above freezing for the remainder of the specified curing period. Concrete permitted to be cured with curing compounds shall be provided the same protection

against freezing and low temperatures as provided herein. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time.

C. METAL WORK CONSTRUCTION SPECIFICATION

1. Scope

The work covered by this specification consists of furnishing and installing all valves, slide gates, stem guides, frames, gate hoists, and all necessary appurtenant apparatus necessary for their installation and operation and the furnishing of all labor, material, and equipment in connection with the fabricating, erecting, and painting of structural steel for metal structures such as stop log slots, walkway brackets, and trash racks as shown on the plans or herein specified.

2. General

2.1 Valves, gates, slides, frames, and lifts, and other appurtenances shall be equal to the manufacturer's model(s) designated on the drawings and shall comply with the style, size, strength, and shape shown. They shall be an approved product from a reputable manufacturer and shall be manufactured to the standards of commercial equipment to facilitate assembly, installation, repair, and replacement.

2.2 All structural shapes, rods, and plates shall be of structural steel or wrought iron, as specified or indicated on the drawings, conforming to the requirements of material specification MT-81, Metal.

2.3 Welding

Each welded joint shall be electric arc welded with 1/4-inch fillet, butt, or bead welds:

Welding electrodes shall be of the type and comply with the requirements of the welding industry for the metal being welded.

Welding shall be done in accordance with the recommended standards of the American Welding Society.

Welding, shearing, burning, and chipping shall be neatly and accurately done and all portions of the work exposed to view shall be neatly finished.

3. Installation

All valves, metal slide gates, frames, lights, and appurtenances shall be carefully installed in conformance with the manufacturer's recommendations. Surface of all metal against which concrete will be placed shall be unpainted and free from all oil, grease, dirt, loose mill scale, and flaky rust. After the gate, frame, and lift have been completely installed, the gate shall be tested by the Contractor by raising and lowering through its full range of operations. Any required changes or adjustments shall be made until the operation of the gate and lifting mechanism is approved by the Technician. Warping of the gate to conform to the concrete will not be allowed.

All structural steel items shall be carefully installed as shown on the drawings. Any required changes or adjustments shall be approved by the Technician.

4. Protection Coatings

All surfaces of valves, gates, frames, structural steel, appurtenances, and fasteners may be either galvanized or painted.

Galvanizing shall be done in accordance with material specification MT-82, Galvanizing.

Painting shall be in accordance with the system shown on the drawings or specified in section 5 of this specification. Painting of galvanized, epoxy-coated, or nonferrous metal surfaces will not be required.

When painting is required, the following shall apply:

Immediately prior to the application of the first coat of paint, the surfaces of metal to be painted shall be thoroughly cleaned, removing rust, loose mill scale, dirt, oil, or grease, and other foreign substances and shall be dry.

Prior to the application of the second and third coats, the paint shall be dry and hard and shall be cleaned of all dirt, oil, and grease, and shall have a dry surface.

The paint shall be thoroughly mixed or stirred immediately before applying in order to keep the pigments in uniform suspension.

The coating of paint applied shall be smoothly and uniformly spread so that no excess paint will collect at

any point. On all surfaces which are inaccessible for paint brushes, the paint shall be applied by spraying or by sheepskin daubers. If the painting is unsatisfactory to the Technician, the paint shall be removed and the metal thoroughly cleaned and repainted.

Paint shall not be applied with the air temperature is below 40 degrees F, or when the air is misty, or when in the opinion of the Technician, conditions are otherwise unsatisfactory for the work. It shall not be applied upon damp or frosted surfaces.

Material painted undercover in damp or cold weather shall remain undercover until dry or until weather conditions permit its exposure in the open. Painting shall not be done when the metal is hot enough to cause the paint to blister and produce a porous paint film.

5. Paint Systems

Three coats of paint shall be applied. The first coat shall be zinc chromate primer. The second and third coats shall be of aluminum paint.

D. CONSTRUCTION OF PIPE STRUCTURE

1. Steel Pipe Conduits

Pipe shall be laid to the line and grade shown on the drawings. Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. The pipe shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings.

The pipe shall be loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

2. Joints

Pipe joints shall conform to the details shown on the drawings and shall be sound and watertight at the pressures specified.

Welding and welded joints shall conform to the welding procedure details and the requirements for repair of welds of AWWA Standard C206 for Field Welding of Steel Water Pipe Joints (AWS D7.0). Field welding shall be done in such a way as to avoid burning the protective coating on the pipe except in the immediate vicinity of the weld.

The ends of pipe to be connected with mechanical couplings shall be machined so as to allow coupling the pipe sections without damaging or displacing the gaskets and to insure uniform end separation of the pipes.

Machined ends of the pipe that receive the coupling sleeves shall be free from dents, gouges, scale, or protective coating (except coal tar epoxy paint). The pipe and couplings shall be assembled with continuous rubber ring gaskets conforming to the dimensions and tolerances recommended by the pipe manufacturer. Coupling followers shall be drawn up evenly to insure uniform pressure on the gaskets.

3. Field Coating and Wrappings

When coal tar enamel coated pipe is specified, joints and couplings shall be primed and coated in the manner specified in AWWA Standard C203, Section 4. Joints and couplings shall be primed, coated, and wrapped where wrapped pipe is used. The use of coal tar tapes, applied in compliance with the manufacturer's instructions, is acceptable for coating joints and couplings if the resulting coating is equivalent in durability and watertightness to the coating on the pipe.

When it is specified that the pipe be coated with coal tar epoxy paint, couplings shall be coated with coal tar epoxy paint will be limited to touch up required to repair damage that occurs during assembly.

4. Handling the Pipe

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coating. Coated pipe shall be handled in the manner specified in AWWA Standard C203, Section 4.

5. Other Pipe

For other pipe, laying and bedding shall be in accordance with manufacturer's recommendations and as approved by the Technician.

6. Backfill

Earth backfill shall be placed in the manner specified for fill adjacent to structures in Construction Specifications MT-4 and MT-5, whichever is appropriate. Care shall be taken to prevent lifting or jacking of the pipe off its foundation during backfilling operations.

TABLE OF QUANTITIES

ITEM NO.	ITEM	UNIT	QUANTITY	COST/UNIT
1.	Mobilization	L.S.	1	
	DAM			
2.	Strip vegetation from crest, downstream slope and toe of old dam	Yds2	6,900	
3.	Seeding downstream slope and borrow areas	Acre	4	
4.	Common Excavation - Key Trench	Yds3	3,300	
5.	Common Excavation - for removal of old mechanical spillway	Yds3	2,700	
6.	Removal of old mechanical spillway - disposal off-site	L.S.	1	
7.	Installation of new mechanical spillway - labor only	L.S.	1	
8.	Specially compacted earthfill - mechanical spillway	Yds3	800	
9.	Embankment - machine compaction	Yds3	13,000	
10.	Pit-run gravel for 6" roadway	Yds3	360	
	INLET STRUCTURE MATERIALS			
11.	Concrete - type II cement, W/C ratio 0.4	Yds3	3.25	
12.	# 4 rebar	Lbs	336	
13.	3' dia. CMP 16 ga.	ft.	6	
14.	3' dia, 24" long water tight connector	ea.	1	
15.	3/4" x 8" anchor bolt w/ nut and washer	ea.	4	
	TRASH RACK - INLET STRUCTURE			
16.	1 1/2" dia. x 6'-6" steel pipe	ea.	5	
17.	5 I 10 x 4'-9" long steel I beam	ea.	1	
18.	5"x1/2"x4'-9" long steel bar	ea.	2	
19.	3"x5"x3/8" steel angle 3" long	ea.	4	
20.	3/4"x1 1/2" steel bolts, nuts and washers	ea.	4	
	INLET BARREL			
21.	2' dia. CMP 16 gage	ft.	21	
22.	2' flanged galv. cut off collar - 2' dia.	ea.	1	
	OUTLET BARREL			
23.	3' dia. CMP 16 gage	ft.	106	
24.	2' flanged galv. cut off collars, 3' dia.	ea.	3	
	PIPE RISER - MATERIALS			
25.	Concrete - Type II cement, w/c ratio 0.40	Yds3	6.0	

ITEM NO.	ITEM	UNIT	QUANTITY	COST/UNIT
26.	Gatewell - 3'6" dia. CMP 16 gage	ft.	20	
27.	Drop Inlet - 4'-0" dia. CMP 16 gage	ft.	15	
28.	2'-0" dia. CMP 16 gage	ft.	10	
29.	3'-0" dia. CMP 16 gage	ft.	5	
30.	# 4 rebar	lbs.	160	
31.	24" Waterman model C-20 gate or equivalent w/ approx. 17" stem	ea.	1	
32.	24" dia. flanged water tight connector	ea.	1	
33.	24" dia. 24" wide band flexible water tight connector	ea.	1	
34.	36" dia. 24" wide band flexible water tight connector	ea.	1	
35.	Oversize 42" hinged lid	ea.	1	
36.	Locking hasp	ea.	1	
	TRASH RACK - PIPE RISER			
37.	3"x12"x8'-6" treated planks	ea.	4	
38.	2"x12"x8'-6" treated planks	ea.	6	
39.	2"x6"x8'-6" treated planks	ea.	1	
40.	2"x6"x6'-6" treated planks	ea.	3	
41.	6"x6"x8'-0" treated posts	ea.	6	
42.	1' dia. std. galv. pipe 7'-0" long	ea.	14	
43.	1' dia. std. galv. pipe 9'-0" long	ea.	8	
44.	1/4"x2 1/2" bolts and nuts	ea.	44	
45.	1/2"x5" carriage bolts	ea.	45	
46.	Heavy duty 12' hinges	ea.	3	
47.	Heavy duty locking hasps	ea.	3	
	PLUNGE POOL			
48.	Common Excavation	Yds3	680	
49.	Gravel filter - 6" thickness	Yds3	76	
50.	Riprap D50-8", 20" thickness	Yds3	215	
	TIMBER BENT			
51.	12" dia x 14' creosote pressure treated posts	ea.	2	
52.	2"x6"x6'-8" creosote pressure treated planks	ea.	4	
53.	2"x12"x6'-8" creosote pressure treated planks	ea.	2	
54.	2"x8"x5'-0" creosote pressure treated planks	ea.	4	
55.	8"x8"x2'-0" creosote pressure treated filler block	ea.	1	