PROJECT SPECIFICATIONS

REHABILITATION OF THE DAMAGED STAIRWAYS LEADING TO THE AMPHITHEATER

1. SCOPE OF WORK FOR BIDDERS

1.1 To provide the infrastructure and landscaping required for the REHABILITATION OF THE MAIN STAIRS OF THE AMPHITHEATER.

1.2 To conduct site visit to familiarize with the on-site conditions and existing facilities.

1.3 To provide as-built plans for the project, one (1) set original CAD drawing printed in A3, three (3) sets photocopy. As-built plans shall indicate the following drawings in any scale not less than 1:100 meter.

a. Floor layout
b. Elevations
c. Sections
d. Other details that maybe required

1.4 To submit weekly accomplishment reports.

1.5 To properly and safely dispose all wastes generated from the construction.

1.6 To ensure that all workers are equipped with construction safety gear at all times.

1.7 To provide temporary site office/storage and portable toilets/latrines for the workers and do regular maintenance of the same throughout the duration of the project. The portable toilets/latrines shall be dismantled at the end of the project.

1.8 To shoulder all costs for power and water utilities used for the duration of the construction.

1.9 To provide first aid requirements for workers throughout the duration of the project.

1.10 To report immediately to JHMC all unearthed hazardous materials, buried treasures or artifacts. JHMC shall coordinate with concerned agencies to handle the same. Activities in said area shall cease until such time that the hazardous materials, treasures have been properly dealt with.

2. DPWH STANDARDS and SPECIFICATIONS

The scope of work shall be in conformity with of the DPWH standards and specifications.

ITEM 102 - EXCAVATION, BACKFILLING AND DISPOSAL

102.1 Description

The Contractor shall perform all earthworks both for roadway, structures, drainage and borrow excavation and the disposal of material in accordance with this Specification and in conformity with the lines, grades and dimensions shown on the Plans or established by the Engineer.

102.2 Construction Requirements

102.2.1 General

When there is evidence of discrepancies on the actual elevations and that shown on the Plans, a pre- construction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the Engineer to serve as basis for the computation of the actual volume of the excavated materials.

All excavations shall be finished to reasonably smooth and uniform surfaces. No materials shall be wasted without authority of the Engineer. Excavation operation shall be conducted so that material outside of the limits of slopes will not be disturbed. Prior to excavation, all necessary clearing and grubbing in the area shall have been performed in accordance with Item 100, Clearing and Grubbing.

The Contractor shall furnish, place and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the site of the work from any source so as to prevent damage to the work or adjoining property.

102.2.2 Conservation of Topsoil

Where provided for on the Plans or in Special provisions, suitable topsoil encountered in the excavation and on areas where embankment is to be placed shall be removed to such extent and to such depth as the Engineer may direct. The removed topsoil shall be transported and deposited in storage piles at locations approved by the Engineer. The topsoil shall be completely removed to the required depth from any designated area prior to the beginning of excavation or embankment work in the area and shall be kept separate from other excavated materials for later use.

102.2.3 Utilization of Excavated Materials

All suitable material removed from the excavation shall be used in the formation of the embankment, subgrade, shoulders, slopes, bedding and backfill for structures, and for other purposes shown on the Plans or as directed.

The Engineer will designate as unsuitable those soils that cannot be properly compacted in the embankments. All suitable materials shall be disposed-off as shown on the Plans or as directed without delay to the Contractor.

Only approved materials shall be used in the construction of embankments and backfills. All excess material, including rock and boulders that cannot be used in embankments shall be disposed-off as directed. Materials encountered in the excavation and determined by the Engineer as suitable for topping, road finishing, slope protection, or other purposes shall be conserved and utilized as directed by the Engineer.

102.2.4 Excavation of Ditches Gutters, etc.

All materials excavated from side ditches and gutters, channel changes, inlet and outlet ditches, and such other ditches as may be designated on the Plans or staked by the Engineer, shall be utilized as provided in Subsection 102.2.3.

The Contractor shall furnish, place and maintain all supports and shoring that may be required

for the sides of the excavations, and all pumping, ditching or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the excavation to prevent damage.

Ditches shall conform to the slope, grade, and shape of the required cross-section with no projections of roots, stumps, rock, or similar matter. The contractor shall maintain and keep open and free from leaves, sticks and other debris all ditches dug by him until final acceptance of the work.

102.2.5 Removal of Unsuitable Materials

Where the Plans show the bottom portion of the disposal cell bed to be selected, all unsuitable materials shall be excavated to the depth necessary for replacement of the selected clay liner to the required compacted thickness.

Where excavation to the finished graded section results in a subgrade or slopes of unsuitable soil, the Engineer may require the Contractor to remove the unsuitable material and backfill to the finished graded section with approved material. The Contractor shall conduct his operations in such a way that the Engineer can take the necessary cross-sectional measurements before the backfill is placed.

102.3 Method of Measurement

The cost of excavation of material which is incorporated in the works or other areas of fill shall be deemed to be included in the Items of work where the material is used.

For measurement purposes, surplus suitable material shall be calculated as the difference between the net volume of suitable material required to be used in embankment or cover material corrected by applying a shrinkage factor or swell factor in case of rock excavation, determined by laboratory tests to get its original volume measurement, and the net volume of suitable material from excavation in the original position. Separate pay items shall be provided for surplus common, unclassified and rock material.

The Contractor shall be deemed to have included in the contract unit prices all costs of obtaining land for the disposal of unsuitable or surplus material.

102.4 Basis of Payments

The accepted quantities, measured as prescribed in Section 102.3, shall be paid for the contract unit price for each of the particular pay items listed below that are included in the Bill of Quantities which price and payment shall be full compensation for the removal and disposal of excavated materials including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this item.

Pay Item Number	Description	Unit of Measurement
102 (1)	Unsuitable Excavation	m^3
102 (2)	Surplus Common Excavation	m^3
102 (3)	Surplus Rock Excavation	m^3
102 (4)	Surplus Unclassified Excavation	m^3

ITEM 414 FORMS AND FALSEWORKS

414.1 Description

This Item shall consist of designing, constructing and removing forms and falsework to temporarily support concrete, girders and other structural elements until the structure is completed to the point it can support itself.

414.2 Material Requirements

414.2.1 Formwork

The materials used for smooth form finish shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper or other acceptable materials capable of producing the desired finish for form-facing materials. Form-facing materials shall produce a smooth, uniform texture on the concrete. Form-facing materials with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of concrete surfaces shall not be permitted. No form-facing material shall be specified for rough form finish.

414.2.1.1 Formwork accessories

Formwork accessories that are partially or wholly embedded In concrete, including ties and hangers shall be commercially manufactured. The use of non-fabricated wire form ties shall not be permitted. Where indicated in the Contract, use form ties with integral water barrier plates in walls.

414.2.1.2 Formwork release agents

Commercially manufactured formwork release agents shall be used to prevent formwork absorption of moisture, prevent bond with concrete, and hot stain the concrete surfaces.

414.2.2 Falsework

The materials to be used in the falsework construction shall be of the quantity and quality necessary to withstand the stresses imposed; it may be timber or steel or a combination of both. The workmanship shall be of such quality that the falsework will support the loads imposed on it without excessive settlement or take up beyond as shown on the falsework drawings.

414.3 Construction Requirements

414.3.1 Design

Falsework and Formworks design and drawings shall be in accordance, with Item 407 Concrete Structure subsection 407.3.9 and 407.3.12 respectively.

414.3.1.1 Formwork and Falsework Drawings

When complete details for forms and falseworks are not shown, prepare and submit drawings to the Engineer, showing the following:

1. Details for constructing safe and adequate forms and falsework that provide the necessary rigidity, support the loads imposed, and produce in the finished structure the required lines and grades. See subsection 414.3.1.2 for design loads. See Subsection 414.3.1.3 for design stresses, loadings and deflections. See subsection 414.3.2 for manufactured assemblies.

2. The maximum applied structural load on the foundation material. Include a drainage plan or description of how foundations will be protected from saturation, erosion, and/or scour see subsection 414.3.3.1.

3. The description of all proposed material. Describe the material that is not describable by standard nomenclature (such as AASHTO or ASTM specified) based on manufacturer's test and recommended working loads. Provide evaluation data for falsework material showing that the physical properties and conditions of the material can support the loads assumed in the design.

4. The design calculations and material specifications showing that the proposed system will support the imposed concrete pressures and other loads. Provide an outline of the proposed concrete placement operation listing the equipment, labor, and procedures to be used for duration of each operation. A superstructure placing diagram showing the concrete placing sequence and construction joint locations shall be included.

5. Design calculations for proposed bridge falsework. A registered professional engineer proficient in structural design shall design, sign, and seal the drawings. The falsework design calculations shall show the stresses and deflections in load supporting members.

6. Anticipated total settlements of falsework and forms shall be shown. Include falsework footing settlement and joint take-up. Design for anticipated settlements not to exceed 20 millimeters. Design and detail on falsework supporting deck slabs and overhangs on girder bridges so there is no differential settlement between the girders and the deck forms during placement of deck concrete. Design and construct the falsework to elevations that include anticipated settlement during concrete placement and

required camber to compensate for member deflections during construction.

7. Support system for form panels supporting concrete deck slabs and overhangs on girder bridges.

8. Details for strengthening and protecting falsework over or adjacent to roadways and railroads during each phase of erection and removal. See subsection 414.3.3.2.

9. Intended steel erection procedures with calculations in sufficient detail to substantiate that the girder geometry will be correct. See subsection 414.3.3.3.

Details of proposed anchorage and ties for void forms shall be submitted. See subsection 414.3.4 for void form requirements.

Separate Falsework drawings for each structure shall be submitted to the Engineer for approval, except for identical structures with identical falsework design and details.

414.3.6 Acceptance

Forms and falsework (including design, construction, and removal) shall be evaluated and approved by the Engineer.

When the falsework installation is complete and before concrete placement or removal begins, the falsework shall be inspected by the Engineer. The Engineer shall certify in writing that the installation conforms to the contract, the approved falsework drawings (including approved changes) and acceptable engineering practices.

414.4 Method of Measurement

When the Contract stipulates that payment will be made for forms and falsework on lump-sum basis, the pay item will include all materials and accessories needed in the work.

Whenever the Bill of Quantities does not contain an item for form and falsework, the work will not be paid directly but will be considered as a subsidiary obligation of the contractor under other Contract Items.

414. 5 Basis of Payment

The accepted quantities measured as prescribed in subsection 414.4, shall be paid for at the Contract lump-slim price for Forms and Falsework which price and payment shall be full compensation for designing, constructing and removing forms and falsework, all materials and accessories needed and for furnishing all labor equipment tools and incidentals necessary to complete the item.

Payment will be made under:

Pay Item Number	Description	Unit Measurement
414	Forms and Falsework	Lump Sum

ITEM 900 - REINFORCED CONCRETE

900.1 Description

This item shall consist of furnishing, placing and finishing concrete in buildings and related structures, flood control and ports, and water supply structures in accordance with this specification and conforming to the lines, grades and dimension shown in the plans.

900.2 Materials Requirements

900.2.1 Portland Cement

This item shall conform to the requirement of ITEM 700, Hydraulic Cement, Volume I.

Concrete Aggregates

The concrete aggregates shall conform to the requirement of Subsection 311.2.2 and 311.2.3 under ITEM 311 of Volume I and ASTM C 33 for lightweight aggregates, except that aggregates failing to meet these specifications but which have been shown by special that or actual service to produce concrete of adequate strength and durability maybe used under method (2) of determining the proportion of concrete, where authorized by the Engineer.

Except as permitted elsewhere in this section, the maximum size of the aggregate shall be not larger than one-fifth (1/5) of the narrowest dimensions between size of forms of the member for which the concrete is to be used nor later than three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars or pretensioning strands.

Aggregate Test

Samples of the fine and coarse aggregates to be used shall be selected by the Engineer for tests at least 30 days before the actual concreting operations are to begin. It shall be the responsibility of the contractor to designate the source or sources of aggregate to give the Engineer sufficient time to obtain the necessary samples and submit them for testing.

No aggregates shall be used until official advice has been received that it has satisfactory passed all test, at which time written authority shall be given for its use.

900.2.3 Water

Water used in mixing concrete shall conform to the requirement of Subsection 311.2.4 under ITEM 311, Part D of Volume 1.

900.2.4 Metal Reinforcement

Reinforcing Steel bars shall conform to the requirements of the following

Specifications; Deformed & Plain Billet Steel	ASTM A 6151
Bars for concrete reinforcement	AASHTO M 31
Deformed Rail – Steel and Plain Bars for concrete reinforcement	ASTM A 616
Deformed A x b – Steel and Plain Bars for concrete reinforcement	ASTM A 617

If reinforcing bars are to be welded, these ASTM specifications shall be supplemented by requirements assuring satisfactory weldability.

Bars and rod for concrete Reinforcement	ASTM A 187
Cold-Drawn Steel Wire for Concrete reinforcement	ASTM A 187 AASHTO M 32
Welded Steel wire fabric	ASTM A 185
For concrete reinforcement	AASHTO M 55

Except that the welded shear strength requirement of those specification shall be extended to Include a wire size differential up to and including six gages.

Wire and Strands for prestressed	ASTM A 416
Concrete	ASTM A 421

Used in making strands for post-tensioning shall be cold-drawn and either stress-relieved in the Case of uncoated strands or hot-dip galvanized in the case of galvanized strands.

High strength alloy steel bar for post-tensioning shall be proof stressed to 90% of the granted tensile strength. After proof stressing, the bars shall conform to the following minimum properties:

Tensile strength fs'	1000 Mpa
Yield strength (0.2 offset)	0.90 fs'
Elongation at rupture in 20 diameter	4 percent
Reduction of area at rupture	25 percent
Structural steel	ASTM A 36
Steel Pipe for concrete-filled Pipe columns	ASTM A 53
Cast-iron Pipe for concrete Columns	ASTM A 377

900.2.5 Admixtures

Air-entraining admixtures, if used shall conform to ASTM C 260. Water-reducing admixtures, retarding admixtures, water-reducing and retarding admixtures and water reducing and accelerating admixtures, if used, shall conform to the requirements of ASTM C 494.

900.2.6 Storage of Materials

Cement and aggregates shall be stored in such a manner as to prevent their deterioration or intrusion of foreign matter. Cement shall be stored immediately upon arrival on the site of the work, in substantial waterproof bodegas, with a floor raised from the ground sufficiently high to be free from dampness. Aggregates shall be stored in such a manner as to avoid the inclusion of foreign materials.

900.3 Construction Requirements

Notations: The notations used in these regulations are defined as follows:

f'c = compressive strength of concrete

Fsp = ratio of splitting tensile strength to square root compressive strength

900.3.1 Concrete Quality

All plans submitted for approval or used for any project shall clearly show the specified strength, f'c', of concrete of the specified age for which each part of the structure was designed.

Concrete that will be exposed to sulfate containing or other chemically aggressive solutions shall be proportioned in accordance with "Recommended Practice for Selecting proportions for Concrete (ACI 613)" and with "Recommended Practice for Selecting proportions for Structural Lightweight Concrete (ACI 613A)."

900.3.2 Methods of Determining the Proportions of Concrete

The determination of the proportions of cement, aggregate, and water to attain the required strengths shall be made by one of the following methods, but lower water-cement ratios may be required for conformance with the quality of concrete.

Method 1. Without preliminary test

Where preliminary test data on the materials to be used in the concrete have not been obtained the water- cement ratio for a given strength of concrete shall not exceed the values shown in Table 900.1. When strengths in excess of 281 kilograms per square centimeter (4000 pounds per square inch) are require or when light weight aggregates or admixtures (other than those exclusively for the purpose of entraining air) are used, the require water-cement ratio shall be determined in accordance with Method 2.

Method 2. For combination of materials previous evaluated or to be established by trial mixtures. Water-cement ratios for strengths greater than that shown in Table 900.1 may be used provided that the relationship between strength and water-

cement ratio for the materials to be used has been previously established by reliable test data and the resulting concrete satisfies the requirements of concrete quality.

Where previous data are not available, concrete trial mixtures having proportions and consistency suitable for the work shall be made using at least three different water-cement ratios (or cement content in the case of lightweight aggregates) which will produce a range of strength s encompassing those required for the work. For each water-cement ratio (or cement content) at least three specimens for each age to be tested shall be made, cured and tested for strength in accordance with ASTM C 39 and C 192.

The strength test shall be made at 7, 14 and 28 days at which the concrete is to receive load, as indicated on the plans. A curve shall be established showing the relationship between water-cement ratio (or cement content) and compressive strength. The maximum permissible water-cement ratio for the concrete to be used in the structure shall be that shown by the curve to produce an average strength to satisfy the requirements of the strength test of concrete provided that the water-cement ratio shall be no greater than that required by concrete quality when concrete that is to be subjected to the freezing temperature which weight shall have a water-cement ratio not exceeding 6 gallon per bag (50 kgs.) and it shall contain entrained air.

Where different materials are to be used for different portions of the work, each combination shall be evaluated separately.

Table 900.1 Maximum Permissible Water-Cement Ratios for Concrete (Method 1)

Specific Compressive strength at 28 days, psi fc'	Maximum permissible Water-Cement Ratio			
	Non Air-entrained Concrete		Air-entrained Concrete	
	U.S. gal. per 42.5 kg. bag of cement	Absolute Ratio by weight	U.S. gal. per 42.5 kg. bag of cement	Absolute Ratio by weight
2500	7 ¼	0.642	6 ¼	0.554
3000	6 ½	0.576	5 ¼	0.465
3500	5 ¾	0.510	4 ½	0.399
4000	5	0.443	4	0.354

900.3.3 Concrete Proportions and Consistency

The proportion of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles on the form and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work.

900.3.4 Sampling and Testing of Structural Concrete

As work progress, at least one (1) set of sample consisting of three (3) concrete cylinder test specimens, 150 x 300 mm. shall be taken from each class of concrete placed each day, and each set to represent not more than 75 cu. m. of concrete.

900.3.5 Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be such a consistency that it will flow around reinforcing steel but individual particles

of the coarse aggregate when isolated shall show a coating or mortar containing its proportionate amount of sand. The consistency of concrete shall be gauged by the ability of the equipment to properly place it and not by the difficulty of mixing water shall be determined by the Engineer and shall not be varied without his consent. Concrete as dry as it is practical to place with the equipment specified shall be used.

900.3.6 Strength Test of Concrete

When strength is the basis of acceptance, each class of concrete shall be represented by at least five tests (10 specimens). Two specimens shall be made for each test at a given age, and not less than one test shall be made for each 150 cu. m. of structural concrete, but there shall be at least one test for each days concreting.

The Engineer may require a reasonable number of additional tests during the progress of the work. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C 172. Specimens made to check the adequacy of the proportions for strength of concrete or as basis for acceptance of concrete shall be made and laboratory-cured in accordance with ASTM C 31. Additional test specimens cured entirely under field conditions may be required by the Engineer to check the adequacy of curing and protection of the concrete. Strength tests shall be made in accordance with ASTM C 39.

The age for strength tests shall be 28 days or, where specified, the earlier age at which the concrete is to receive its full load or maximum stress. Additional test may be made at earlier ages to obtain advance information on the adequacy of strength development where age-strength relationships have been established for the materials and proportions used.

To conform to the requirements of this Item:

1. For structures designed in accordance with the Working Stress Design (WSD) method of this chapter, the average of any five consecutive strength tests of the laboratory-cured specimens representing each class of concrete shall be equal on or greater than the specified strength, fc', and not more than 20 percent of the strength test shall have values less than that specified.

2. For structures designed in accordance with the Ultimate Strength Design (USD) method of this chapter, and for prestressed structures the average of any three consecutive strength test of the laboratory cured specimens representing each class of concrete shall be equal to or greater than the specified strength, fc' and not more than 10 percent of the strength tests shall have values less than the specified strength.

   When it appears that the laboratory-cured specimens will fail to conform to the requirements for strength, the Engineer shall have the right to order changes in the concrete sufficient to increase the strength to meet these requirements. The strengths of the specimens cured on the job are intended to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When, in the opinion of the Engineer, the strengths of the job-cured specimens, the Contractor may be required to improve the procedures for protecting and curing the concrete, or when test of field-cured cylinders indicate deficiencies in protection and curing, the Engineer may require test in accordance with ASTM Specification C 42 or order load test as outlined in the load tests of structures for that portion of the structure where the questionable concrete has been placed.

900.3.7 Splitting Tensile Test of Concrete

To determine the splitting ration, Fsp, for a particular aggregate, test of concrete shall be made as follows:

1. Twenty four (24) 15 cm. diameter by 30 cm. long (6 in. dia. by 12 in. long) cylinders shall be made in accordance with ASTM C 192, twelve at compressive strength level of approximately 210 kilograms per square centimeter (3000 psi) and twelve at approximately 280 kilograms per square centimeter (4000 psi) or 350 kilograms per square centimeter (5000 psi). After 7 days moist curing followed by 21 days at 23 ºC (73 ºF) and 50% relative humidity, eight of the test cylinders at each of the two strength levels shall be tested for splitting strength and four for compressive strength.

2. The splitting tensile strength shall be determine in accordance with ASTM C 496, and compressive strength in accordance with ASTM C 39.

The ration, Fsp, of splitting tensile strength to the square root of compressive strength shall be obtained by using the average of all 16 splitting tensile test and all 8 compressive tests.

Minimum Strength, Concrete other than fill, shall have a minimum compressive strength at 28 days of 140 kilograms per square centimeter (2000 psi).

900.3.8 Batching

Batching shall conform to the requirements of ITEM 405, Structural Concrete.

900.3.9 Mixing and Delivery

Mixing and delivery shall conform to the requirements of ITEM 405, Structural Concrete.

900.3.9.1 Concrete Surface Finishing: General

This shall be in accordance with ITEM 407, Concrete Structures.

900.3.9.2 Curing Concrete

This shall be in accordance with ITEM 407, Concrete Structures

900.3.9.3 Acceptance of Concrete

The strength of concrete shall be deemed acceptable if the average of three (3) consecutive strength test results is equal to or exceed the specified strength and no individual test result falls below the specified strength by more than 15%.

Concrete deemed to be not acceptable using the above criteria may be rejected unless Contractor can provide evidence, by means of core tests, that the quality of concrete represented by the failed test result is acceptable in place. Three (3) cores shall be obtained from the affected area, cured and tested in accordance with AASHTO T24. Concrete in the area represented by the cores will be deemed acceptable if the average of cores is equal to or at least 85% and no sample core is less than 75% of the specified strength otherwise it shall be rejected.

900.4 Method of Measurement

The quantity of concrete to be paid shall be the quantity shown in the Bill of Quantities

schedule; unless changes in design are made in which case the quantity shown in the Bill of Quantities will be adjusted by the amount of the change for the purpose of payment. No deduction will be made for the volume occupied by the pipe less than 101 mm. (4") in diameter or for reinforcing steel, anchors, weep holes or expansion materials.

900.5 Basis of Payment

The accepted quantities measured as prescribed in Sub-Section 900.7 shall be paid for at the appropriate contract unit price for the pay item listed below as shown in the Bill of Quantities, which price and payment shall be full compensation for furnishing all materials, including metal water stops, joints, joint fillers, weep holes, and rock backing and timber bumpers; for all form and false work; for mixing, placing, furnishing, and curing the concrete; and for all labor, materials, equipment, tools and incidentals to complete the item, except that reinforcing steel shall be paid for at the contract unit price per kilogram for reinforcing steel metal pipes and drains, metal conduits and ducts, and metal expansion angles shall be paid for as structural steel that when the proposal does not include an item for Structural Steel these miscellaneous metal parts shall be paid for as reinforcing steel.

Pay Item No.	Description	Unit of Measurement
900 (1)	Reinforced Concrete	cubic meter (cu.m.)

PART I – MATERIALS DETAILS

ITEM 700 – HYDRAULIC CEMENT

700.1 Portland Cement and Masonry Cement

Cement shall conform to the requirements of the following cited Specifications for the type specified or permitted.

Type	Specifications
Portland Cement	AASHTO M 85 (ASTM C 150)
Blended Hydraulic Cements	AASHTO M 240 (ASTM C 595)
Masonry Cement	AASHTO M 150-74 (ASTM C 91)

When Types IV and V (AASHTO M 85), P and PA (AASHTO M 150) cements are used, proper recognition shall be given to the effects of slower strength gain on concrete proportioning and construction practices.Types S and SA cements will be permitted only when blended with Portland Cement in proportions approved by the Engineer.

Unless otherwise permitted by the Engineer, the product of only one mill of any one brand and type of Portland Cement shall be used on the project.

The Contractor shall provide suitable means of storing and protecting the cement against dampness.Cement which, for any reason, has become partially set or which contains lumps of caked cement will be rejected.Cement salvaged from discarded or used bags shall not be used.

ITEM 703 – AGGREGATES

703.1 Fine Aggregate for Concrete and Incidentals

703.1.1 Concrete

Fine Aggregate for concrete shall conform to the requirements of AASHTO M6, with no deleterious substances in excess of the following percentages:

Clay lumps	1
Coal and lignite	1
Material passing 0.075 mm sieve	4

Other substances – as shown in the Special Provisions

Lightweight aggregate, if required or permitted by the Special Provisions, shall meet the pertinent requirements of AASHTO M 195.

703.1.2 Granular backfill filter material for under drains and filler for paved waterways shall be permeable and shall meet the requirements of AASHTO M 6, except that soundness tests will not be required and minor variations in grading and content of deleterious substances may be approved by the Engineer.

703.1.3 Aggregate for minor concrete structures shall be clean, durable, uniformly graded sand and gravel, crushed slag or crushed stone, 100 percent of which will pass a 37.5 mm (1-1/2 inches) sieve and containing not more than 5 percent passing the 0.075 mm (No. 200) sieve.

703.2 Coarse Aggregate for Portland Cement Concrete

Coarse aggregate for concrete shall meet the requirements of AASHTO M 80. Lightweight aggregate, if required or permitted by the Special Provisions, shall conform to the requirements of AASHTO M 195, for the grading specified.

703.3 Aggregate for Portland Cement Treated and Stabilized Base Course

The crushed and uncrushed granular material shall consist of hard durable stones and rocks of accepted quality, free from an excess of flat, elongated, soft or disintegrated pieces or other objectionable matter. The method used in obtaining the aggregate shall be such that the finished product shall be as consistent as practical.

All materials passing the 4.75 mm (No. 4) mesh produced in the crushing operation of either the stone or gravel shall be incorporated in the base material to the extent permitted by the gradation requirements. The plasticity index shall not be less 4 or more than 10.

703.4 Aggregate for Untreated Subbase, Base or Surface Courses

Aggregate shall consist of hard, durable particles or fragments of crushed stone, crushed slag or crushed or natural gravel. Materials that break up when alternately wetted and dried shall not be used.

Coarse aggregate is the material retained on the 2.00 mm (No. 10) sieve and shall have a percentage of wear of not more than 50 for subbase and not more than 45 for Base and Surface

Courses as determine by AASHTO Method T 96.

Fine aggregate is the material passing the 2.00 mm (No. 10) sieve and shall consist of natural or crushed sand and fine mineral particles.The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two-thirds) of the fraction passing the 0.425 mm (No. 40) sieve.For base courses, the fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6, while for subbase course; the liquid limit shall not be greater than 35 plasticity index not greater than 12.

For surface courses, the fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and a plasticity index not less than 4 or greater than 9. All materials shall be free from vegetable matter and lumps or balls of clay. When crushed aggregate is specified, not less than 50 mass percent of the particles retained on the 4.75 mm (No. 4) sieve shall have at least one fractured face.

Gradation of each designated size of aggregate shall be obtained by crushing, screening and blending processes as may be necessary.

Materials otherwise meeting the requirements of this Section will be acceptable whenever such materials produce a compacted course meeting applicable density requirements as specified in Subsections 200.3.3, 201.3.3, 202.3.3 and 203.3.6.

ITEM 709 – PAINTS

709.1 Description

This Item covers all paint materials including Vehicles, Pigment, Pastes, Driers, Thinners and Mixed Paints for steel and wooden structures.

709.2 Material Requirements

709.2.1 General

Paint, except, aluminum paint, shall consist of pigments of the required fineness and composition ground to the desired consistency in linseed oil in a suitable grinding machine, to which shall be added additional oil, thinner and drier as required.

Aluminum paint shall consist of aluminum bronze powder or paste of the required fineness and composition to which shall be added the specified amount of vehicle.

The paint shall be furnished for use in ready mixed, paste or powder form. All paint shall meet the following general requirements:

a. The paint shall show no excessive settling and shall easily be re-dispersed with a paddle to a smooth, homogenous state.The paint shall show no curdling, livering, caking or color separation and shall be free from lumps and skins.

b. The paint as received shall brush easily, possess good leveling properties and shall show no running or sagging when applied to a smooth vertical surface.

c. The paint shall dry to a smooth uniform finish free from roughness grit, unevenness and other imperfections.

d. The paint shall not skin within 48 hours in three quarters filled closed container.

e. The paint shall show no thickening, curdling, gelling or hard caking after six (6) months storage in full, tightly covered container at a temperature of 21°C (70°F).

709.2.2 The paint shall conform to the requirements of the indicated specifications as follows:

Red Lead Ready-Mixed Paint Type I, II, III and IV	AASHTO M 72
Aluminum Paint	AASHTO M 69
Type I and II White & Tinted Ready-Mixed Paint	AASHTO M 70
Foliage Green Bridge Paint	AASHTO M 67
Black Paint for Bridges and Timber Structures	AASHTO M 68
Basic Lead Silicon Chromate, Ready-Mixed Primer	AASHTO M 229

709.2.3 The constituents' parts of the paint shall meet the following specifications:

Red Lead (97% Pb_3O_4)	ASTM D 83
Iron Oxide (85% Fe_2O_3)	ASTM D 84
Aluminum Powder and Paste	ASTM D 962
Magnesium Silicate	ASTM D 605
Mica Pigment	ASTM D 607
Titanium Dioxide	ASTM D 476
Chrome Yellow	ASTM D 211
Calcium Carbonate	ASTM D 1199
Basic Lead-Silicon Chromate	ASTM D 1638
Basic Carbonate White Lead	ASTM D 81
Zinc Oxide	ASTM D 79
Chrome Oxide Green	ASTM D 263
Carbon Black	ASTM D 561
Lampblack	ASTM D 209
Prussian Blue	ASTM D 261
Boiled Linseed Oil	ASTM D 260
Raw Linseed Oil	ASTM D 234
Pale Heat Bodied Linseed Oil	Fed Spec. TT-0-367
Alkyd Resin	Fed. Spec. TT-R-266
Mineral Spirit	ASTM D 235
Driers	ASTM D 600
Turpentine	ASTM D 13

709.3 Proportion for Mixing

It is the intent of these Specifications to provide a paint of proper brushing consistency, which will not run, streak or sag and which will have satisfactory drying qualities.

709.3.1 Aluminum Paint, Field Coats on Structural Steel

The paint shall be mixed in the proportion of 0.242 kg of aluminum powder of paste per liter of vehicle of long oil spar varnish (2 lb/gal) producing a paint containing 21 mass percent pigment and 79 percent vehicle.The weighed amount of powder or paste shall be placed in a suitable mixing container and the measured volume of vehicle then poured over it.The paste or powder shall be incorporated in the paint by vigorous stirring with a paddle.The powder

or paste will readily disperse in the vehicle. Before removing any paint from the container, the paint shall be thoroughly stirred to insure a uniform mixture and the paint shall be suitably stirred during the use. The amount of paint enough for one day's use only shall be mixed at one time.

When two field coats of aluminum paint are specified, the first coat shall be tinted with lampblack paste or Prussian blue paste in the quantity of 0.024 kg/L or more (1/5 lb/gal) of paints. The exact quantity used shall be sufficient to give a contrast in color which can be readily distinguished. When three field coats of aluminum paint are specified the second coat shall be tinted.

709.3.2 Aluminum Paint, Field Coats on Creosoted Timber

This paint shall be mixed as specified for Aluminum Paint for Structural Steel except that the proportions shall be 0.272 kg of aluminum powder or paste per liter of vehicle (2-1/2 lb/gal).

Other paint composition may be used when and as stipulated in the Special Provisions.

709.4 Containers and Markings

All paints shall be shipped in strong, substantial containers plainly marked with mass, color and volume in liters of the paint content, a true statement of the percentage composition of the pigment, the proportions of the pigment to vehicle, the name and address of the manufacturers and the stencil of the authorized inspecting agency. Any package or container not so marked will not be accepted for use under this Specification.

ITEM 710 – REINFORCING STEEL AND WIRE ROPE

710.1 Reinforcing Steel

Reinforcing steel shall conform to the requirements of the following Specifications:

Deformed Billet-Steel Bars for Concrete Reinforcement	AASHTO M 31 (ASTM A 615)
Deformed Steel Wire for Concrete Reinforcement	AASHTO M 225 (ASTM A 496)
Welded Steel Wire Fabric for Concrete Reinforcement	AASHTO M 55 (ASTM A 185)
Cold-Drawn Steel Wire for Concrete Reinforcement	AASHTO M 32 (ASTM A 82)
Fabricated Steel Bar or Rod Mats for Concrete Reinforcement	AASHTO M 54 (ASTM A 184)
Welded Deformed Steel Wire Fabric of Concrete Reinforcement	AASHTO M 221 (ASTM A 497)
Plastic Coated Dowel Bars	AASHTO M 254 Type A
Low Alloy Steel Deformed Bars for	

Bar reinforcement for concrete structures, except No. 2 bars shall be deformed in accordance with AASHTO M 42, M 31 and M 53 for Nos. 3 through 11.

Dowel and tie bars shall conform to the requirements of AASHTO M 31 or AASHTO M 42 except that rail steel shall not be used for tie bars that are to be bent and re-straightened during construction. Tie bars shall be deformed bars. Dowel bars shall be plain round bars. They shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the site of the work, a minimum of one half (1/2) the length of each dowel bar shall be painted with one coat of approved lead or tar paint.

The sleeves for dowel bars shall be metal of an approved design to cover 50 mm (2 inches), plus or minus 6.3 mm of the dowel, with a closed end, and with a suitable stop to hold the end of the sleeve at least 25 mm (1 inch) from the end of the dowel bar. Sleeves shall be of such design that they do not collapse during construction.

Plastic coated dowel bar conforming to AASHTO M 254 may be used.

ITEM 714 – WATER

714.1 Description

This Item covers criteria for acceptance of Questionable Water either natural or wash water for use in concrete.

714.2 Requirements

The mixing water shall be clear and apparently clean. If it contains quantities or substances that discolor it or make it smell or taste unusual or objectionable, or cause suspicion, it shall not be used unless service records of concrete made with it (or other information) indicated that it is not injurious to the quality, shall be subject to the acceptance criteria as shown in Table 714.1 and Table 714.2 or as designated by the purchaser.

When wash water is permitted, the producer will provide satisfactory proof or data of non-detrimental effects if potentially reactive aggregates are to be used. Use of wash water will be discontinued if undesirable reactions with admixtures or aggregates occur.

Table 714.1
Acceptance Criteria For Questionable Water Supplies

	Limits
Compressive strength, min. %	
Control at 7 days	90
Time of Setting deviation from control	from 1:00 earlier to 1:30 later
Time of Setting (Gillmore Test)	
Initial	No marked change
Final Set	No marked change
Appearance	Clear
Color	Colorless
Odor	Odorless
Total Solids	500 parts/million max
PH value	4.5 to 8.5

Table 714.2
Chemical Limitation for Wash Water

	Limits
Chemical Requirements, Minimum Concentration	
Chloride as $C1^{(-1)}$ expressed as a mass percent of cement when added to the $C1^{(-1)}$ in the other components of the concrete mixtures shall not exceed the following levels:	
1. Prestressed Concrete	0.06 percent
2. Conventionally reinforced concrete in a moist environment and exposed to chloride	0.10 percent
3. Conventionally reinforced concrete in a moist environment but not exposed to chloride	0.15 percent
4. Above ground building construction where the concrete will stay dry	No limit for corrosion
Sulfate as SO_4, ppm[A]	3000
Alkalies as (Na_2O + 0.658 K_2O), ppm	600
Total Solids, ppm	50000

[A] *Wash water reused as mixing water in concrete may exceed the listed concentrations of sulfate if it can be shown that the concentration calculated in the total mixing water, including mixing water on the aggregate and other sources, does not exceed that stated limits.*

Water will be tested in accordance with, and shall meet the suggested requirements of AASHTO T 26.

Water known to be of potable quality may be used without test.

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