

**MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA**

**THE DETAILED DESIGN
OF
FLOOD CONTROL, URBAN DRAINAGE AND
WATER RESOURCES DEVELOPMENT IN
SEMARANG IN THE REPUBLIC OF INDONESIA**

FINAL REPORT

● 中国书画函授大学肇庆分校建校二十周年纪念册

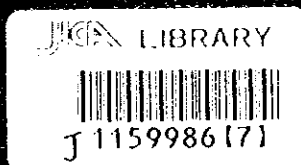
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**MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA**

**FLOOD CONTROL, URBAN DRAINAGE AND
WATER RESOURCES DEVELOPMENT IN SEMARANG**

**COMPONENT B:
JATIBARANG MULTIPURPOSE DAM CONSTRUCTION**

BIDDING DOCUMENTS

**PACKAGE 1:
JATIBARANG MULTIPURPOSE DAM
INCLUDING APPURTENANT STRUCTURES**

**VOLUME 2
SPECIFICATION**

AUGUST 2000



1159986 (7)

**CONSTRUCTION OF THE JATIBARANG MULTIPURPOSE DAM
PACKAGE 1: JATIBARANG MULTIPURPOSE DAM INCLUDING
APPURTENANT STRUCTURES**

SPECIFICATION

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DIVISION A
GENERAL SPECIFICATIONS

**CONSTRUCTION OF THE JATIBARANG MULTIPURPOSE DAM
PACKAGE 1: JATIBARANG MULTIPURPOSE DAM INCLUDING
APPURTENANT STRUCTURES**

SPECIFICATION

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SECTION 1. GENERAL

1.1 DEFINITIONS

All terms used in this specification shall have the same meanings as defined in the General Conditions of Contract.

1.2 DESCRIPTION OF THE PROJECT

1.2.1 Overview of the Project

The city of Semarang suffers frequent flooding in the wet season and water shortage in the dry season. Progressing land subsidence, mainly caused by ground water extraction, further exacerbates flooding in low-lying areas in the North of the city.

To mitigate these problems and to enhance economic development the project for Flood Control, Urban Drainage and Water Resources in Semarang has been brought about with the assistance of the Government of Japan.

The project has been broadly divided into the following three components which address different aspects of the project. The components are as follows:

- a. West Floodway / Garang River Improvement;
- b. Urban Drainage System Improvement; and
- c. Construction of the Jatibarang Multipurpose Dam.

The functions of the Jatibarang Multipurpose Dam are flood control, public water supply for Semarang City and hydropower generation.

1.2.2 Contract Packages

For the purposes of implementation each of the three components has been subdivided into contract packages. There is a total of 8 packages of work in the project with the breakdown as shown in the following table. The package for the work covered by this document is highlighted to clarify its position in relation to the project components and to other packages.

COMPONENT	DESCRIPTION OF PACKAGES
West Floodway / Garang River Improvement	Package 1: West Floodway and Garang River Improvement Works
	Package 2: Reconstruction of Simongan Weir
	Package 3: Raising of Railway Bridge over West Floodway
Urban Drainage System Improvement	Package 1: Semarang River Drainage System Improvement
	Package 2: Asin River Drainage System Improvement
	Package 3: Bandarharjo Drainage System Improvement

Construction of the Jatibarang Multipurpose Dam	Package 1: Jatibarang Multipurpose Dam including Appurtenant Structures Package 2: Operation and Maintenance Buildings and Goa Kreo Bridge
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1.2.3 Relationship between Components and Packages

In general, from the point of view of construction, there is no relationship nor interface between packages of different components.

Packages within the same component may have common interfaces.

Works by others may be under construction in the same areas during the implementation of work packages of this project.

1.2.4 The Requirement

It is required that there be constructed and completed in accordance the Contract, the construction of all of the Works for Package 1: Jatibarang Multipurpose Dam including Appurtenant Structures.

1.2.5 Scope of Work

The major works to be carried out under the Contract shall consist of, but not be limited to, the following:

- a. A Dam;
- b. A Spillway;
- c. Outlet Facilities including the design, supply, installation and commissioning of all Water Control Plant items;
- d. Diversion and care of the Kreo River including the construction and subsequent plugging of a diversion tunnel;
- e. Power generation plant including its design, supply, installation and commissioning;
- f. Hydropower Station Building;
- g. Road works including permanent access roads on the right bank and a permanent access road on the left bank to the Jatibarang management complex site which has a Time for Completion of 384 days;
- h. Earthworks for Jatibarang Dam Management Complex which has a Time for Completion of 384 days.
- i. Relocation of an existing power line in the reservoir area

Further details of the above items are summarised in table 1.2.5 and complete descriptions of the requirement are included in Drawings, the Specification, the Bill of Quantities and other documents comprising the Contract.

TABLE 1.2.5: MAJOR WORK ITEMS

ITEM	DESCRIPTION	DETAILS
Centre Core Rockfill Dam:	Height above Foundation	77 m
	Crest Length	200 m
	Crest Width	10 m
Spillway :	Crest Width of Service Spillway	15 m
	Total Crest Width	60 m
	Length	307 m
	Stilling Basin	24 m x 60 m
	Spillway Bridge (PC Girder Type)	24 m x 5 m
Outlet Facilities:	Inclined-type Intake Structure	
	Bulkhead Gate	2.0 m (w) x 1.4 m (h)
	Emergency Gate	2.0 m (w) x 1.4 m (h)
	Steel Outlet Pipe in tunnel	393 m x 1.4 m dia.
	Control Gates	650 and 250 mm dia
Diversion Works:	Tunnel with 2r cross section	5.8 m (w) and (h)
	Tunnel Length	441 m
	Tunnel Gradient	1/30
	Temporary Cofferdam	
Hydropower Generation Works:	Power Station Building	390 m ²
	Horizontal Francis Turbine	64.7 m, 1.64 MW
	Horizontal 2 MVA 50 Hz, 750 rpm generator	
	Switchgear and cables	
	Control Equipment	
	Overhead Crane	
	Substation Switchgear	
	Transmission Lines including towers and poles	
Roadworks	Permanent Access Roads	
Other Works	Earthworks for Jatibarang Dam Management Complex	
	Relocation of existing power line	
	Provision of maintenance equipment	

1.2.6 Concurrent Contracts

Concurrent with the construction of the Works, the Employer will have under construction, on two separate sites within the Site for this Contract, works for contract Package 2 : Operation and Maintenance Buildings and Goa Kreo Bridge

The Contractor shall plan his operations as far as it is practicable to avoid any interference or delay to the work of the Employer and of other contractors engaged by the Employer on those operations.

To assist in co-ordinating his operations with the work being done by others, the Contractor shall establish direct site liaison and communications as necessary with the Engineer and other contractors employed by the Employer for all purposes associated with his proposed operations. In the event that the requirements of the Contractor, the Employer and other contractors conflict at any stage of the work, the Engineer shall decide the order in which work shall proceed.

The Engineer shall be given reasonable notice of all meetings between the Contractor and other contractors employed by the Employer and the Engineer shall be entitled to be present at such meetings. The Contractor is to submit to the Engineer copies of all written communications issued to other contractors at the time of issue or received from other contractors at the time of receipt if it bears direct relation to the Contract and the Works.

Subject to the rights of the Contractor under the Contract, the decision of the Engineer shall be final in the event of any disagreement between the Contractor and other contractors employed by the Employer referred to in this Clause, which cannot be resolved mutually.

1.3 GENERAL INFORMATION

1.3.1 Topography

The site for the Works is located in a hilly area through which the Kreo River has cut a deep v-shaped valley. At the dam site the river bed is about 15 m wide at EL. 90 m rising to a gorge width of 175 m at crest elevation. Further detail of site conditions are included in the Drawings.

1.3.2 Climate

The climate of the Semarang area is typically tropical, characterised by two (2) distinct seasons: a Rainy Season and a Dry Season. These result from the seasonal changes in the atmospheric circulation pattern, caused by the annual north-south migration of the Inter-Tropical Convergence Zone.

Summarised below are the climatic characteristics of the construction site area, which are based on climatological data observed in the period of 1968 to 1996 at BMG-Semarang Station operated by Centre of Meteorology and Geophysics.

Mean annual rainfalls	: 2,378 mm
Mean annual temperature	: 27.3 deg. C
Mean maximum temperature through a year	: 31.9 deg. C
Mean minimum temperature through a year	: 23.5 deg. C
Mean monthly rainfall during dry season (Apr to Oct)	: 124 mm
Maximum temperature during dry season (Apr to Oct)	: 32.8 deg. C

Minimum temperature during dry season (Apr to Oct) : 23.4 deg. C

More detailed data is included in the Supplementary Information provided to Bidders.

1.3.3 Geological Conditions

Rock at the sites consists of sedimentary rock of the Damar formation from the latter part of the Tertiary to Quaternary periods. The rock is formed by complicated alteration which consists of conglomerate, conglomeratic sandstone, tuffaceous sandstone and sandstone. Beds vary considerably in thickness.

Further details of geological conditions are shown in the Drawings.

1.3.4 Access to the Site

1.3.4.1 Location of Site

The main part of the Site is located approximately 20 km South South-West of Semarang City, Central Java Province, Indonesia. The dam itself is to be constructed on the Kreo River, 13 km upstream of the confluence with the Garang River.

The quarry, from which rockfill and aggregate etc. may be obtained, is defined as part of the Site and is situated approximately 17 km south of the Dam site in the Ungaran region.

1.3.4.2 Existing Roads and Transportation Facilities

Public roads exist up to within approximately 300 m of the dam site and to within 100 m of the quarry site but they are not necessarily suitable for access for construction purposes owing to their unsuitable standard, width, alignment or proximity to residential areas. Additional roads for the purpose of access to the various parts of the Site shall be constructed under this contract.

An airport and a shipping port exist in Semarang.

The Contractor shall fully inform himself of the conditions of roads, traffic conditions and traffic regulations with respect to gaining access to the Site for the purposes of performing the Works and shall take all necessary actions to ensure availability of access to the Site as required.

1.3.4.3 Load Limits

The public roads and bridges have varying load limits and the Contractor shall be responsible for determining the load limits existing at the time and ensuring that his Equipment does not exceed such limits. Before moving any heavy construction equipment into public roads and bridges, the Contractor shall make suitable arrangements with the appropriate Government authorities and obtain their approval for the passage of such traffic.

The Contractor shall use every possible means to prevent any of public roads or bridges connecting with or on the road to the Site from the being damaged by any traffic of the Contractor or his subcontractors.

The Contractor shall make any necessary repairs or replacement of any structure or route damaged as a result of his own negligence. Such repair or replacement shall be done to the satisfaction of the Engineer or the relevant Government authorities and shall be at the Contractor's expense.

1.3.4.4 Tracked Vehicles

The Contractor shall not travel tracked vehicles or plant on any bituminous sealed road surface or bridge. Rubber tired vehicles conforming to applicable load restrictions will be permitted to use bituminous sealed road.

1.3.4.5 Safety

The Contractor shall take necessary care at all times to ensure the convenience and safety of residents along or nearby the roads and streets used to access the Site.

1.3.4.6 Construction of Additional Access Roads

All additional roads required by the Contractor as temporary road on the Site of the Works and to the quarry site shall be provided by the Contractor at his expense.

1.3.5 Sources of Major Materials

1.3.5.1 Embankment Material and Concrete Aggregate etc.

Pervious material may be crushed rock obtained from the quarry, river gravel on the site or from excavated rock from the site (e.g. tunnel excavation)

Semi-pervious material may be crushed rock obtained from the quarry or Mt. Merapi sand obtainable from local suppliers

Impervious material may be selected from excavated material from the dam or the spillway construction and, where necessary, mixed with crushed coarse material from the quarry.

Concrete aggregate may be crushed rock obtained from the quarry, or river gravel from the Site.

Unless otherwise specified, at least twenty-eight (28) days prior to working and source, the Contractor shall notify the Engineer of its location, the type and quantity of materials available and his intention regarding its use. The Contractor shall sample the source as is necessary to determine the suitability of the materials being excavated and shall submit the results of all sampling to the Engineer for approval. At any time during the progress of the Work, the Engineer may direct further samples to be taken from the source by the Contractor and should further testing indicate that the material is unsatisfactory the Engineer will withdraw approval for use of the source.

The cost of all work involved in developing a source of construction material, of constructing and maintaining haul roads, of winning and hauling the materials to Site and, if any necessary, processing, shall be included in the appropriate rates and lump sum prices tendered in the Bill of Quantities unless otherwise specified.

1.3.5.2 Other Materials

Cement is obtainable from local suppliers

Reinforcing bar is obtainable from local suppliers

Fuel and oil products are obtainable from local suppliers

1.3.6 Power and Telephone Facilities

Electric power and telephone services are available in the vicinity of the Site. The Contractor shall make his own arrangements for procurement of such utilities.

1.4 CONTRACT DOCUMENTS AND DRAWINGS

1.4.1 Contract Documents

The Contractor will be provided with a maximum of five (5) sets of Contract Documents for his own use. Tender Documents in the Contractor's possession shall be marked superseded or returned to the Employer after issue of the Contract Documents and will not be recognised in the administration of the Contract. Further instructions issued by the Engineer shall be kept at all times on the Site by the Contractor and shall be available to the Engineer and his staff.

1.4.2 Bid Drawings

The drawings included in the Bidding Documents are to be used for bidding purposes only. The drawings show the work to be carried out in accordance with the Contract as definitely and in as much detail as is possible at the time of bidding. The Contractor may use the Bid Drawings for placing preliminary orders for materials or for preparing drawings of Temporary Works. However, the Bid Drawings shall not be used as a basis for fabrication of equipment or for construction of the Works.

1.4.3 Construction Drawings

Bid Drawings will be supplemented or superseded by such Construction Drawings as necessary for the purpose of the proper and adequate execution of the Works. Two (2) full size prints of such Construction Drawings will be issued by the Engineer to the Contractor in accordance with the construction programme required under the provisions of Clause 1.5. On receipt of the Construction Drawings, the Contractor shall check them carefully and advise the Engineer in writing of any discrepancies, errors or omissions and full instructions will be furnished to the Contractor should any discrepancies, errors or omissions be found. The Contractor shall be required to perform the Work in accordance with such Construction Drawings at the applicable rates bid in the Bill of Quantities for such work or work of a similar nature. Although the Drawings are prepared to scale, work shall be based upon dimensions shown on the Drawings and not on dimensions scaled from the Drawings.

The Engineer may, from time to time during the construction, issue further drawings to supplement or amend the Construction Drawings, if deemed necessary. Such further drawings shall become part of the Construction Drawings.

The Contractor shall be governed by figure dimensions as given on the Drawings. Where the required dimensions are not shown in figures, the Contractor shall obtain such dimensions from the Engineer before proceeding with the construction of the portion of the Works to which they refer. In every case, detailed drawings shall take precedence over general drawings.

When additional information regarding foundation or other conditions becomes available as a result of excavation work, further testing or

otherwise, and if it is found desirable to make changes in the alignment, cross section, dimensions or design of the Works to conform to such conditions, the Employer reserves the right to make such changes as in the opinion of the Engineer are necessary or desirable, and the Contractor shall forthwith comply with any such direction of the Engineer.

Bid drawing may be used as construction drawings, as defined above, when authorised, in writing, by the Engineer.

1.4.4 Drawings to be furnished by the Contractor

1.4.4.1 General

All of the various types of drawings as stated hereinafter shall be prepared in a form approved by the Engineer and submitted in advance to give the Engineer sufficient time to review and approve them without causing any delay to the field works. The Contractor shall provide qualified staff and a sufficient number of draftsmen and assistants capable of producing all drawings required.

All drawings and supporting computations to be submitted by the Contractor for the Engineer's approval shall be in English and shall be in metric units in accordance with the International System of Units (SI). The drawings shall be in JIS A1 size (594 mm by 841 mm) unless otherwise specified or approved by the Engineer.

The Contractor shall be held responsible for all drawings and documents not submitted within the time limits stipulated in Clause 1.4.5 and for all costs involved for delays and damages consequent thereto. Contractor's drawings approved by the Engineer are to be used for construction.

1.4.4.2 Working Drawings

The Contractor shall prepare the working drawings for all items of the Permanent Works on the basis of the Construction Drawings issued by the Engineer. The working drawings shall show sufficient details of the structure of the works or the construction methods or procedures such as, but not limited to, excavation and embankment fillings; concrete reinforcement bar arrangement including bending/cutting schedule and bar list, expansion joints, contraction joints, construction joints, concrete placement details, waterstop layout, equipment installation, etc., by which the Contractor will proceed with the field construction and operation. Further, drawings presenting full details of items not to be incorporated into the permanent Works but which affect the quality of work such as concrete forms, supports, etc., shall also be included in the working drawings. All the working drawings related to any section on the Works shall be approved by the Engineer prior to the time the Contractor plans to perform such section of work.

1.4.4.3 Shop Drawings

Shop drawings shall be prepared by the Contractor, or the Contractor's materials/equipment supplier on behalf of the Contractor, to show the outline, dimensions, type of material, etc., of particular items indicated in the Drawings and/or Specifications and as directed by the Engineer. Such shop drawings shall be submitted by the Contractor to the Engineer for approval.

1.4.4.4 Drawings of the Temporary Works

Thirty (30) days before starting any section of the Temporary Works specified in Clause 1.9 hereof, the Contractor shall submit to the Engineer for approval drawings showing details of such facilities.

The drawings for Temporary Works shall show the locations and other pertinent details of the principal components of the construction plant, offices, quarters, warehouses, storage areas, workshops, labour camps and other temporary buildings and facilities which the Contractor proposes to construct in the Works area.

If any change is made in the items mentioned above during erection or after the items become operational, the Contractor shall submit revised drawings showing such changes to the Engineer for approval.

1.4.4.5 As-Built Drawings

Throughout the period of construction, the Contractor shall maintain an up-to-date set of as-built drawings for the various items of work completed. Such drawings shall show all authorised changes to the Construction Drawings and Shop Drawings to the extent that they correctly portray the true "as-built" condition of each item of the Permanent Works. The format of the as-built drawings shall be as approved by the Engineer.

The up-to-date set of as-built drawings shall be subject to periodical inspection at the Site by the Engineer and if the drawings are found unsatisfactory or not up-to-date the Contractor shall bring them up-to-date within fourteen (14) days after inspection. If any part of the permanent Works delineated on the drawings is complete, the pertinent as-built drawings, after approval by the Engineer, shall be signed by both the Engineer and the Contractor, or their representatives, and three (3) copies shall be kept by the Engineer.

The as-built drawings shall be made on high quality reproducible paper so that clearly readable copies can be made. The finished set of as-built drawings shall be submitted by the Contractor to the Engineer for his approval and transmittal to the Employer in the manner specified in Clause 1.4.5.4.

1.4.4.6 Other Drawings

Drawings other than those mentioned above, which are of a general nature, such as the proposed construction methods, temporary works for construction purposes, schematic diagrams and outlines of how various types of work are to be performed shall, as directed by the Engineer or as stipulated in the Contract Conditions and Specification, be submitted to the Engineer for approval.

1.4.4.7 Form and Presentation of Drawings

a. General

All shop Drawings and Working Drawings produced by the Contractor or his subcontractors for this Contract shall use a common system of sizes, title blocks and numbers in accordance with this Sub-Clause, regardless of who produces the drawings.

b. Drawing Sizes and Standards

All drawings shall be drawn in the accordance with Clause 1.4.4.1.

c. Title Blocks

- (i) The Contractor shall submit a sample of the title block he proposes to use for approval by the Engineer. The general format of the title blocks shall follow those of this Specification.
- (ii) The Contractor or his subcontractor's title blocks shall show the Contractor's and subcontractor's name, the date, the title, and number of the drawing and each new issue of the drawing shall be identified by a revision letter as a part of the number. In addition each drawing shall show the following details in the lower right hand corner:

FLOOD CONTROL, URBAN DRAINAGE AND WATER
RESOURCES DEVELOPMENT IN SEMARANG

COMPONENT: CONSTRUCTION OF THE JATIBARANG
MULTIPURPOSE DAM

PACKAGE 1: JATIBARANG MULTIPURPOSE DAM
INCLUDING APPURTENANT STRUCTURES

DRAWING NO

d. Numbering System

- (i) Primary reference to drawing numbers on all drawings, correspondence, operation, and maintenance instructions and elsewhere, shall be the number from the Engineer's numbering system, which system will be notified to the Contractor.
- (ii) The Contractor may, if he desires, insert his own reference number in the appropriate place on the title block.
- (iii) Drawing number shall be as allocated by the Engineer.

e. Quality

The quality of working drawings, shop drawings, "as-built" drawings and drawings for temporary works shall be in accordance with Clause 1.4.5.

f. Drawing Index

The Contractor shall compile a drawing index for all drawings produced by himself and his subcontractors. The Contractor shall submit an up-to-date copy of each sheet of the index to the Engineer at three monthly intervals or on request.

g. Drawing on Site

Copies of the latest revisions of all drawings shall be sent to the Contractor's site office as soon as possible after they are approved. The drawings shall be available at all reasonable time for inspection by the Engineer.

1.4.5 Submittal and Approval of Contractor's Drawings

1.4.5.1 General

- a. It is to the Contractor's advantage to prepare his drawings and submit them to the Engineer at the earliest possible time to avoid delay in the fieldwork due to lack of approved Drawings on hand for the construction crew.
- b. Any work done prior to the Engineer's approval of the drawings shall be at the Contractor's risk. Approval by the Engineer of the Contractor's

drawings shall not relieve the Contractor from any of his obligations in the complying with the provisions of the Contract.

1.4.5.2 Procedure for Submittal and Approval

- a. Unless otherwise specified the Contractor shall submit his working drawing, shop drawings and other required drawings to the Engineer for approval at least sixty (60) days prior to the commencement of construction of any particular item of work. Shop drawings for any particular item which has to be fabricated outside of the Site shall be submitted early enough to allow adequate time for review, approval, fabrication, transportation and receipt at the Site.
- b. Four (4) clearly readable print copies of each drawing shall be submitted to the Engineer by means of a standard transmittal sheet. The format of the transmittal sheet shall be as approved by the Engineer.
- c. The Engineer shall have the right to direct the Contractor to provide additional details and change in the drawings if they are necessary to ensure compliance with the provisions and intent of the Specifications. Within thirty (30) days after the receipt of the drawings submitted by the Contractor, and the Engineer shall return one (1) copy thereof of the Contractor marked "Approved for Construction", "Approved for Construction-Except as Noted", or "Not Approved Resubmit".
- d. The return and receipt of any approved drawing shall be deemed to authorise the Contractor to proceed with the work covered by such drawing, but before proceeding with the work the Contractor shall first submit to the Engineer by logged transmittal sheet two (2) prints of each drawing. When requested by the Engineer, one (1) transparency of working drawings and shop drawings shall also be submitted together with two (2) prints. Copies of all approved drawings shall be maintained at the Contractor's site office in proper order.
- e. When correction or revision is directed on the Contractor's submitted drawings, the Contractor shall make the necessary corrections and/or revisions in a timely manner and shall resubmit them in two (2) copies to the Engineer in the same manner as for new drawing. This procedure shall continue until the drawings have been finally approved.

1.4.5.3 Other Information

All applicable requirements of this Clause shall apply equally to other submittals described in Clause 1.5.

1.4.5.4 As-Built Drawings

Within one (1) month following the issue of the Certificate of Completion of the Works, the Contractor shall furnish to the Engineer, for his approval; and transmittal to the Employer, the final version of as-built drawings. These as-built drawings shall consist of:

- a. Two (2) sets of transparent polyethylene sheets ;
- b. Three (3) sets of full-sized (A1 size) bound copy ; and
- c. Ten (10) sets of reduced size (A3 size) bound copy.

1.4.6 Payment

Payment for Drawings in accordance with this Clause 1.4 shall be made at the Lump Sum price entered in the Bill of Quantities. (Item A.3)

For the purposes of monthly progress payments the amount completed, expressed as a percentage of the total number of drawings required to be completed by the Contractor, shall be determined. Payment shall be calculated by multiplying the percentage completed by the lump sum for Drawings entered in the Bill of Quantities. Payment for drawings shall never exceed the lump sum entered in the Bill of Quantities.

1.5 CONSTRUCTION PROGRAMME, CONSTRUCTION PLAN, PROGRESS REPORTS AND OTHER SUBMITTALS

1.5.1 General

The Contractor shall prepare and submit a construction programme, a construction plan, progress reports and other required documents in the manner specified herein.

1.5.2 Construction Programme

1.5.2.1 General

- a. In accordance with Sub-Clause 14.1 of the Conditions of Contract, within sixty (60) days after receiving the Letter of Acceptance, the Contractor shall submit to the Engineer a detailed construction time schedule of the overall works for approval. The schedule shall be in accordance with the construction programme submitted with the Tender and approved by the Letter of Acceptance but shall provide significantly more details in accordance with this Clause. The details required shall include each main activity such as, but not limited to, each main item referred to in the Bill of Quantities associated with each of the main items of work as listed in Clause 1.2.4 of the General Specification. Activities shown on the schedule shall consist not only of the actual construction sequence including mobilisation, but also time allowances necessary for the preparation and approval of drawings and samples, for the procurement and shipment of materials and equipment including obtaining licences and permits for procurement and/or importation, for the installation of the special time, for possible delays caused by floods or inclement weather conditions, religious holidays, etc. The construction time schedule shall be prepared and submitted in computerised bar chart and CPM network forms. The critical path(s) shall be marked on the network as well as float for each activity. An original copy of the software and manuals used to prepare this schedule shall be submitted to the Engineer for the use of his Consultant for the duration of the Contract. The Contractor shall submit copies of the construction time schedule and all subsequent revised Construction Programmes in accordance with Sub-Clause 14.2 of the Conditions of Contract and shall also submit the computer input data on floppy disk on each occasion. The software shall also be capable of comparing actual and planned progress both physically and financially and this information should be prepared and submitted on a fortnightly basis.
- b. The construction time schedule shall be so prepared that all the Works are to be completed within the time for completion as stated in Contract Data in accordance with Sub-Clause 43.1 of the Conditions of Contract.
- c. The construction time schedule shall be subject to modifications and changes as necessary and, after approval by the Engineer, shall become part of the Contract.

- d. The Construction Programme as approved by the Engineer shall be closely monitored and kept current. It shall be formally updated by the Contractor once in every four (4) months or at any time directed by the Engineer, and submitted to the Engineer each time for approval. Revisions to the Construction Programme shall show the effects of any variations and compensation events.

1.5.2.2 Revision of Programme

- a. If in the course of execution the rate of progress of the Works or any section thereof falls behind the approved Construction Programme and if, in the opinion of the Engineer, the Contractor shall not be able to complete the Works or such section of the Works by the time required, then the Engineer may order the Contractor to increase his work force or supplement the Construction Plant on Site or take any other adequate steps to expedite the rate of progress for that section, submit for approval a revised construction programme showing the proposed measures to complete the Works on time.
- b. If the Contractor proposes to modify or revise the Construction Programme and if the change affects the Engineer's design and drawings programme, the Employer shall not be responsible for the consequence of the late issuance of Construction Drawings attributable to the change even after the approval by the Engineer of the modification or the revision of the Construction Programme.

1.5.3 Construction Plan

1.5.3.1 General

Within sixty (60) days after receiving the Letter of Acceptance for the whole Works under the Contract as specified the Contract Data, the Contractor shall submit a revised general construction plan including a detailed equipment to be mobilised, particulars of Temporary Works and method statements for major items of work to the Engineer for approval. The plan shall be prepared on the basis of the General Plan submitted by the Contractor with his Bid. Any instructions given by the Employer and/or the Engineer on and after award of the Contract shall be incorporated.

The construction plan shall clearly indicate all access routes to be used by the Contractor during the execution of the Works. Public roads used for such purposes shall be maintained by the Contractor in accordance with Sub-Clause 1.3.4.7 of this specification

1.5.4 Weekly Schedule

The Contractor shall, at the end of each week, submit to the Engineer for his review and comments two (2) copies of a weekly schedule for the succeeding week in a form approved by the Engineer. The schedule shall contain appropriate comments with regard to the work to be performed on each major item as well as other construction work related to the execution of the Works including procurement of materials, transportation of materials and equipment, preparation of drawings and other items required by the Engineer.

1.5.5 Monthly Progress Report

1.5.5.1 Written Report

The Contractor shall submit, before the tenth (10th) day of each month or at any time designated by the Engineer, five (5) copies of a monthly progress report in a form acceptable to the Engineer detailing the progress of the Works during the preceding month. The report shall contain, but not be limited to, the following items:

- a. A brief but detailed description of all works executed during the reporting month together with a cumulative summary of progress to date for each main activity.
- b. Total overall percentage of work completed up to the end of reporting month as well as the total overall schedule percentage completed and the forecast completion date computed by the critical path method (or other method previously approved by the Engineer) as of the end of the reporting month with appropriate comments on progress.
- c. Actual percentage of each main work item completed, as well as their schedule percentage, with appropriate comments on their progress. The percentages shall be provided for each month and cumulatively.
- d. Schedule of activities to be started within the succeeding two (2) months with the forecast starting and completion dates. If the dates are different from those shown on the approved Construction Programme an explanation shall be given.
- e. List of manpower by trade, and supervisory personnel by position, employed during the reporting month.
- f. List of Construction Plant and materials on Site used in the execution of the Works including those that arrived at or were removed from the Site. The records shall include duration for which Equipment was not in working order.
- g. Total work quantities to be incorporated in the permanent Works including, but not limited to, the following items:
 - (i) Total quantities of various classifications of excavation and embankment.
 - (ii) Total quantities of various classes of concrete poured.
 - (iii) Main items of the temporary works performed during the reporting month.
 - (iv) General description of the weather conditions during the reporting month including records of each rainfall duration.
 - (v) List of each accident involving, lost time, and/or death of any person, damage suffered by Works, properties and equipment.
 - (vi) Occurrence of any event or condition that might delay or prevent completion of the Works in accordance with the current, approved Construction Programme and the steps taken by the Contractor to correct the situation.
 - (vii) Schedule of the amount of payments received to date and the amount of any monthly invoice submitted but not yet paid.
 - (viii) Estimated amount of payment from the Employer to the Contractor for the succeeding month.
 - (ix) Colour photographs (not smaller than 8 cm x 12 cm) of the work progress of all major components of the Works from start to

completion taken at locations directed by the Engineer. A brief description and date of each photograph shall be stated. The date shall be imprinted in each negative and photograph. A minimum of two photographs shall be taken of each major component under construction in the month including temporary works.

- (x) Any other matters which may be required under the Contract or statement concerning any matter arising from or relating to the execution of the Works during the reporting month.

1.5.5.2 Video Report

The Contractor shall make a video tape recording of the progress of the Works on a monthly basis and shall engage a professional recording company approved by the Engineer to carry out the work.

The monthly recording shall be of 30 minutes duration and shall be carried out throughout the duration of the Contract or as directed. Additional recordings may be necessary to record significant milestone events.

A copy of each monthly recording shall be submitted to the Engineer. The recording shall be accompanied with dialogue in English, describing the events recorded.

At the completion of the Works the monthly recordings shall be compiled and edited into a single recording of four hours duration, or as directed, complete with approved dialogue and soundtrack and submitted to the Engineer.

1.5.6 Daily Report

The Contractor shall prepare daily and periodical reports in a form approved by the Engineer. The following items:

- a. Weather conditions;
- b. Staff and labour force employed on the work;
- c. Materials and equipment on Site;
- d. Work in progress including locations and estimates of daily production;
- e. Work in preparation;
- f. Accident or any other reason causing a suspension of the work;
- g. Occurrence of any event or condition that might delay the progress of work; and
- h. All other information relevant to the progress of the Works.

1.5.7 Joint Meeting to Discuss Progress

A regular meeting between key personnel of the Engineer and the Contractor's authorised representative shall be held once a week at a time agreed upon by both parties to discuss the progress being made, the work proposed for the forthcoming week and any problem having a direct bearing on the immediate or near term work activities.