Japan International Cooperation Agency (JICA)

Directorate General of Sea Communication, Ministry of Communications (DGSC)

Indonesian Port Corporation II (IPC II)

No.

Final Report

for the Detailed Design Study

on the Urgent Rehabilitation Project

of

Tanjung Priok Port

IN THE REPUBLIC OF INDONESIA

DRAFT BID DOCUMENT

Package 1: Channel and Basin Improvement

Volume III Technical Specifications

March 2006

Nippon Koei Co., Ltd.

Japan Port Consultants, Ltd.

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THE URGENT REHABILITATION PROJECT OF THE TANJUNG PRIOK PORT

Bidding Documents for Package 1: Channel and Basin Improvement

VOLUME III

TECHNICAL SPECIFICATIONS

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SECTION 100 – GENERAL

101. General Information

101.1 Site of Works

The site of the Works is located in and around the Tanjung Priok Port in Jakarta. The water area of the Port is about 400 ha, and is surrounded by the breakwaters and the berths. The maximum size of vessel navigable in the Port is about 300 m in LOA. There are two entrances to the Port: west entrance (-14m DL) and east entrance (-5m DL). The east entrance is not used except for small vessels due to the shallow depth.

The Port has commercial berths of about 10 km in total length. The Tanjung Priok Port is the busiest port in Indonesia, and the daily ship call nears 100 vessels.

Navigation access to the Port through west entrance consists of an Outer Access Channel with a depth of -14 m DL, Inner Access Channel with a depth of -14 m DL, and Basins with depth ranging from -10 to -14 m DL.

Details of the Site Location are shown in the Drawings.

101.2 Names of Areas and Segment

The names of areas and segments used for the Works are shown in Appendix 101, and listed as follows:

Dredging Area	:	Outer Channel Inner Channel Turning Basin
Breakwater Demolition	:	Dam Barat Dam Timur Dam Tengah-1 Dam Tengah-2 Dam Citra-1 Dam Citra-2
New Breakwater Construction	:	New Dam Barat New Dam Tengah-1 Section 1 New Dam Tengah-1 Section 2 New Dam Tengah-1 Section 3 New Dam Tengah-2

101.3 Definition of "Dredging" and "Excavation"

The terms used for the Works are defined as follows:

"Dredging" : Removing soil from the dredging area in accordance with

SECTION 800, but not including the removing of the core and foundation materials under the existing breakwater as specified in SECTION 600

"Excavation" : Removing of the core and foundation materials under the existing breakwater in accordance with SECTION 600, removing of the soil for replacement at the new breakwater as specified in SECTION 700, or any other removing of soils other than "Dredging".

101.4 General Description of Works

The Works included in this Contract comprise, but not limited to the construction of the following:

- Demolition of about 1,830 m of the existing breakwaters at Dam Barat, Dam Timur, Dam Tengah, and Dam Citra, and recovery of the reusable materials for the construction of new breakwater.
- Construction of about 1,660 m of new breakwaters at New Dam Barat and New Dam Tengah-1.
- Construction of about 320 m of new breakwater at New Dam Tengah-2.
- Dredging of about 8,100,000 m^3 of soils, which includes marine sediments, sand, silt, and clay to provide:
    - Widening of the Outer Channel: 300 m wide and of depth -14.0 m DL
    - Enlarging of the Inner Channel and the Turning Basin: the maximum radius of 280 m and of depth of -14.0 m DL.
- Disposal of the dredged spoil off the coast of Tanjung Karawang village about 27 km from the Site.
- Provision and installation of new navigation buoys, light beacons, and sector light, relocation of a number of existing navigation and mooring buoys, and demolition of existing navigation towers.

101.5 Climatic Conditions

The Port is located in the tropical monsoon zone. The southeast monsoon prevails between May to September, and the northwest monsoon between November to March. Southeast monsoon season is relatively dry, and the precipitation is concentrated in the northwest season, which has 65% of the total annual rainfall of 1,800mm. Throughout the year, wind is rather mild. Some gusts occur in the wet season, but no tropical cyclone has been experienced. The ambient temperature ranges between 23 and 33ºC.

101.6 Wave Climate

The predominant directions of waves to the Port are in the range of 310º N to 30º N. The existing breakwaters protect the port against those waves, except in its eastern part, where parts of the breakwater are almost submerged during high tides due to settlement/ collapse of the structure.

The design wave height with a 1 in 50 year return period, at 350 m due north of the Dam Tengah, has been estimated from measured data and hindcasts as follows:

Direction (ºN)		Hs
310 - 330	:	2.5 m
340 - 360	:	2.5 m
10 - 30	:	2.5 m

101.7 Bathymetry

The seabed of the coastal zone near the Port lies in a gentle slope of 1 to 1,000. The isobathic water depth contour of -20m DL is situated about 15 km off the Port. The Outer Channel (-14m DL) extends about 3.5km from the Port entrance to offshore. A 0.5 to 1km wide swath of shallow zone (-3 to -4m DL deep) stretches immediately seaward of the breakwaters.

The water depth inside the Port is maintained to the navigable levels. The Inner Channel is maintained to -14m DL, and the adjoining anchorage area to -5 to -7m DL. The basin in front of the Jakarta International Container Terminal (JICT) is maintained to -14m DL, and the basin in front of Pier III to -12m DL. The remaining zones have the water depth of shallower than - 10 m DL. Annual maintenance dredging volume in the Port is about 600,000 m3 .

101.8 Site Geology

Refer to the Drawings.

The following table depicts the subsoil conditions of four locations at the Site:

Location	Boring Point No.	Subsoil Conditions
Outer Channel	BS-8	Up to -17m DL (Clay/Silt, N-value < 8), -17m to - 18m DL (Sand, N-value < 10), Deeper than -18m DL (Clay/Silt, 8 <N-value<30)
Inner Channel	BS-9	Up to -14m DL (Clay/Silt, N-value < 8), -14 m to -16.5 m DL (Sand, 10 < N-value < 30), -16.5 m DL to -19.5 m DL (Clay/Sand , N-value > 30)
New Basin	BS-13	Up to -13m DL (Clay/Silt, N-value < 8), -13m to -14.5m DL (Clay/Silt, 8 <N-value<30)
New Breakwater	BS-20	Up to -12m DL (Clay/Silt, N-value < 8), -12 m to -15m DL (Clay/Silt, 8 <N-value<30), -15 m to -16m DL (Sand, 10 < N-value < 30)

102. Interference with Other Traffic

The Contractor shall ensure that floating crafts, plant, and equipment, and any staging or other temporary works to provide minimal interference, prevent, or obstruct the navigation of vessels in the existing approach channel or to existing ports in the area. The Contractor shall observe the port traffic regulations governing the sea traffic in and out the Tanjung Priok Port.

The Contractor shall coordinate with the Port Administration Office of Tanjung Priok Port (ADPEL), Port Pilotage the Navigation Division in the Directorate General of Sea Communication (DGSC), port users, fishing parties, and other concerned parties in regard to safe operation. The Contractor shall provide lights, markers, notices or other safety devices as may be required by them to indicate the activities and working areas.

The Contractor shall confer regularly (daily or weekly) with ADPEL and Pilotage about the working zones and times in order to minimize the traffic interferences with others prior to commencement of the work and during the works. The Contractor shall abide by the any regulations set forth by the ADPEL and Pilotage with respect to the working zones and times.

The Contractor shall prepare the Safety and Prevention Manual for the Contractor's staff and workers against the accidents likely to occur in the water area. The Contractor shall submit the Safety and Prevention Manual to the Engineer for approval prior to the mobilization of the floating equipment.

The Contractor shall indemnify the Employer against any claims lodged by the other port users in regard to the interferences caused by the Contractor. Operational delays of the Works related to the minimum traffic interferences shall not be considered valid ground for any extension of time and additional monies.

103. Existing Works, Services and Structures

The Contractor shall not interfere in any way with any existing works whether the property of the Employer or of a third party and whether or not the position of such works is indicated to the Contractor by the Engineer.

The Contractor shall ensure that the stability of existing structures is no way impaired as a result of his construction activities and shall take all necessary precautions by means of such methods as may be approved to assure the stability of those structures until the permanent works are completed.

The Contractor shall take every precaution to avoid damage to existing services on site and en route to the sea dumping area, including breakwaters, navigation aids, fishing nets and traps. The Contractor shall by his own independent enquiries and observations establish the locations of all such services as are known to exist. All services uncovered shall be adequately supported or diverted or both as may be required by the Engineer. Should any service be damaged or any unidentified service be uncovered, the fact shall be reported to the Engineer immediately.

Staging of the demolition and construction of the breakwaters shall be in accordance with the provisions in SECTION 600 and 700. The purpose of defining the staging of such works shall be to keep the calmness of the port basin high through maintaining a certain length of the breakwater as a wave protection during construction period. The Contractor shall be responsible for the claims lodged by the port users in regard to high waves, which make shipping operation idle, caused by the Contractor's negligence of such provisions.

104. Wrecks and Steel Debris

Refer to SECTION 300 SITE CLEARANCE AND DEMOLITION

105. Contractor's Working Area and Accommodation

There will be no area in the Port made available to the Contractor for a yard or offices. The Contractor shall take all necessary measures and arrangements at his own expense to secure an area for his general operation near the Site.

The Contractor shall submit to the Engineer for approval the plan of the yard and office area prior to its construction.

The yard and office area shall be surrounded by fences and gates, the type of which shall be subject to the approval of the Engineer.

106. Geological Investigation

106.1 General

Prior to commencement of the construction of the breakwater, the Contractor shall carry out the geological investigation at the locations shown on the Drawings, unless otherwise instructed by the Engineer. The main purpose of the investigation is to determine the exact depths of the soil replacement for breakwater construction.

The Contractor shall submit to the Engineer for approval the details of the method of the geological investigation.

The Contractor shall submit the investigation results to the Engineer for review.

106.2 Boring Length

The tip of the boring shall reach 20 m measured from the seabed of the point.

106.3 Testing Parameters

Testing Parameter	Frequency
SPT (N-Values)	Every 2 m depth
Consolidation Test	Take undisturbed sample every 2 m depth (except for sand layer) for laboratory testing

107. Temporary Works

The Contractor shall provide and maintain and remove on completion of the Works all necessary temporary works including but not limited to temporary traffic diversions, survey stages, sheet-piling, cofferdam, temporary material storage, and shall make them safe and suitable in every respect to the satisfaction of the Engineer. Complete details of the temporary works proposed shall be submitted to the Engineer for approval a minimum of 14 days prior to the construction of such temporary works.

108. Method Statements

Prior to commencement of any parts of the Works, the Contractor shall submit a detailed statement of working methods of each work to the Engineer for approval. The Contractor shall refer to the each SECTION in regard to minimum requirement of the contents of the method statements.

109. Construction Program

The Contractor shall submit a detailed Construction Program as provided for in the Sub-Clause 14.1 of the Conditions of Contract.

109.1 Contents of the Construction Program

The Contractor shall list at least each of the detailed work activity together with an estimate of activity duration involved:

- Pre- and Post- Construction Survey
- Geological Investigation
- Site Clearance before and after the construction
- Dredging by area
- Demolition of Existing Breakwater by location
- Construction of New Breakwater by location
- Navigation Aids by type

Duration of each activity mentioned above shall be split up into the following categories:

- Mobilize
- Setting out
- Procurement and delivery of materials
- Installation and/or placement of materials
- Demobilize

For each category, the planned construction rate shall be indicated, together with resources (equipment and manpower) to be employed.

The Construction Program shall specify the expected number of working days per week and hours per day to be worked throughout the duration of the Contract. It shall also state the dates of all statutory and other public holidays on which the Contractor does not expect to work.

The Contractor shall allow for bad weather, holidays, moving equipment about the site, operational port activities, difficult access and any other factors and contingencies in his estimates of activity duration.

The Construction Program shall be in the form of bar-chart with inclusions of interlink lines and critical path line.

109.2 Monthly Review of Construction Program

Together with monthly progress report (specified in the next clause), the Contractor shall submit to the Engineer the following information in writing:

- The actual starting dates of all activities started and completed during the period of the progress claim
- The current status of all works underway, indicating by work quantity or percentage, at the time of the progress claim
- The reasons for any discrepancy between the Construction Program and the actual progress, together with the Contractor's proposals for ensuring that all key and critical dates are achieved.

110. Safety, Security, and Environment

Within 28 days after the Commencement Date, the Contractor shall submit the safety and security plan for approval by the Engineer a working Safety Plan, containing adequate control measures in accordance with the relevant local laws and regulations regarding prevention of accidents, fires and public nuisances upon commencement of the Works, and shall implement the same properly and diligently throughout the execution of the Works.

The Contractor shall appoint a full time Safety Manager for the Works, who shall be responsible for implementing the Safety Plan and providing, of necessary seminars to the workers periodically on environmental protection.

The Contractor shall ensure that his staff and workmen are all fully trained in and aware of good and safe working practices.

All temporary and partially completed works shall be protected by way of barriers, lights, notices and the like.

The Contractor shall ensure that all precautions are taken to safeguard the general public and operating staff from any dangers created.

Warning and diversion signs shall be suitably placed to give vessels ample warning signs.

The Safety Plan shall also consider work at the Site and include requirements for proper warning and protection, for example of existing berths, pipes or obstructions, or voids, openings, pits and trenches. The Contractor shall ensure that all appropriate measures are implemented.

The Contractor will be responsible for the safety of the public legitimately passing through the site. All excavations, plant or items of potential danger to the public must be barricaded and signposted to the satisfaction of the Engineer and the Contractor must provide sufficient watchman to ensure the safety of the public at all times.

111. Notice of Operations

The Contractor, when required by the Engineer, shall supply in writing full information regarding the location in which the materials are being obtained and in which the work is being prelate.

No permanent work shall be undertaken without the Engineer's approval. Full and complete notice in writing shall be given to the Engineer sufficiently in advance of the time of the operation for him to be able to make such arrangements as he may deems necessary for its inspection.

All work must be carried out in such a way as to minimize danger to the public or the workmen on the site.

The cost of complying with this Clause will not be paid for directly, but will be considered to be included in the Bid prices for pay items under this Contract.

112. Monthly Progress Report

112.1 General

The Contractor shall submit Monthly Progress Report as provided for in the Sub-Clause 14.5 of the Conditions of Contract. The Contractor shall submit the sample form of the Monthly Progress Report to the Engineer for approval within 35 days after the date of the Letter of Acceptance.

The Contractor shall submit the Monthly Progress Report within the first week of every month from the next month of the Notice to Proceed. The report, after the Engineer's comments and the Contractor's correction, shall be submitted to the Engineer in both a hard copy and an electric file.

112.2 Minimum Requirements of the Monthly Progress Report

The Monthly Report shall at minimum contain followings:

- Daily weather and sea state records including approximate precipitations, wind velocity and direction, wave height
- Daily manpower (staff and labor) logs
- Daily construction equipment logs
- Daily material delivery records
- Daily records of dredging and dumping
- Daily test, inspection, monitoring, and measuring records
- Safety and Accident reports
- Monthly Review of Construction Program, as stated in the previous clause.
- Sketches delineating the area or section of progress of each work (work done previous months, work done this month)

- Financial progress, showing the summary of the monthly statements
- Photographs

113. Completion Report

113.1 General

The Contractor shall submit Completion Report as provided for in the Sub-Clause 14.5 of the Conditions of Contract.

The Contractor shall submit the Completion Report not later than 14 days after the issue of the Taking-Over Certificate. The report, after the Engineer's comments and the Contractor's correction, shall be submitted to the Engineer in both a hard copy and an electric file.

113.2 Minimum Requirements of the Completion Report

The Completion Report shall at minimum contain followings:

- Summaries of the items reported in the Monthly Report
- Summaries of qualities of the works, such as concrete materials, concrete strength, and rock materials

114. Standard Specification

114.1 General

The Contractor shall observe the particulars and conditions in standards or codes of practice, which are referred to in the Contract, with respect to material, quality, and workmanship of the Works.

If standard specifications are not specified to the work in the Contract, relevant provisions of the appropriate specification, subject to the approval of the Engineer, shall be applied.

114.2 Provision of Standards and Codes

The Contractor shall provide one copy of each standard or code of practice referred to in the Contract for the use of the Engineer.

114.3 Equivalency of Standards and Codes

Whenever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Engineer's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineer's approval. In the event the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards specified in the Documents.

115. Testing Laboratory

Prior to the commencement of any parts of the Works, the Contractor shall propose the independent testing laboratories, at which the Contractor intends to carry out the tests required in the Contract. Such proposal shall include, but not limited to, test items, name of the laboratory, testing equipment, applied standard specifications, and shall be approved by the Engineer.

116. Drawings

116.1 List of Drawings

The list of the Drawings is contained in Appendix 102.

116.2 Shop Drawings

The Contractor shall submit the Shop Drawings to the Engineer for his review and approval not less than 28 days prior to the start of any parts of the works. The numbers of the copy and the format of the submission shall be subject to approval of the Engineer.

The Engineer shall approve or comment for corrections within 14 days after receipt of the drawings from the Contractor. No parts of the works shall be started without approval of the Shop Drawings.

The Shop Drawings shall be of sufficient details so that the Contractor's supervisors, foreman, technician, or craftsman and the Engineer's inspectors can correctly and unanimously understand the nature of the work and the method of construction, and shall include, but not limited to, the followings:

- General layout and dimensions of the works, based on the pre-construction surveys
- Locations, structures, and details of temporary facilities and works, such as Contractor's yard plan, precast yard, warning buoy arrangement, and temporary storage arrangement.
- Navigation route map for the hoppers and barges
- All type of plans and sections of breakwater demolition and construction, indicating the areas to use the reuse materials.
- Drawings to show the sequence of breakwater demolition and construction
- Bending bar schedule and fixture arrangement for reinforcement concrete
- Formworks arrangement
- Dredging area divisions by the type of dredger employed, and sequence of dredging
- Details of navigation aids, indicating specifications of power supply, painting, and illumination calculation.

Within 35 days after the date of the Letter of Acceptance, the Contractor shall submit the Engineer for approval the sample of drawing title box, drawing numbering system, list of Shop Drawing, and schedule of the submission.

The Engineer's approval of the Contractor's Shop Drawings shall not in no way relieve the Contractor of responsibility for the correctness of such drawings.

116.3 As-Built Drawings

Before the Taking-Over Certificate is issued for the part or whole, the Contractor shall submit the draft As-Built Drawings to the Engineer for his review. The numbers of the copy and the format of the submission shall be subject to approval of the Engineer.

As-Built Drawings shall indicate all the changes, and actual elevations and dimensions.

117. Discrepancies

The Contractor shall give prompt notice to the Engineer of any discrepancies in technical specification among the Specifications, the Drawings, and the Bill of Quantities which he discovers when executing the Works.

The Engineer will make adjustment and issue such instruction to the Contractor within a reasonable time. The Engineer's instruction in regard to the technical interpretation shall be final. Such work shall be executed strictly in accordance with the Engineer's instruction.

118. Facilities for the Engineer

118.1 Office for the Engineer

The Contractor shall provide an office building for the Engineer which shall be ready for occupation not later than 3 months after issuance of the Notice to Proceed. The building shall be total floor area of about 500 m2 and contain rooms as follows:

5 Office Rooms each 50 m^2
1 Meeting Room of 70 m^2
Storage Room
Kitchen
Washroom
Guard House
Drivers' Standby Quarter

The provision shall include:

- Supply and erection of the building
- Equipping, furnishing, marinating, and cleaning of the building as specified in Appendix 103.
- Services including of portable water, electric light, electricity, 24 hour security, office boy.
- Construction and maintenance of access road and parking areas with car ports.

The office of the Engineer shall be located within the Contractor's yard/office area. The proposed location of the office shall be subject to the approval of the Engineer.

The building shall be of substantial weatherproof construction, and be fully burglarproofed. All rooms shall have windows and all windows shall be protected from direct sunlight by awnings. The office shall be air-conditioned. Washrooms shall be fitted with washbasins, flush closets and a shower, all with suitable drainage.

Detailed of the Contractor's proposal for the office building shall be submitted to the Engineer for approval at least 2 weeks before erection is commenced.

Until the office becomes available to the Engineer, the Contractor shall provide the substitute office with the similar facilities and services.

Upon completion of the Contract, or as directed by the Engineer, all furniture and equipment shall be fully serviced and any body and upholstery damage repaired, and shall be handed over to the Employer.

118.2 Vehicle for the Employer and the Engineer

At the Commencement Date of the Contract, the Contractor shall provide the following new vehicles not later than fifteen (15) days after the Commencement Date:

Vehicle Type A:

Sedan motorcar of nominal capacity, 5 seats, 2.4 liters gasoline, mechanical transmission type (Toyota Camry GL with Model NO. ACV30L-AEMNKW or equivalent approved by the Engineer).

(For Employer)

One (1) Sedan motorcar

(For Engineer)

One (1) Sedan motorcar

Type C (For Engineer):

Three (3) units of 4-wheel drive utility vehicle, 7 seats, 3.0 liters turbo diesel engine, mechanical transmission type (4 Runner with Model No. KZN185L-GKMST or equivalent approved by the Engineer).

The vehicles shall be for the use of the Employer, the Engineer and their staff whether on or off the Site.

The Contractor shall responsible for the cost of operating including fuel and driver, licensing, insurance, repairs and maintenance and shell keep all the vehicles at the deposal of the Engineer and Employer.

The tools and optional facility to be provided shall be of "Full Extras" defined by the dealer of similar setup by other manufacture. Vehicles shall be equipped with a fire extinguisher, seat belts for all seats, two sets of upholstery and first aid kits.

Upon completion of the Contract, or as directed by the Engineer, all vehicles shall be overhauled, fully serviced and any body and upholstery damage repaired and the vehicles shall be handed over to the Employer.

118.3 Boat for the Engineer

The Contractor shall provide, operate, and maintain a boat for the Engineer's sole exclusive use.

The boat shall be at least 10 meters long with a sheltered area with standing headroom and equipped with an inboard diesel engine of sufficient capacity to give a speed of minimum of 10 knots at full load during a slack tide.

The boat shall be an age of less than 5 years and equipped with sufficient numbers of approved life jackets for the complete complement of crew and passengers.

Upon completion of the Contract the boat and all associated equipment shall become the property of the Contractor.

118.4 Survey Equipment for the Engineer

The Contractor shall provide and maintain all survey equipment and consumable listed in Appendix 104 for the sole use of the Engineer. All survey equipment shall be provided for use of the Engineer shall be provided in a new and unused condition before the Contractor commences any survey or setting out work on site.

Upon completion of the Contract all surveying equipment provided for the Engineer shall become the property of the Contractor.

118.5 Radio Communication for the Engineer

The Contractor shall provide and maintain radio communication equipment consisting of a base station at the Engineer's office with a range of at least 30 km, 2 mobile units for the Engineer's boats, and 10 hand held mobile sets for sole use of the Engineer. The type of the radio shall be subject to the approval of the Engineer.

Compliance with local laws and regulations for supply, installation and use of such equipment and any fees payable thereto shall be the responsibility of the Contractor.

Upon completion of the Contract all radio communication equipment provided for the Engineer shall become the property of the Contractor.

119. Quality Control and Assurance

Within 28 days after the Commencement Date, the Contractor shall submit, for approval by the Engineer, a Quality Control and Quality Assurance System describing the organization and resources which he proposes to provide to control the quality of the Works, including the work of subcontractors. The statement must include the number and type of staff responsible for quality control, with details of their qualifications and duties.

Within 28 days after the Commencement Date, the Contractor shall submit the Project Quality Plan for approval. This shall contain the information set out in the schedule below:

Organization and Authority:

- Project Organization - organization charts, interface diagrams

- Responsibility and Authority - position descriptions, signature authority, activity/authority and responsibility and the like

Process Planning and Control:

- Quality Plans - design, procurement, fabrication, installation, construction, commissioning, maintenance, servicing
- Check and Verification Documents - inspection and test plans, check lists, test sheets, review and verification, validation sampling plans.
- List of all measuring and testing equipment required for the project.
- Audit Schedules - internal, suppliers/subcontractors.

Quality Records and Forms:

- List of record types
- Sample forms
- Project filing system
- Records retention/submission
- Suppliers/Sub-Contractors Documents (as applicable)

SECTION 200 – SURVEY

201. Datum and Levels

Levels for the works are to be related to Datum Level (DL). The Datum Level (DL) have been assumed and referred to in the Drawings and Documents:

		Datum Level (DL)
HHWL (Highest High Water Level)	:	+1.06 m
MHWS (Mean High Water Spring)	:	+0.91 m
MSL (Mean Sea Level)	:	+0.48 m
MLWS (Mean Low Water Spring)	:	+0.09 m
LLWS (Lowest Low Water Spring)	:	+0.00 m

202. Benchmarks

The Grid area in the Drawings has been based on UTM (WGS-84).

The benchmarks to be used as reference for all setting out of the Works are shown on the Drawings.

The Contractor shall carry out the traverse and level surveys on these given points in order to verify the accuracy and integrity of these benchmarks prior to setting out the Works, and submit the survey results to the Engineer.

The Contractor shall be responsible for the establishment, maintenance and protection of suitable permanent and temporary benchmarks and control points throughout the duration of the construction works.

203. Levels to be Agreed

Before the commencement of any part of the Works, the Contractor shall survey and take levels of the Site, in presence of the Engineer, both above and below water level, and obtain the Engineer's agreement on the limits of payment on which the measurement of the Works are to be based. The Contractor shall submit the plans of completed surveys to the Engineer for approval.

Refer to SECTION 700 and 800 in regard to the area and spacing of the pre-construction survey.

Such plans shall be drawn and submitted in CAD format at a scale approved by the Engineer.

Whenever directed by the Engineer, the Contractor shall provide to the Engineer a copy of all data sheets, field books, and calculations produced in connection with works for inspection.

204. Setting Out

The Contractor shall provide at his own cost all survey control necessary for setting out the Works form the benchmarks, reference lines, and dimensions shown on the Drawings or directed by the Engineer, and shall be responsible for correctness of all such setting out.

The dimensions and levels of the Site shown on the Drawings are believed to be correct but the Contractor must verify the same and shall be held responsible for the consequences of any error contained therein or any omission thereof.

205. Echo Sounding

205.1 Echo Sounder

Multi-frequency recording echo sounders with operating frequencies of approximately 210 KHz and 30 KHz shall be used, and both depths shall be appeared on the recording paper simultaneously. The frequency of 210 KHz shall be used for making the pre- and post-construction survey charts.

The Contractor shall carry out the bar-check calibration with presence of the Engineer at the start and end of every survey. If the bar-check result at the end deviates more than 5 cm from that of the start, such survey results shall be discarded.

205.2 Tide Gauge Board

During the echo sounding, the Contractor shall install a tide board at a location directed by the Engineer, and shall take the water levels to the nearest 10 cm manually.

205.3 Automatic Tide Gauge

The Contractor shall also install an automatic tide gauge, capable of radio sending data automatically to the survey boat.

205.4 DGPS Positioning System

Whenever echo sounding is carried out, DGPS positioning system shall be applied for horizontal positioning. The horizontal accuracy of the DGPS positioning system shall be ± 0.5 m.

The GPS system shall be installed, tested with attendance with the Engineer, and set to work for continuous operation during the sounding works.

The geodetic data output of the GPS positioning system shall be automatically input into the Window operated software capable of:

- Output of geodetic position referring to the Site grids.
- Displaying of the position of boat, dredging boundaries and sea level reduced to the chart datum simultaneously on a monitor mounted on the survey boat.
- The results of the survey as a graphical data can be retrieved directly from the system, and given to the Engineer immediately after the survey.

206. Assistance to the Engineer

Whenever instructed by the Engineer, the Contractor shall carry out any surveys, which are deemed to be necessary, in the opinion of the Engineer, to investigate, inspect, examine, or measure the items directly or indirectly connected to the Works.

The Contractor shall render to the Engineer the assistance of the Engineer's survey in such a way as providing equipment, facilities, helper, and materials at any time as may be required by the Engineer.

SECTION 300 – SITE CLEARANCE AND DEMOLITION

301. General

301.1 Scope of Works

The works shall include, but shall not necessarily be limited to:

- Demolition of two Light Beacons on the Dam Tengah
- Demolition of Port Entrance Marker on the Dam Barat
- Removal of wrecks and obstacles
- Removal of debris
- Removal of rubbish resulting from the works
- Relocation of the Mooring Buoys (100 ton sinker x 3 nos, 30 ton sinker x 7 nos.)

Refer to SECTION 600 DEMOLITION OF EXISTING BREAKWATERS for the demolition of the existing breakwaters for recovering the reusable materials for the construction of new breakwaters.

301.2 Method Statements

Prior to commencement of each demolition work, the Contractor shall submit his proposals for carrying out the work to the Engineer for approval. The proposals shall include details of timing and extent of the works and any staging thereof.

302. Site Clearance

Prior to the commencement of any dredging, demolition of existing breakwaters, and construction of new breakwaters, installation of new navigation aids, the Contractor shall clear all trees, hedges, stumps, bushes or other vegetation, soil heaps, pavements, existing structures, fences, debris and other rubbish in the way of, or otherwise affected by, the Works.

All existing services to areas to be cleared or demolished shall be rerouted or stopped off as ordered or approved by the Engineer, or the appropriate authority, before the work commences.

303. Demolition of Navigation Aids

The locations of the navigation aids to be demolished are shown on the Drawings, and summarized in the following table:

Type	Location	Remarks
Port Entrance Marker (Green)	S 06-04-50, E 106-52-48 On the Dam Barat	One 22 m high lattice tower and one unused house.

Light Beacons (Red)	One at the western end, and another at eastern end of Dam Tengah	About 6 m high steel structures.

The contractor shall demolish all the structures including its foundations to the satisfaction of the Engineer.

304. Relocation of Mooring Buoys

There are numbers of mooring buoys (100 ton and 30 ton sinker types, or other types) at both sides of the Inner Channel as shown on the Drawings.

The Contractor shall relocate the mooring buoys including the sinkers and chains to the locations shown on the Drawings, or instructed by the Engineer. The locations indicated on the Drawings shall be only construed as a reference.

The Contractor shall investigate the type of the sinker and the mooring system and submit to the Engineer for approval the method and equipment to be used for the relocation work prior to commencement of this work.

305. Wrecks and Steel Debris

Upon encounter of the wrecks or steel obstacles, which disrupt the execution of the dredging and breakwater works, the Contractor shall immediately notify the Engineer and shall take all necessary measures to identify the nature, extent, and location of such items.

When the Contractor has submitted adequate information concerning the nature, extent, and location, the Engineer will then advise the Contractor what action is to be taken with respect to the removal of the items.

Wherever possible the Contractor shall continue the works around such wrecks or obstacles, until such items have been removed by the Contractor. Operational delays of the works related to the removal of the wrecks or obstacles shall not be considered valid ground for any claims.

The locations and the estimated dimensions of the wrecks in the Site had been located by side-scan sonar in July 2005 as shown in the Drawings. However, the Engineer and the Employer are not liable for the accuracy and the completeness of the investigation map.

306. Disposal

The Contractor shall remove the items described in the preceding clauses from the Site immediately after the demolition, unless otherwise directed by the Engineer. The Contractor shall seek for the disposal places and shall dispose of them at his own discretion and cost, unless otherwise directed by the Engineer.

SECTION 400 – MATERIALS

401. General

All materials used in the Works shall be of the best quality of their respective kinds as specified or described in the Specifications, Drawings, and Bills of Quantities and shall comply with the appropriate current standard published by the British Standard Institution, Japanese Industrial Standard or other approved national equivalents.

In all cases where the name of a particular type or make of equipment or item is referred to in the Contract, this indicates the acceptance standard. The Contractor may offer the equipment or materials other than those specified and in all cases the Contractor's offer shall be of at least equal quality.

The Contractor shall propose all the materials to the Engineer and obtain the written approval before placing such orders.

The Engineer shall be at liberty to reject any or all materials and workmanship in the Works that are not equal in quality and nature to approved samples, and the Contractor shall immediately remove such materials or demolish such works at his own cost.

The Contractor shall advise the Engineer, within 30 days of the receipt of the Letter of Acceptance, of the source of all materials to be used in concrete works. In the event that the Contractor later proposes to obtain materials from a different source he shall notify the Engineer at least 30 days before such materials are to be used.

402. Backfill Material for Breakwater Foundation

402.1 General

The backfill material, not including reuse materials recovered from the existing breakwaters as specified in SECTION 600, shall consist of naturally produced, sand, gravel, cobble, or rock. It shall not contain harmful materials such as clay lumps, tree roots, shale, iron pyrites, coal, mica, organic matter, or heavy metals.

402.2 Required Properties

The property of the backfill material shall be in accordance with the following table:

Percentage Passing 0.075 mm Sieve by mass	:	Maximum 15 %

403. Stone for Breakwater

403.1 General

Stone for breakwater shall be hard, angular, sound and durable. It shall be free of laminations and weak cleavage or fracture planes and shall be of such a quality that it will not disintegrate or erode from the action of air, water, wetting and drying and impact due to current/wave actions. The Contractor shall carry out such demonstration as may be necessary to prove that it shall be capable of being handled and placed without fracture or damage and that it does not break down if travelled upon by equipment used to place it.

403.2 Required Properties

Stone shall have the following mechanical and chemical properties, which shall be measured, except where otherwise noted, by the methods described in BS 812:

a.	Ratio of the least lateral dimension to the maximum length of each rock measured at right angles	:	Not greater than 2 for armor stone, 3 for rubble stone
b.	Apparent Relative Density	:	Minimum Value of 2.6
c.	Water Absorption	:	Not more than 5 % (m/m)
d.	Soundness loss in mass after 5 cycles by the test method given in Appendix B of BS 6349 Part 1	:	Not more than 12 % for sodium sulphate or 18 % for magnesium sulphate
e.	Aggregate Abrasion Value	:	Not more than 15 %
f.	Aggregate Impact Value	:	Maximum Value of 30
g.	Compressive Strength (10 cm diameter, 20 cm long cylinder	:	500 kgf/cm^2

403.3 Quarry

The Contractor shall make his own arrangements to secure a sufficient supply of specified rock for the Works. The Contractor shall submit the details of the quarry to the Engineer for approval before such rocks are delivered to the site.

It is the Contractor's responsibility to obtain necessary permits, to observe the environmental regulations, to maintain all necessary temporary works.

Approval of a quarry of stone shall not be construed as relieving the Contractor of his obligations to supply materials in the finished works in conformity with the requirements of this Specification and the Contractor shall carry out all such sampling and testing as is necessary to ensure compliance therewith.

403.4 Test during Construction

If the Engineer considers that the quality of the stones or grades supplied is different from that of stone approved previously, the Engineer may direct the Contractor to take samples in the Engineer's presence and to carry out full testing at the Contractor's expense.

The frequency of the routine sampling and the test items shall be subject to the approval of the Engineer.

404. Bamboo

The bamboo incorporated into the permanent works shall be of types locally called "Ori", "Petung", or "Jawa (Jowo)", and of age of minimum 2 years. The bamboo shall be straight, thick-walled, free from damage by insect, rot or other defects harmful for fabrication of mattress and pile.

The physical properties of the bamboo shall be in accordance with the following table:

a.	Diameter	:	Minimum 8 cm measured at the tapered end
b.	Length	:	Between 10.5 to 12.0 m
c.	Thickness	:	Minimum 5 mm
d.	Shear Strength	:	Minimum 170 kgf/cm2 (bamboo material) Minimum 300 kgf/cm2 (bamboo whole area)
a.	Diameter	:	Minimum 8 cm measured at the tapered end
b.	Length	:	As shown on the Drawings. No splicing is allowed.

405. Cement

405.1 Type of Cement

The cement shall be obtained from manufacturers approved by the Engineer.

The cement shall be Ordinary Portland Cement (OPC) complying with requirements of BS 12, JIS R 5210, ASTM C-150, or NI.8, or Sulphate Resisting Portland Cement (SRPC) complying with BS 4027, ASTM C-150 Type V or equivalent.

The tricalcium aluminate (C3A) content, irrespective of any other criteria elsewhere in this specification, shall not exceed 13 % for OPC and 3.5 % for SRPC.

405.2 Manufacture's Certificate

Each consignment of cement shall be accompanied by a certificate from the manufacturer showing that the cement offered has been tested and analyzed for its chemical composition and physical properties and that such tests and analyses comply in all respects with the relevant requirement of the applied standard specification.

405.3 Test after Delivery to Site

The Engineer may instruct the Contractor at any time to carry out further test on any sample of the cement after it has been stored at the Site prior to use, in order to determine if the cement has deteriorated during transportation or storage. No cement shall be allowed to be used until it has been accepted as satisfactory by the Engineer.

The Engineer may reject any cement if the results of such tests are not satisfactory, notwithstanding the manufacturer's certificate. All rejected cement shall be immediately removed from the Site at the Contractor's own cost.

The costs of all the tests on cement are deemed to be included in the rates entered in the Bills of Quantities for related items of the Works.

405.4 Transport and Storage

The age of the cement at the time of delivery to the Site shall not be more than 2 months, and the cement shall be used within 3 months of delivery to the Site. The outdated cement shall be immediately removed from the Site.

Bagged cement shall be delivered to the Site in original bags with the description of item, quantity, quality and name of the manufacturer clearly printed on the bag. Damaged bags shall forthwith be removed from the Site.

The cement shall be transported to the Site in covered vehicles adequately protected against the weather and shall be stored properly in approved, well-ventilated, weather-proof and water-proof stores to prevent air-setting due to moisture. The floors of such stores shall be raised at least 30 cm above the ground.

Each consignment of cement shall be kept separately to permit easy access for identification, inspection, testing and issuance. Bagged cement shall not be stacked higher than 1.5 m. On delivery at the Site, the cement shall immediately be placed in those stores and used in the order of delivery.

The Contractor shall submit a weekly report to the Engineer on the various consignments of cement then in store, showing what quantity has been received and issued during the week, from whom obtained, and in what portions of the Work the cement has been used.

406. Admixture

Admixtures shall only be used in specified circumstances when the Engineer judges that the use of the admixture is not only desirable but essential.

The Contractor shall apply in writing to the Engineer requesting approval to use admixture not later than 2 months before the Contractor proposes to incorporate. Such application shall include full documentation and test information as may be required or recommended by BS 5075 or equivalent. The Contractor shall also provide a full method statement for his proposals.

The Engineer reserves the right to reject any such application without reasons being given and the Contractor shall not in consequence be entitled to any claim on any grounds whatsoever.

407. Aggregates

407.1 Required Properties

Fine aggregate shall consist of natural screened and washed sand or crushed sand having hard and durable particles, or of other inert materials with similar characteristics. It shall not contain harmful materials such as salts, clay lumps, tree roots, shale, iron pyrites, coal, mica, organic matter. If necessary, aggregate shall be washed and sieved to remove the deleterious substances. Marine-dredged and beach sand shall not be permitted for use in concrete mixes.

Coarse aggregate shall consist of natural gravel, crushed gravel, or crushed stone, free from coating of clay or other deleterious substances. It shall not contain harmful materials such as salts, clay lumps, tree roots, shale, iron pyrites, coal, mica, organic matter. If necessary, aggregate shall be washed and sieved to remove the deleterious substances.

Naturally occurring sand/gravel mixtures (all-in-grade) shall not permitted in the Works.

The physical and chemical properties of the aggregates shall be in accordance with the following table:

	Property	Applied to		Permissible Limits
a.	Clay, Silt, and Dust Content	Fine- Coarse-	:	Shall not exceed 3 % by mass when determined in accordance with the decantation method specified in BS 812.
b.	Flakiness Index	Coarse-	:	Shall not exceed 30 in accordance with BS 812.
c.	Elongation Index	Coarse-	:	Shall not exceed 35 in accordance with BS 812.
d.	Soundness	Fine- Coarse-	:	The weight loss after 5 cycles in magnesium sulphate solution shall not exceed 15% and after 5 cycles in sodium sulphate shall not exceed 10 % in accordance with BS 812 or ASTM C-88.
e.	Acid Soluble Chlorides (CL-ion)	Fine- Coarse-	:	Shall not exceed 0.06 % by weight by weight of fine aggregate and 0.03 % by weight of coarse aggregate as determined in accordance with BS 812.
f.	Acid Soluble Sulphates (SO_4-ion)	Fine- Coarse-	:	Shall not exceed 0.4 % by weight for both fine and coarse aggregates as determined in accordance with BS 1377.
g.	Shell Content	Fine- Coarse-	:	Shall not exceed the following limits by weight as determined in accordance with BS 812: 40 mm aggregate 2% 25 mm aggregate 5% Fine aggregate 20%
h.	Water Absorption	Fine- Coarse-	:	Shall not exceed 2 % as determined in accordance with BS 812 in the saturated surface dry condition.
h.	Shrinkage	Coarse-	:	Shall not exceed 0.05 % as determined in accordance with BS 812.
i.	Specific Gravity (apparent)	Fine-	:	Shall not less than 2.6

		Coarse-		

The Contractor shall submit all the test results specified in the above table to the Engineer for approval prior to the commencement of the trail mixes.

If supplies from the approved sources subsequently are found to deviate from the approved samples and do not meet test requirements, then the sources will be rejected by the Engineer.

407.2 Grading of Aggregates

Fine aggregate shall conform to the gradings indicated in the following table:

JIS 1102 Sieve (mm)	Percentage by mass passing sieve (%)
10	100
5	90 – 100
2.5	80 – 100
1.2	50 – 90
0.6	25 – 65
0.3	10 – 35
0.15	2 – 10

The fine aggregate not complying with this table may be used, subject to the approval of the Engineer, provided that the trial mix can prove that such aggregate can produce concrete of the required quality.

The coarse aggregate shall conform to the gradings given in the following table in accordance with the nominal size of aggregates specified:

JIS A5005 Sieve (mm)	Percentage by mass passing sieve for Nominal Sizes (%)	
	40 to 5 mm (4005)	25 to 5 mm (2505)
50	100	100
40	95 - 100	100
25	-	95 - 100
20	35 - 70	-
15	-	30 - 70

10	10 - 30	-
5	0 - 5	0 - 10
2.5	-	0 - 5

Other sieve systems such BS 410 may be used subject to the written approval of the Engineer. In such a case, the Engineer will determine the criteria values of the percentages in the above tables.

The Contractor shall submit all the sieve results to the Engineer for approval prior to commencement of the trial mixes.

408. Water

The Contractor shall make adequate arrangements to deliver and store sufficient water at the Works for use in mixing and curing. Water used for the Works shall conform to BS 3148 as modified hereafter. The Contractor shall provide details of his proposed sources to the Engineer for approval.

Sea water shall never be used in concrete mixes or for the curing of concrete.

The properties of the water, irrespective of any other criteria elsewhere in this specification, shall be in accordance with the following table:

a.	Dissolved Chloride Content in the Mixing Water	:	Shall not exceed 500 ppm
b.	Dissolved sulphate, alkali carbonate or bicarbonate content combined	:	Shall not exceed 1,000 ppm
c.	Dissolved solids other than listed above	:	Shall not exceed 2,000 ppm
d.	Water Temperature when mixing	:	Shall not exceed 25°C

409. Steel Reinforcement Bar and Binding Wire

All steel reinforcement used in structural concrete shall be the following types:

Deformed Bar	JIS G 3112	Hot-rolled deformed bar Class 2, SD-295A Class 2, SD-345
Round Bar	JIS G 3112	Hot-rolled deformed bar Class 1, SR-235 Class 2, SR-295

The tolerances on shape and dimension shall comply with the JIS G 3112.

Mill certificate shall be provided for each consignment of steel reinforcement which shall include the results of the cast analysis of the bar supplied, the carbon equivalent value, and the tensile, bend, and rebend tests. The tensile test results shall include the cross-sectional area.

After delivery to the Site, the Engineer may require the Contractor to carry out conformity tests on further samples at an approved nominated laboratory. Any steel reinforcement which, as a result of such conformity tests, does not comply with the specifications will be rejected and shall be removed from the Site without delay.

The frequency of the routine sampling and the test items shall be subject to the approval of the Engineer.

Tying wire shall be No. 16 gauge soft annealed iron or No. 18 gauge stainless steel wire or other equivalent.

When stored, the steel reinforcement bar shall not be placed directly on the ground, but on suitable sleepers or racks and under covering to protect it against rain. Steel reinforcement shall be stored separately according to their diameter and length.

410. Structural Steel Shapes and Plates

410.1 Required Properties

Structural steel shapes and plates shall comply with SS-400 Hot Rolled Section of JIS G 3101 or ASTM A35 and A283 or approved equivalents.

The chemical composition and mechanical properties of hot-rolled steel shall comply with the standards as shown in the following tables:

CHEMICAL COMPOSITION

Unit: %

Symbol	C	Mn	P	S
SS 400	--	--	0.05 max	0.05 max

MECHANICAL PROPERTIES

Symbol	Yield Point (N/mm²)		Tensile Strength	Elongation Shapes over 5 mm
	Thickness of rolled steel (mm)		(N/mm²)	Up to 15 mm in thickness
	16 or under	Over 18 up to 40		
SS 400	245 min	235 min	400 to 510	17% or over

The Contractor shall obtain mill certificates of the hot-rolled steel from the manufacturer and such certificates shall be submitted and approved by the Engineer.

The tolerances on shape and dimensions shall comply with the JIS G 3191, JIS G 3192, JIS G 3193 and JIS G 3194.

410.2 Test Certificates

The Contractor shall obtain test certificates of this structural steel from the manufacturer and shall submit to the Engineer. The test certificates shall state that the material has been tested and found to comply in all respects with the relevant JIS requirements or eqivalent. If considered necessary by the Engineer, he may send samples of the structural steel shape and plate to a laboratory for chemical and mechanical analysis.

The costs of all the tests on cement are deemed to be included in the rates entered in the Bills of Quantities for related items of the Works.

410.3 Transport and Storage of Structural Steel

During transportation, loading and unloading, all structural steel shall be handled in such manner that they will develop no damage.

When being stored, the structural steel shall not be placed directly on the ground, but on suitable sleepers or racks and under covering to protect them against rain, salty wind, dirt and etc. The structural steel shall be stored separately according to their dimensions and length.

411. Bolts, Nuts and Washers

411.1 General

Unless otherwise specified on the Drawings, bolts (except anchor bolts in concrete) nuts and washers shall conform to the requirements of JIS G 3101, JIS B 1180, JIS B 1181, JIS B 0205, JIS B 1256 or ASTM A-325M, ASTM F-436M. or approved equivalents.

411.2 Anchor Bolts, Nuts and Washers

Nominal: ASTM A36 for threaded rods and ASTM A307 for headed bolts and for all nuts.

High Strength: ASTM A193, Grade B7 for threaded rods and headed bolts, with ASTM A194, Grade 2 ANSI Series nuts and ASTM A325 for washers. Hardened washers shall be provided with high strength anchor bolts.

Nuts shall be of the coarse-thread series. Bolts shall have 2A tolerances and nuts shall have 2B tolerances. Bolts shall conform to ANSI B1.1. Nuts shall be heavy semi-finished hexagon nuts conforming to ANSI B18.2.2.

Nuts and washer for galvanized structures shall be galvanized in conformance with ASTM Specification A153.

Mill Test Report: Two copies of the mill test report, as required applicable codes standards, shall be submitted to the Owner if requested.

411.3 Anchor Bolt Sleeves

Anchor bolt sleeves shall be made of standard weight steel pipe conforming to ASTM A120 or equivalent made of polyethylene plastic.

Openings shall be shop or field punched or drilled. Plugs shall be maintained until the foundation is prepared for grouting prior to setting base plates and/or equipment.

SECTION 500 – CONCRETE WORKS

501. General

501.1 Scope of Works

The works covered under this section of the Specification shall include, but not limited to, the concrete works of the following:

- Concrete Block (2.0 ton and 3.0 ton) as artificial armor for breakwater
- Coping Concrete of the breakwaters
- Concrete Foundation of Light Beacons on the breakwaters
- Concrete Foundation of Sector Light on land

501.2 Shop Drawings

Refer to SECTION 100.

501.3 Materials

Refer to SECTION 400.

501.4 Supervision of Concrete Work

Throughout the progress of the concrete work the Contractor shall employ competent supervisors and provide such supervision as is necessary to ensure:

- the day to day control of the quality and quantity of the concrete, and
- the mixing, transporting, placing, compacting, curing and protection of the concrete, and
- the carrying out of all testing as specified and further testing which the Engineer may require, and
- the conducting of investigations as the Engineer may instruct, and
- the preparation of reports and control charts as specified.

502. Concrete Mixes

502.1 Concrete Mix Specification

The various classes of concrete required for the Works are indicated in the Drawings and are defined in the table below. All classes of concrete shall consist of Ordinary Portland Cement (OPC) or Sulphate Resisting Portland Cement (SRPC) as indicated:

Concrete Class	Cement Type	Usage/ Location	Nominal Maximum Aggregate Size (mm)	Design Compressive Strength (kgf/cm^2)	Slump (cm)	Minimum Cement Content (Kg/m^3)	Maximum Free Water /Cement Ratio
C 180	SRPC	All Non Reinforced Concrete	40	180	6.5±2.0	270	0.50
C 240	SRPC	All Reinforced Concrete	25	240	10±2.5	330	0.45

502.2 Mix Design

After approval of all materials to be used in the concrete and at least 6 weeks before the start of placing any structural concrete, the Contractor shall submit for approval the mix design he intends to use based on proportional weights of cement, aggregate and water (with due allowance for dry aggregate water absorption).

The mixes shall be designed so that the target mean strengths (fm) are greater than the Design Compressive Strengths (fc) by a margin of 1.64 times the standard deviations (s) of the recorded concrete strength from the batching plant ($fm = fc + 1.64s$). The standard deviation shall be calculated at least 40 test results each representing separate batches of the similar concrete produced by the same plant and under the same supervision, provided that no standard deviation less than 40 kg/cm2 shall be used. In the absence of such historical data a standard deviation of 80 kg/cm2 shall be used.

502.3 Trial Mixes

The Contractor shall prepare trial mixes at an approved laboratory from the approved materials and proportion intended for use in the Works with presence of the Engineer. The testing shall be in accordance with BS 1881 or JIS A1138 or approved equivalent.

No concrete shall be placed in the Works until the trail mix results have been approved by the Engineer. Changes of the materials shall be subject to the new trail mixes.

The Contractor shall carry out at least 3 trial mixes of each concrete class not on a single day, and shall make 3 test cubes from each mix (total number of cubes: minimum 9). Slump measurement shall be taken one for each mix. The acceptance/rejection criteria of the trial mixes shall be in accordance with the following table:

Slump Acceptance/Rejection Criteria	Compressive Strength Acceptance/Rejection Criteria

All the measurement of slump shall be within the specified value.	Calculate the mean and deviation of the 28-day compressive strengths of the samples. By applying Student's t test, calculate the 95% Confidence Limit (lower side) of the sample distribution. This limit value shall be not less than the specified Design Compressive Strength.

If the trial mix fails, the Contractor shall alter the mix design and/or the source of materials, and shall propose a new trial mix to the Engineer.

503. Testing of Concrete and Concreting Materials

503.1 Tests of Materials

Refer to SECTION 400.

503.2 Test for Workability of Fresh Concrete

The slump test shall be in accordance with BS 1881: Part 102.

503.3 Tests of Hardened Concrete

Test Cubes:

The compression tests shall be performed on cubes 150 x 150 x 150 mm as described in BS 1881: Part 116. Sampling, making test cubes and curing of cubes shall be in accordance with BS 1881: Part 101, 108 and 111 respectively.

The Contractor shall construct the curing tank nearby the casting yard, subject to the approval of the Engineer, for the purpose of curing test cubes during mixing and casting.

The date of the crushing test cubes shall be either 7 days or 28 days depending on the purpose of the tests as specified in this section. The compressive strength of the concrete cube at 7 days, if so specified in this section, shall be equal to or more than two thirds of the required compressive strength.

Test Cores:

The Engineer may instruct the Contractor to drill cores when the result of a cube test has proved unsatisfactory or the Engineer judges the quality of the placed concrete is unsatisfactory. The diameter of the core shall be 150 mm or 100 mm, and the length/diameter ratio shall be between 1 and 1.2. Core cutting shall be carried out by a skilled specialist subcontractor. The cost of such testing core shall be borne by the Contractor even though testing core has not failed in the quality assurance test.

503.4 Frequency of Test

During the mixing and casting of concrete the frequency of testing for control purposes shall be as indicated in the following table. No direct payment shall be made for these testing. The cost of testing shall be included in the bid prices on concrete.

Type of Test	Frequency

• Grading of Fine and Coarse Aggregates • Flakiness and Elongation Index of Coarse Aggregate • Clay, Silt, and Dust Content of Fine and Coarse Aggregates	Once every month or as directed by the Engineer.
Cement (Acid soluble alkali level, Specific surface)	One 2 kg sample for quality tests once every month or as directed by the Engineer.
Water (Dissolved Chloride Content)	One 500 ml sample prior to approval of source and once every month or as directed by the Engineer.
Concrete Cube	One set (minimum 6 cubes) from each mixer for class of concrete once every day or as directed by the Engineer. 3 cubes shall be tested at 7 days and 3 cubes at 28 days. The point of sampling of fresh concrete shall be at delivery into the construction.
Slump Test	Once every 2 hours from each mixer or as directed by the Engineer.
Temperature of Batched Concrete at Placing	Once every 2 hours from each mixer or as directed by the Engineer.
Concrete Core	As directed by the Engineer.

Prior to the commencement of the concrete works, the Contractor shall submit to the Engineer for approval the forms of report and quality control chart for each test item. The Contractor shall submit such report and the quality control chart as soon as the test results come out.

503.5 Failure Test

If the test results of the materials and/or quality of hardened concrete have become unsatisfactory to the Engineer, the Engineer will instruct the Contractor to submit the following reports:

- Report of additional tests such as concrete core to verify the quality of the hardened concrete.
- Contractor's analysis of the causes of the quality deterioration.
- Contractor's proposal to improve the quality.

When the Contractor has submitted adequate reports, the Engineer will then advise the Contractor what action is to be taken.

If the Engineer has judged that the quality of the hardened concrete is substandard, the Contractor shall remove and replace at his own expense all concrete from the concerned pour.

504. Site Batching and Mixing

504.1 Weigh Batching

For Class C180 and C240 concretes, all aggregates shall be weigh batched, and shall not be volume batched.

504.2 Equipment

At least 4 weeks prior to carrying out any concrete works the Contractor shall submit to the Engineer for approval details of the batching and mixing equipment he proposes to use including the manufacturer's name, type of plant and estimated output.

504.3 Weigh of Aggregates, Water and Cement

The weighing machines shall be of an approved type and manufacture and shall be fitted with scales which shall indicate the weight of each ingredient of the batch to an accuracy of ±2 %. The range of the weighing machine shall not exceed twice the normal working load. Water shall be gauged either by volume or by weight to an accuracy of ±2 %.

504.4 Calibration of Batching plant

The weighing machines shall be maintained in a clean condition. Calibration shall be done under the supervision of the Engineer over the scale ranges, by placing known weights certified by an acceptable testing agency in the weighing compartments before commencement, and thereafter at least once for every 1,000 tones of material weighed or not less than once per week. Calibration of water measuring devise shall also be done.

504.5 Water Content of Aggregate

The water content of the fine aggregate shall be determined before mixing is commenced everyday. Samples for determining the water content shall be taken from those stocks of aggregates to be used during the same day. During rain the water content shall be checked every 2 hours or as directed by the Engineer.

Water quantity in the concrete proportion shall be adjusted according to water content of the fine aggregate.

Test method of water content and the calculations of adjustment of water quantity shall be subject to the Engineer's approval.

505. Ready-Mixed Concrete

Ready-mixed concrete may be used, subject to the approval of the Engineer, and shall comply with all requirements specified in this section. The Contractor shall ensure that the concrete has not stiffened in the interval between batching and arrival on site. Batching times shall be recorded on the delivery ticket.

When truck-mixed concrete is used, water shall be added under supervision, either at the Site or at the central batching plant, as agreed by the Engineer but in no circumstances shall water be added in transit. The time of water introduction shall be recorded on the delivery ticket.

The ready-mixed concrete supplier shall provide the Engineer with inspection and testing facilities equal to those required by this Contract for site batching.

506. Transportation

The concrete shall be discharged from the mixer and transported to the place of depositing by the modes and methods which will prevent the segregation or loss of ingredients, and which are sufficiently rapid enough to ensure that the concrete does not commence to set before it is compacted in position.

The Contractor shall submit to the Engineer for approval the detailed the modes and methods of transportation of fresh concrete from mixer to the place of depositing.

507. Placing and Compaction

507.1 Prior to Concrete Placement

All concrete surfaces, formwork and reinforcement bars against which concrete is to be placed shall be properly prepared before mixing is commenced. Concrete droppings or grout shall be removed, reinforcement bars or metal items to be embedded or surrounded by concrete shall be free from any loose rust, mill scale or mould oil and other deleterious matter, and all surfaces against which concrete is to be placed shall be thoroughly cleaned. Formwork shall be free from standing water. The Contractor shall allow for and use mechanical or other means of removal of all foreign matter from these surfaces and provide all necessary temporary openings in the formwork for such removal.

Concrete shall not be placed in any part of the Works until the Engineer's approval has been received. A system of inspection sheets shall be implemented for authorization by the Engineer.

507.2 Placing Concrete in Hot Weather

Concrete shall not be placed when the shade air temperature exceeds 40°C.

The temperature of batched concrete at time of placing shall not exceed 32°C unless otherwise directed.

The Contractor shall take necessary measures to provide cool concrete and cool concreting conditions in order to reduce workability loss, premature drying of concrete and the development of high temperatures and temperature gradients in placed concrete.

Prior to commencement of any concrete works, the Contractor shall submit to the Engineer for approval the method statements for concreting in hot weather, which may include:

- Painting white all storage vessels, hoppers, pipes, walls, or roofs which contain or convey aggregates, cement or mixing water.
- Dampening the forms.
- Reducing the concrete temperature to the lowest practical level by the methods, such as:
    - Shading aggregate
    - Cooling the mixing water before use
    - Screening the mixing plant and transporting vehicles from wind, rain, and sun

- Erecting sunshades at the concrete placing location.
- Reducing the time between the placing of concrete and start of curing to the minimum possible.
- Minimize evaporation during the first few hours subsequent to placing the concrete by suitable means such as applying moisture by fog spraying.

507.3 Drop Height

Unless otherwise agreed by the Engineer concrete shall not be dropped into place from a height exceeding 1.5 m. When skip or chutes are used they shall be kept clean and used in such a way as to avoid segregation.

507.4 Placement of Concrete in Layers

Concrete shall be placed in horizontal layers to a compacted depth not exceeding 450 mm. Procedures for placing and compacting concrete in the Works shall be to the approval of the Engineer and shall be decided by the Contractor prior to commencement of concreting.

Where concrete is to be placed in multiple layers, each layer shall be continuous and shall be placed and compacted while the concrete in the immediately underlying layer is still workable. When the concrete is placed in more than one layer, compaction of a layer shall extend into the underlying layer to ensure there is no segregation between successive layers but care shall be taken to avoid any disturbance of partially set layers which have been previously placed.

If during concreting a previously placed layer or edge of concrete has set before the subsequent layer has been placed, concreting shall be stopped and the placed concrete shall be cut back to a sound face to the satisfaction of the Engineer at the Contractor's cost.

507.5 Pumping

Where concrete is conveyed and placed by mechanically pumped pressure, the equipment shall be suitable in kind and adequate in capacity for the work and shall be so arranged that no vibrations result which might damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete shall be ejected where it is to be used in such a manner that there will be no contamination of the concrete or separation of the ingredients. After completion of each concreting operation, the entire equipment shall be thoroughly cleaned.

Use of the pump and its type shall be permitted only if authorised by the Engineer in writing after approval of trial mix.

507.6 Concrete Compaction

To get rid of the entrapped air in the concrete as much as possible, all freshly deposited concrete shall be compacted by mechanical vibrator.

The vibrator shall be capable of transmitting frequencies of not less than 6000 cycles per minute and capable of imparting an acceleration of 6g to the concrete immediately in contact with them. Sufficient vibrators in serviceable condition shall be on Site so that spare equipment is always readily available in the event of breakdowns.

The poker shall be inserted vertically and quickly and should penetrate some 100 mm into any previous layer.

507.7 Steel Fixer and Carpenter

During the placing of concrete, a competent steel fixer and carpenter shall be in constant attendance, so as to make any necessary adjustment or correction of the reinforcement and formwork.

507.8 Protection from Sea Water

The Contractor shall take all reasonable precautions to prevent sea water or sea spray from affecting concreting operations. In areas likely to be so affected, the formwork shall be adequately protected and all parts which are found to be affected shall be thoroughly washed down with clean fresh water. Under no circumstances shall concrete be contaminated by salt water during placing.

507.9 Interruption of Placing Concrete

If concreting is suspended due to plant breakdown or for any cause, a stop-end shall be formed square to the work without delay. Should the period of suspension not exceed 30 minutes, concreting may be recommenced provided that the surface is first cleaned. The fresh concrete shall be tamped so as to be contiguous with the concrete previously placed, to the satisfaction of the Engineer. Should the period of suspension exceed 30 minutes no further concreting shall be carried out until the previously placed concrete has hardened and its surface has been prepared as a construction joint. Where the concrete is visible, such as in exposed faces of a retaining wall etc., it shall be cut back to a horizontal construction joint to the extent and in a manner approved by the Engineer before concreting is recommended.

507.10 Records

A complete record shall be kept by the Contractor of the date, time and placing of all classes of concrete in each portion of the work and this shall be available for inspection by the Engineer at any time. The Contractor shall also supply suitable maximum/minimum thermometers and record the ambient shade temperature and temperature of fresh concrete where the concrete is being placed during concreting.

The formats of the records shall be submitted to the Engineer for approval prior to commencement of concrete works. Such records shall be kept on Site and a copy shall be given to the Engineer everyday during concrete is being placed.

508. Joint in Concrete

508.1 Construction Joint

Laitance from the horizontal surface shall be removed by brushing off while the placed concrete is still fresh but has stiffened slightly. Removing of the laitance after the concrete has set shall not be permitted.

Vertical stop-ends shall be formed for vertical construction joints unless otherwise directed by the Engineer. Stop-ends shall be well made, easily removable, and fixed to avoid grout loss.

When concreting at construction joints, the use of mortar or grouts, or wetting the face of joint on prepared concrete surfaces shall not be allowed unless otherwise directed by the Engineer.

The Contractor shall submit to the Engineer for approval the detailed methods prior to commencement of any concrete works, which shall at least include:

- Location of construction joints

- Preparation of construction joints for horizontal and vertical surfaces (removing laitance, vertical stop-end)

- Concreting at construction joints (cleaning of formworks)

No construction joints shall be permitted to be made without Engineer's approval in regard to the detailed methods.

508.2 Expansion Joint

Expansion joints shall be formed in accordance with the Drawings. Approved expansion joint filler material, asphalt impregnated, polyvinyl chloride, or polyethylene, shall be supplied and laced in the joint to provide freedom for two adjacent concrete slabs or blocks to expand.

The exposed edges of the joints shall be sealed with an approved joint sealant and shall be located and formed as required on the Drawings.

509. Reinforcement

509.1 Store of Reinforcement Bars

All reinforcement bars shall be stored under a waterproof shelter and supported above the surface of the ground and any water lying on the ground, and shall be protected from damage and corrosion.

509.2 Shop Drawings

Shop drawings, bending schedules, and installation drawings for all reinforcement bars shall be prepared by the Contractor and submitted to the Engineer for approval prior to fabrication. Details shall conform to the requirements of ASTM A-615 or BS 4466 or equivalent.

No bar bending bar works shall be commenced without Engineer's approval to the shop drawings.

The Engineer's approval does not relieve the Contractor in any way of his responsibility for accuracy and/or completeness of the detailing work.

509.3 Bar Bending

Steel reinforcement shall be bent accurately to the shapes and dimensions shown on the approved bar bending lists of drawings. Bars shall be bent round mandrels of the requisite diameter.

Steel reinforcement shall be cut and bend in accordance with BS 4466 or ASTM A-615 or equivalent. Cutting or bending by the application of heat is not permitted. Welding of reinforcement shall be in accordance with BS 5135, and only be permitted subject to the Engineer's approval.

Hot rolled high yield bars shall not be straightened or bent again, having once been bent.

509.4 Placing Reinforcement Bar

The number, size, form and position of all steel reinforcement bars, ties, links, stirrups, and other reinforcement shall be in exact accordance with the drawings and they shall be kept in the correct position and with the required cover, without displacement during the process of pouring and compacting the concrete in place, in a manner approved by the Engineer. The Contractor shall provide all necessary distance pieces and spacers to maintain the reinforcement bars in the correct position. The type of distance pieces shall be subject to the approval of the Engineer. Temporary supports within the concrete to keep reinforcement in place will not be allowed. Any ties, links, or stirrups connecting the bars shall be taut so that the bars are properly braced, and the inside of hooks and bends shall be in contact with the bars around which they are intended to fit.

509.5 Approval of Reinforcement before Concreting

The Contractor shall in all cases request the approval of the reinforcement bars by the Engineer in sufficient time to allow inspections to be made and shall not commence concreting until such approval is obtained. The period between the Contractor's request for approval and his intention to commence concreting shall not be less than 24 hours, and the Engineer may require a longer period if, in his opinion, the requirement is of such complexity as to require it.

Such approval shall not absolve the Contractor from his responsibilities under the Contract.

510. Formwork

510.1 General

All formwork, shuttering, supporting false-work, struts and staging shall be of suitable quality, either metal, timber or other approved material and of such strength with ample scantlings as to ensure that the shuttering remains rigid and without distortion throughout the placing, ramming, compacting and setting of the concrete. The design of the formwork shall be such as to enable it to be struck and removed without damage to the concrete.

The formwork of the concrete blocks shall be of metal type.

The Contractor shall submit his designs of the formworks to the Engineer prior to the commencement of each part of the work and work shall not commence until such approval has been received.

510.2 Spacing Blocks and Ties

Concrete spacing blocks shall be made of concrete at least equal in quality to the main concrete.

All internal metal ties where permitted or parts thereof shall be extracted without damage to the concrete and any resulting holes shall be filled with permanently impermeable filler to the satisfaction of the Engineer.

510.3 Preparation of Formwork

Immediately before the concrete is placed, the formwork shall be thoroughly cleaned out and freed from sawdust, shavings, wire cuttings, dust, sand, clay and all other deleterious and extraneous materials.

Temporary openings shall be provided in the formwork to facilitate this work. The inside surfaces of the formwork shall, immediately prior to final erection, be coated with mould oil. The mould oil shall be of approved type and shall be applied uniformly and the quantities used shall be the minimum consistent with its purposes. The Contractor shall ensure that all steel reinforcement and adjoining concrete surfaces are kept free of mould oil.

510.4 Concrete Bedding Layer

For concrete placed against soil or fill, the bedding layer shall be either 75 mm thick non-structural concrete or 75 mm thick compacted fine crushed rock covered by an approved impervious PVC membrane, of minimum thickness 0.15 mm.

510.5 Approval of Formwork before Concreting

The Contractor shall in all cases request the approval of the formwork by the Engineer in sufficient time to allow inspections to be made and shall not commence concreting until such approval is obtained. The period between the Contractor's request for approval and his intention to commence concreting shall not be less than 24 hours, and the Engineer may require a longer period if, in his opinion, the requirement is of such complexity as to require it.

Such approval shall not absolve the Contractor from his responsibilities under the Contract.

510.6 Removal of Formwork

The minimum periods which shall elapse between the placing and compacting of ordinary structural concrete and the removal of the shuttering for various types are given in the table, but this will not relieve the Contractor from his obligation to delay removal of the shuttering until the concrete has attained sufficient strength, and the Contractor will be held responsible for and shall make good at his own expense all injury and damage arising from premature removal of the shuttering.

Type of Formwork	Minimum Removal Time
Vertical faces of foundation plinths and vertical faces of precast items	1 day
Metal formwork of concrete block unit	3 days
Vertical faces of columns, beams and walls	4 days
Undersides of suspended slabs, beams, etc.	10 days

Props to suspended slabs, beams, etc	14 days

511. Curing

511.1 General

The purpose of the curing shall be preventing loss of the moisture from concrete until the concrete has developed the necessary degree of impermeability and strength.

Curing of the horizontal surface shall be started as soon as possible after the concrete has been compacted and finished, and immediately after the bleed water disappears.

Methods of curing shall be those which keep the water at the surface of concrete (e.g. ponding, spraying, or damp hessian) and/or those which prevent the loss of moisture from the concrete (e.g. curing compound or leaving the formwork in place). The Contractor shall submit to the Engineer for approval the detailed method of curing for each part of the concrete.

During the period of curing the concrete shall not be moved or lifted or shall not be subjected to the undue external forces, unless otherwise instructed by the Engineer.

The concrete of which the curing has not been carried out in accordance with the approved method or specified duration shall be treated as defect concrete, and such concrete shall be subject to the failure test specified in this section.

511.2 Minimum Periods of Curing

The minimum periods of curing shall be in accordance with the following table:

Horizontal Surfaces	7 days
Vertical and Inclined Surfaces	4 days (When formwork has been kept in position for 4 days, no further curing is required)

512. Concrete Surface Finishes

512.1 Surface Finish

For finishing of top surfaces on unformed concrete, the following types of finishes shall be required.

Type	Description	Location Applied

U.1 - Screeded Finish	Type U.1 is a screeded finish for surfaces of foundations, beds and slabs to be covered by backfill and subsequent stages of construction. It is also the first stage for finishes U.2 and U.3. The finishing operation shall consist of leveling and screeding the concrete to produce a uniform, plain or surface, surplus concrete being struck off by a straight edge immediately.	Foundation for Sector Light (under ground)
U.2 - Wood Trowel Finish	Type U.2 is a trowelled finish for surfaces of beds and slabs where a hard smooth steel-trowelled surface is not required. Trowelling shall be done only after the concrete has hardened sufficiently, and may be by hand. Care shall be taken that the concrete is worked no more than is necessity to produce a uniform surface free from screed marks.	Concrete Block, Coping Concrete
U.3 - Trowel Finish	Type U.3 is a hard smooth steel-trowelled finish for surfaces of tops of walls, copings and other members exposed to weathering, seatings for bearing plates and the like, where the metal is in direct contact with the concrete. Trowelling shall not commence until the moisture film has disappeared and the concrete has hardened sufficiently to prevent excess laitance from being worked to the surface.	Foundation for Light Beacons, Foundation for Sector Light (exposed part)

SECTION 600 – DEMOLITION OF EXISTING BREAKWATER

601. General

601.1 Scope of Work

The scope of the works covers the demolition of the existing breakwaters at the Dam Barat (250 m), the Dam Timur (291 m), the Dam Tengah-1 (228 m), Dam Tengah-2 (919 m), the Dam Citra-1 (93 m), and Dam Citra-2 (100 m) to the required depths and profiles as shown on the Drawings and as required in this section.

The works shall include, but shall not necessarily be limited to:

- Removal of the concrete block (about 1.2 ton apiece, total about 20,000 pieces) and transport to the new breakwater for reuse as an armor block.
- Removal of the crown concrete and covered concrete (in-situ volume of about 15,300 m^3), and crashing, and transport to new breakwater for reuse as replacement material.
- Removal of breakwater core and foundation consisting of rubble, sand and gravel (approximately 170,000 m^3), and transport to the new breakwater for reuse as replacement material.
- Pre- and Post- surveys of each layer removal.

601.2 Staging of the Works

The Contractor shall complete the demolition of the sections at the Dam Timur, Dam Tengah, and the Dam Citra in accordance with the following sequence and direction, unless otherwise directed by the Engineer:

Step 1 : Dam Timur, north to south direction

Step 2 : Dam Tengah-1, northwest to southeast direction

Step 3 : Dam Tengah-2, west to east direction

Step 4 : Dam Citra, direction not specified

Refer also to SECTION 700 for the staging of the works in conjunction with the construction of the new breakwaters.

The staging of the works for the demolition of the existing breakwater (SECTION 600) and the new breakwater (SECTION 700) are specified so as to keep calmness of the port basin high as mentioned in the SECTION 100 Clause 103. The Contractor may propose the alternative staging plan if his plan is proved to be effective with respect to the calmness of the port. Such alternative staging shall be subject to the approval of the Engineer.

601.3 Reuse of Recovered Materials from the Existing Breakwaters for New Breakwater

The Contractor shall incorporate all the recovered materials from the demolished breakwaters into the new breakwaters. The Engineer may direct the Contractor to transport and stockpile or place a part of the Concrete Block to the locations within the Port.

The destination of the recovered materials in the new breakwaters shall be in accordance with the following table:

Origin in the demolished breakwaters		Destination in the new breakwaters
• Concrete Block	➔	• Armor Layer at south side of New Dam Tengah-1,
• Coping Concrete • Covered Concrete • Fragmented Concrete Block (weight less than 500 kg) • Core Rubble Stones • Foundation Gravel and Sand	➔	• Replacement Materials at New Dam Tengah-1 (above -8.0 m CD)

601.4 Temporary Storage

Recovered concrete blocks, coping concrete, and cover concrete are allowed to stockpile along the Dam Timur before they are incorporated into the new breakwater. The available temporary storage area is shown on the Drawings.

Such materials shall not be laid directly on the existing armor layer of the Dam Timur in order to avoid mingling with the existing armor materials. The Contractor is responsible for the stability of the Dam Timur in the vicinity of the temporary storage. The Contractor shall satisfy himself through his study of the height and width of the stockpiled concrete blocks.

No temporary storage of materials recovered from the core and foundation shall be permitted. They shall be directly transported to the new breakwaters for incorporation.

601.5 Interference with Other Traffic

Refer to the SECTION 100 GENERAL REQUREIMENTS.

601.6 Wrecks and Obstacles

Refer to SECTION 300 SITE CLEARACNE AND DEMOLITION

601.7 Environmental Monitoring and Protection

Refer to the SECTION 1100 ENVIRONMENTAL MONITORING AND PROTECTION.

601.8 Existing Services and Structures

Refer to the SECTION 100 GENERAL REQUREIMENTS.

602. Removal of Concrete Block

602.1 General

The Contractor shall remove all the concrete blocks from the breakwaters as shown on the Drawings, and reuse all such concrete blocks as material of the new breakwaters unless otherwise directed by the Engineer.

The Contractor shall take cautions against rapture and fragmentation of the block during removal and transportation. The Contractor shall submit to the Engineer for approval the type of tongs or lifting devices prior to commencement of the works.

602.2 Criteria for Reuse

The concrete block that weighs less than 500 kg, either fragmented or intact, shall not be reused as an armor material for the new breakwaters. Such small blocks shall be used only for the replacement fill material for the foundation of the new breakwaters.

603. Removal of Crown Concrete and Cover Concrete

The recovered concrete shall be crushed to less than 1.0 ton of the weight before incorporation into the new breakwaters as replacement material of the foundation.

604. Excavation of Core Body

604.1 General

The Contractor shall remove the core and excavate the foundation of the existing breakwaters to the elevations and profiles as shown on the Drawings, and shall use all such materials as backfill material for new breakwaters.

The Contractor shall excavate all the material above the design profiles except for the unsuitable materials as specified in this section. When the Contractor encounters the suspected materials, the Contractor shall immediately notify the Engineer and shall carry out the sieve analysis of the material. When the Contractor has submitted the result of the sieve analysis, the Engineer will then advise the Contractor what action is to be taken with respect to limits and levels of the areas to be excavated. Operational delays of the works related to the unsuitable materials shall not be considered valid ground for any extension of time and additional monies.

604.2 Criteria for Reuse

The silt content of the reuse material shall be less than 15 % by weight. (0.075 mm sieve). The unsuitable materials shall be disposed of at the designated sea dumping area.

604.3 Limits and Levels of Areas to be Excavated

Excavation shall be finished within the following elevations and tolerances:

Flat Bottom	:	± 50 cm measured vertically from the design depth
Slope	:	± 50 cm measured vertically from the design depth

605. Survey and Inspection

Before and after each layer is removed or excavated, the Contractor shall carry out the survey to verify the level and volume of each layer. The survey shall be carried out in the presence of the Engineer, and the Contractor shall prepare the drawings to show the results of the survey. The plans and sections shall, when mutually agreed by the Engineer and the Contractor, be signed by both parties.

Lines of surveys shall be made at 20 m normal to the centerline of the breakwater, extending at least 15 m beyond the edges of the removal or excavation. Individual elevation/sounding points on such lines shall be spaced not more than 5 m.

The accuracies of the survey shall be within ± 1.0 m horizontally, and the within ± 0.1 m vertically.

606. Method Statements

The Contractor shall submit a detailed statement of working methods to the Engineer for approval.

The detailed statement shall include at least:

- Equipment, devices, and methods of removal, excavation, and transportation of each material.
- Method of pre- and post- surveys of each layer removal, and calculation.
- Temporary Storage plan of the concrete block
- Method of crushing crown and cover concretes
- Test procedure of determining unsuitable (sieve analysis)

SECTION 700 – CONSTRUCTION OF NEW BREAKWATER

701. General

701.1 Scope of Work

The works covered under this section of the Specification shall include, but not limited to, the breakwater construction of the following:

- New Dam Barat (100 m)
- New Dam Tengah-1 Section 1 (151 m)
- New Dam Tengah-1 Section 2 (1,067 m)
- New Dam Tengah-1 Section 3 (25 m)
- New Dam Tengah-2 (318 m)

701.2 Pre-Construction Survey

A survey of the seabed shall be made before commencing breakwater construction. Echo sounding shall be carried out by the Contractor in the presence of the Engineer. The plans and sections shall, when mutually agreed by the Engineer and the Contractor, be signed by both parties as representing the configuration of the areas at the commencement of the breakwater construction.

The Contractor shall refer to SECTION 200 with respect to the method of echo sounding.

Lines of surveys shall be made at 20 m normal to the centerline of the revetments, extending at least 25 m beyond the edges of the sand replacement. Individual sounding points on such lines shall be spaced not more than 5 m. Separate lines of soundings shall be run along the breakwater centerline with maximum spacing of 20 m.

701.3 Reuse of Recovered Materials from the Demolished Breakwaters

The Contractor shall incorporate all the recovered materials from the demolished breakwaters into the new breakwaters except for the Concrete Block. The Engineer may direct the Contractor to transport and stockpile or place a part of the Concrete Block to the locations within the Port.

The destination of the recovered materials in the new breakwaters shall be in accordance with the following table:

Origin in the demolished breakwaters		Destination in the new breakwaters
• Concrete Block	➔	• Armor Layer at south side of New Dam Tengah-1,
• Coping Concrete • Covered Concrete • Fragmented Concrete Block	➔	• Replacement Materials at New Dam Tengah-1 (above -8.0 m CD)

(weight less than 500 kg) • Core Rubble Stones • Foundation Gravel and Sand		

Wherever the quantities of the recovered materials are not sufficient to complete the segment of the new breakwater (e.g. Armor Layer at New Dam Tengah), the Contractor shall use the new material to complete such segment as indicated on the Drawings.

701.4 Staging of Works

The Contractor shall complete the construction of the New Dam Tengah-1 in accordance with the following sequence and direction, unless otherwise directed by the Engineer:

Step 1 : New Dam Tengah-1 Section 2, west to east direction

Step 2 : New Dam Tengah-1 Section 3, west to east direction

Step 3 : New Dam Tengah-1 Section 1, direction not specified

Refer also to SECTION 600 for the staging of the works in conjunction with the demolition of the existing breakwaters.

During Step 1 and 2 above, the head of the new breakwater construction (secondary armor layer) shall precede minimum 160 m (measured eastward along the new breakwater center line) ahead of the existing breakwater demolition.

Demolition of the Dam Timur (Step 1 of demolition work as specified in SECTION 600) may be started and finished regardless of the 160 m overlap rule. The purpose of this is to keep the calmness of the port basin high through maintaining the certain length of the breakwater as a wave shield.

The staging of the works for the demolition of the existing breakwater (SECTION 600) and the new breakwater (SECTION 700) are specified so as to keep calmness of the port basin high as mentioned in the SECTION 100 Clause 103. The Contractor may propose the alternative staging plan if his plan is proved to be effective with respect to the calmness of the port. Such alternative staging shall be subject to the approval of the Engineer.

701.5 Settlement

The Contractor shall make due allowance for settlement and consolidation of both the mound and subsoil underneath the breakwater occurring during the construction and maintenance period. The profiles and elevations shown on the Drawings are those of the completed breakwater at the end of the maintenance period.

701.6 Dispersal of Turbidity

The Contractor shall take all possible and reasonable measures to reduce the dispersal of suspended solid into the surrounding sea during dredging and dumping operations. In particular the Contractor shall:

- regularly check and maintain all barges to prevent leakage from any door seals;
- not overload barges so that material spills out;

- avoid using material which contain fines and avoid placing stone and backfill materials, and avoid placing rocks with a coverage of dust or fines.

702. Stone Material

702.1 General

Refer to SECTION 400 for the required qualities of the stone.

702.2 Stone Classification and Grading

The stone used for the breakwater construction shall be classified in the following table:

Grade	Locations to be Used	Size Range
A	Armor	500 – 1,000 kg
B	Armor	250 – 500 kg
C	Foot Protection, Armor	100 – 200 kg
D	Core	50 – 100 kg

At least 75 % (m/m) of the stones in each class shall consist of rocks within top half of the range specified.

Prior to the first delivery of each class of stone, the Contractor shall take samples from the stockpile at the quarry under the supervision of the Engineer, and measure the grading for approval of the Engineer.

702.3 Sample Stone

Sets of the typical stones of maximum and minimum weight of each class shall be selected from the quarry before delivery of the stones to the Site, and shall be erected on plinths at the locations which will be instructed by the Engineer to serve as a guide to the classification of stones.

702.4 Test during Construction

If the Engineer considers that the quality of the stones or grades delivered to the Site is different from those approved previously, the Engineer may direct the Contractor to take samples in the Engineer's presence and to carry out full testing at the Contractor's expense.

703. Survey and Measurement

It is essential that frequent checks upon the accuracy of construction be made not only of the completed work but also at all intermediate stage so that the thickness of all layers and the size of the core comply with requirements. The Contractor shall therefore supply all equipment and labor necessary to enable the Engineer to satisfy that the works are constructed in full compliance with the Specifications and Drawings.

Before and after each layer of materials is placed, the Contractor shall carry out the survey to take the levels of the surface of each layer. The purpose of the survey shall be for controlling elevations of the works and payment.

The survey shall be carried out in the presence of the Engineer, and the Contractor shall prepare the drawings to show the results of the survey. The plans and sections shall, when mutually agreed by the Engineer and the Contractor, be signed by both parties.

Lines of surveys shall be made at 10 m normal to the centerline of the breakwater, extending at least 15 m beyond the edges of the excavation or placing, unless otherwise instructed by the Engineer. Individual sounding points on such lines shall be spaced not more than 5 m. Separate lines of soundings shall be run along the breakwater centerline with maximum spacing of 20 m. The accuracies of the survey shall be within ± 1.0 m horizontally, and the within ± 0.1 m vertically.

The Contractor shall submit to the Engineer for approval the method of survey prior to start of the works.

704. Trench Excavation

The Contractor shall excavate the seabed to the depths and profiles as will be instructed by the Engineer, and dispose of all the excavated materials at the sea dumping site as shown on Appendix 701.

704.1 Depth of Excavation

Prior to commencement of the construction of the breakwater, the Contractor shall carry out the geological investigation at the new breakwater as shown on the Drawings. The purpose of the investigation shall be to determine the exact depth of the soil replacement at each location. The details of the investigation shall be in accordance with the relevant sub-clause in SECTION 100. The investigation report shall be submitted to the Engineer. Upon receipt of the report, the Engineer shall determine and instruct to the Contractor the exact depth of trench at each location.

704.2 Tolerance

No ridges, heaps or whatever shall protrude above the design depths and profiles.

705. Backfilling Trench

705.1 Backfill Materials

Two types of the materials shall be allowed to use for this work at the locations specified in the following table:

Type of Materials	Locations to Be Used
• Materials recovered from the core body of the existing breakwaters	New Dam Tengah-1 (above -8.0 m DL)
• New material (Refer to SECTION 300)	Not specified

New materials shall not be backfilled above, or mixed up with, the recovered materials, unless otherwise directed by the Engineer. Before the commencement of dumping of the recovered materials into the trench, the Contractor shall take levels of the trench in accordance with the method specified in the Clause 703 for the purpose of controlling elevations and payment.

705.2 Tolerance

The elevation of the backfilled trench shall be finished within the following elevation and tolerance:

Flat Surface	:	± 20 cm measured vertically from the design elevation

The Contractor shall remove the materials which has been backfilled above the specified tolerances at his own cost.

706. Bamboo Foundation

706.1 Bamboo Pile

Bamboo piling is required at the New Dam Barat as shown on the Drawings.

A bamboo pile shall be made of 7 pieces of bamboos and shall be assembled with hemp ropes with a spacing of 50 cm as shown on the Drawings. The length of the assembled bamboo pile shall be between 10.5 and 12.0 m. The diameter of the assembled bamboo pile shall be of minimum 24 cm. The bamboo pile shall be subject to the inspection by the Engineer prior to driving.

The pile shall be driven at least to the depths specified on the Drawings. Prior to the commencement of the pile driving, the Contractor shall submit the Engineer for approval the equipment and method of pile driving.

The bamboo piles shall be driven with the horizontal tolerance of 10 cm

706.2 Bamboo Mattress

Bamboo mattress is required at the New Dam Barat and the New Dam Tengah-2 as shown on the Drawings.

The typical dimension of a unit of the assembled bamboo mattress is 10 m x 10 m with minimum thickness shall be 24 cm.

A bamboo mattress shall consist of 3 layers of bamboo. Each bamboo shall be tightly fastened by hemp-palm ropes with the adjacent bamboos. Each layer of the bamboo mattress shall be fastened with other layers at an interval of 0.6 m^2.

The bamboo mattress shall be extended at least 1.5 m from both sides of the toes of the armor layer.

The bamboo mattress shall be assembled on land, and brought to the position afloat. The assembled mattress shall be subject to the approval of the Engineer prior to the installation.

The bamboo mattress shall be anchored to the designated location, and rubble stone shall be placed as the weight on it evenly to avoid the tipping up. The gap between the bamboo mattresses shall be minimal.

707. Placing Stones

707.1 Methods of Placing

The Contractor shall carry out drop tests on land, which imitate the height of the tipping or dumping to prove that the raptures of the stones are minimal. The method of such demonstration shall be proposed prior to the demonstration by the Contractor to the Engineer for approval.

The stones placed directly on the bamboo mattress shall be placed in a manner that the mat is not ruptured.

Considering the risk of damage of the core and underlayer by wave action, the Contractor shall limit the extent to which the core is constructed ahead of the underlayer, and the underlayer ahead of the armor. The Contractor shall submit his proposal with respect to this.

The methods used for placing rock in the breakwaters shall be subject to the approval of the Engineer. Rock placed directly on the on the bamboo mattress shall be placed in such a manner that the bamboo mattress is not ruptures. Apart from that no particular restriction will be applied to the method of placing the stone in the core and in the armor underlayers where rock may be placed by tipping and dumping from barges.

All rocks in the outer faces of the breakwater shall be placed individually so as to achieve the maximum interlocking, and tipping or dumping will not be permitted.

Slopes of the various layers of core, underlayer, and armor layer shall be such that as to maintain the outer profile of the breakwater and the minimum layer thickness specified in the Drawings.

707.2 Tolerance

Each stone layer shall be finished within the following elevations and tolerances:

Core:

Flat Surface	:	± 20 cm measured vertically from the design elevation
Side Slope	:	± 20 cm measured normal to the slope

Foot Protection:

Flat Surface under the armor layers	:	± 20 cm measured vertically from the design elevation
Flat Surface not under the armor layers	:	Above the design elevation

Layer thickness	:	Not less than design thickness

Underlayer Armor:

Upper Flat Surface under the Coping Concrete	:	± 5 cm measured vertically from the design depth
Upper Flat Surface not under the Coping Concrete	:	± 20 cm measured vertically from the design elevation
Side Slope	:	± 20 cm measured normal to the slope
Layer thickness	:	Not less than design thickness

Main Armor:

Upper Flat	:	Above the design elevation
Side Slope	:	Above the design elevation
Layer thickness	:	Not less than design thickness

708. Recovered Concrete Block as Armor (New Dam Tengah-1)

708.1 Conditions of Reuse

The recovered concrete blocks from the removal of the existing breakwaters, either fragmented or intact, which are smaller than 500 kg in weight, shall not be incorporated into this work. Such materials shall be used as backfill materials for trench.

The recovered concrete block shall be used as materials for armor layer at south side of New Dam Tengah-1.

The recovered concrete block shall not be placed mixing with the armor stone. The area placed by concrete block and area placed by armor stone shall be clearly demarcated. The Contractor shall submit such demarcation plan to the Engineer for approval prior to commencement of the work.

708.2 Method of Placing

The concrete blocks shall be placed randomly in a single layer.

The density of the concrete blocks shall be such that the space designated for units as shown on the Drawings shall be fully occupied by the units, and reasonable degree of the interlocking of the units shall be achieved.

The Contractor shall demonstrate the placing of the concrete blocks on land before the commencement of the work to prove that units shall be capable of being handled and placed without fracture or damage, and shall achieve certain interlocking. The details of the demonstration shall be subject to the approval of the Engineer.

Any placed units that are fractured or damaged to a degree that endanger the durability or stability of the unit, or otherwise unacceptable to the Engineer, shall be removed by the Contractor at his own cost.

708.3 Method of Placing

The concrete blocks shall be placed in uniform so as to achieve the maximum weight as a whole to the elevations as shown on the Drawings.

Any placed units that are fractured or damaged to a degree that endanger the durability or stability of the unit, or otherwise unacceptable to the Engineer, shall be removed by the Contractor at his own cost.

709. New Concrete Block

709.1 Type of Concrete Block

The characteristics of the concrete block shall be in accordance with the following table:

a.	Weight per Unit	:	Nominal 2.0 ton and 3.2 ton (No unit shall weigh 10 % less than these values)
b.	Stability Factor (Kd)	:	8.3
c.	Void Ratio	:	Not less than 50 %
d.	Placement Pattern	:	Random in 2 layers
e.	Nominal Thickness of the Layer (total of first and second layers)	:	About 1.8 m for 2.0 ton type and 2.2 m for 3.2 ton type

The type of the concrete block shall be well proven and recognized type. The Contractor shall propose the type of the concrete block and its details to the Engineer for approval.

Concrete block units shall be cast in steel moulds, and the surface finish shall be Class U.2 or better as specified in SECTION 500.

709.2 Method of Placing

Concrete block units shall be placed applying the basic principles set up for the type of the artificial armor system used, or such basic principles as are normally used for the type, all of which shall be subject to the approval of the Engineer.

The number of the units to be placed shall be at least the numbers which the type of the artificial armor system stipulates by using the parameters of (1) volume of the layer covered by the concrete blocks, (2) volume of each unit, and (3) void ratio. The Contractor shall submit his calculation to the Engineer for approval.

If the designated areas are not all covered by the theoretical number of the units, the Contractor shall manufacture and place additional concrete blocks at the vacant space at his own cost.

The Contractor shall apply the appropriate gripping tongs for placing the blocks in order to achieve the random orientation of the units, which shall be subject to the approval of the Engineer. Use of single sling or fixed pin shall not be permitted.

The Contractor shall demonstrate the placing of the concrete blocks on land before the commencement of the work to prove that units shall be capable of being handled and placed without fracture or damage, and the placing method shall achieve the randomness. The details of the demonstration shall be subject to the approval of the Engineer.

Any placed units that are fractured or damaged to a degree that endanger the durability or stability of the unit, or otherwise unacceptable to the Engineer, shall be removed by the Contractor at his own cost.

710. Coping Concrete

Top surface of the mound, on which the precast coping concrete units shall be installed, shall be finished to the elevation indicated on the Drawings and the tolerance specified. Voids in the mound shall be filled with finer materials.

The lower part (concrete block) shall be a precast unit, and the upper part (coping concrete) shall be in-situ concrete as shown on the Drawings.

711. Method Statement to Be Submitted

The Contractor shall submit a detailed statement of working methods not more than 28 days prior to the commencement of the work for approval of the Engineer. The detailed statement shall include at least:

- Method of interim surveys and measurement
- Method of placing and shaping of each layer of breakwater
- Method assembling, driving, and placing of bamboo piling and bamboo mattress
- Demonstration method of placing stones
- Method of manufacturing the concrete blocks
- Estimation of settlement of mount and establishment of target elevation of each layer during construction

- Locations to be placed by reuse materials (demarcation plan)
- Proposal of Type of Concrete Block
- Method of placing precast coping concrete and cast-in concrete of coping concrete

SECTION 800 – DREDGING

801. General

801.1 Scope of Work

The scope of the works covers the dredging of all materials from within the areas for the Outer Channel, the Inner Channel, and the Turning Basin, and the disposing of the dredged material at the dumping site as shown on Appendix 701 and as required in this section. The works shall include, but shall not necessarily be limited to:

- Dredging of all materials to the required line and level including removal of any sedimentation, which may occur to the Port due to this work.
- Disposal of dredged material at the location allocated for the purpose, off the coast of Tanjung Karawang village about 27 km from the Site.
- Pre, progress, and post dredging survey at the Outer Channel, the Inner Channel, the Turning Basin, and Dumping Site
- Environmental monitoring and protection.
- Coordination with the ADPEL, Pilotage, Port users, and other related authorities, and provision of the safety precautions requested by them.

801.2 Interference with Other Traffic

Refer to the SECTION 100 GENERAL REQUREIMENTS.

801.3 Wrecks and Obstacles

Refer to SECTION 300 SITE CLEARACNE AND DEMOLITION

801.4 Environmental Monitoring and Protection

Refer to the SECTION 1100 ENVIRONMENTAL MONITORING AND PROTECTION.

802. Dredging Methods

802.1 Nature of Material to be Dredged

The available borehole information indicates that the materials to be dredged are soft clay, sand, and clay. The Contractor shall dredge all the soils regardless of the type of the materials. No claim compensation for encountering different types of soil is given to the Contractor.

The characteristics of the materials are described in the Drawings.

The Contractor shall take due precaution to the existence of wrecks and steel obstacles (refer to SECTION 300). Incidental delay and cost due to the damages to the dredgers by such obstacles shall not be a valid basis of the claim.

The Contractor shall make due allowance in his rates for dredging work for removal of any sedimentation or siltation which may occur during the execution of the Works.

It is the Contractor's responsibility to ensure that the dredging works have achieved the required depths and profiles shown on the Drawings at the final acceptance of the Works by the Engineer.

802.2 Type of Dredgers

The Contractor shall use the dredging equipment to meet the following requisites:

- The size and capacity shall be such that the dredging works can be completed before the Time for Completion;
- The type of the dredgers shall be such that the interference with other traffic shall be minimal; and
- The dispersal of suspended solid and sediment shall at the minimum level.

The dredgers shall be equipped with appropriate positioning system, and gauge or sensor to measure the depth of the dredge head to the accuracies required by the dredging tolerance. The Contractor shall maintain an adequate stock of spare parts and exchange units on the site to avoid disruption of the positioning system.

The Contractor shall use a grab type dredger to dredge at the area within 20 m from the Jakarta International Container Terminal (JICT) berths in order to minimize the structural disturbances to the existing berths, unless otherwise instructed by the Engineer.

802.3 Type of Hopper Barges

Overflow discharge from the hoppers while loading of the dredged materials into the hoppers shall be moderate to avoid the undue dispersion of the suspended solids to the surrounding waters. The Contractor shall remove the sedimentation in and outside the Project Site caused by the Contractor's dredging works.

The hoppers to be used for transportation of the dredged materials to the sea dumping area shall be watertight and shall not cause any leakage of the contents. The Contractor shall submit to the Engineer for approval the door sealing arrangement of the hopper barges prior to its mobilization.

802.4 Dispersal of Turbidity

The Contractor shall take all possible and reasonable measures to reduce the dispersal of suspended solid into the surrounding sea during dredging and dumping operations. In particular the Contractor shall:

- use the best practicable operating methods to minimize the suspended solid and sediment release from the dredger;
- if loading into barge or using hopper dredgers then measures shall be taken or procedures adopted tp avoid overspill;
- regularly check and maintain barges, hoppers, discharge pipes, and ancillary equipment to prevent leakage from joints and seals.
- adopt a pattern of dumping within the disposal areas to minimize the overlapping of unsettled plumes of sediment;

- adopt any other appropriate measures to ensure that the requirements with regard to suspended solids limits, stated below, are met all times.

The turbidity caused by the dredging works shall not exceed 80 mg/m^3, equivalent Suspended Solids (SS), measured at 4.5 km radius from the entrance of the Port at any time.

If the turbidity exceeds 80 mg/m^3 at any point on the 4.5 km radius, the Contractor shall monitor the turbidity everyday at the points instructed by the Engineer until the values of the turbidity subside below 80 mg/m^3 .

Refer to SECTION 1100 in regard to detailed method of monitoring and the mitigation measures.

802.5 Limits and Levels of Areas to be Dredged

The dredging shall be finished within the following elevation and tolerance:

Flat Bottom	:	– 50 to + 0 cm measured vertically above the design depth
Perimeter Slope	:	– 0 to + 5 m measured horizontally outside the design profile (adjacent to the New Dam Barat and existing Dam Timur at the Port entrance, between the area 100 m north and 200 m south from the Port entrance measured along the centerline of the Outer and Inner Channel)
		– 0 to + 10 m measured horizontally outside the design profile (other than above area)

The required levels shown on the Drawings shall be attained over the whole of the areas to be dredged. Any high areas that remain after dredging shall be redredged to the required level.

The Contractor shall fill the over-dredged areas by granular material, which the Engineer will instruct the specifications, to the design depth elevation less tolerance, with no extra cost to the Employer.

Regardless of the tolerances given above, the Contractor shall take every precaution to avoid damage to existing facilities due to over dredging such as breakwaters and berths. The Contractor shall be responsible for any damages to the existing facilities.

803. Disposal of Dredged Material

803.1 General

All materials dredged from the Works shall be disposed of at the designated sea dumping area unless specifically stated otherwise by the Engineer.

If dredged material is deposited anywhere except within the designated sea dumping area, such material shall be removed by the Contractor to the satisfaction of the Engineer and the cost thereof will be borne by the Contractor.

803.2 Location of Dumping Area

The location of the sea dumping area is shown in the Appendix 701.

803.3 Dumping Tolerance

All dredged material shall be dumped within the specified limit of the offshore dumping site as required.

Vertical Tolerance:

The seabed elevation shall not be shallower than -20 m DL at any time.

Horizontal Tolerance:

No dredged material shall be dumped outside the designated boundaries.

If dredged material is deposited anywhere outside the designated dumping area, such materials shall be removed by the Contractor to the satisfaction of the Engineer and the cost thereof shall be borne by the Contractor.

803.4 Monitoring of Location of Transportation Barge

The location of the TSHD (Trailing Suction Hopper Dredgers) or hopper barges for transport of dredged materials to the sea dumping area shall be continuously measured and recorded through a GPS system with accuracy of ± 20 m. Such records shall be simultaneously and automatically relayed to the office of the Engineer, and displayed on the monitoring screen.

The Contractor shall submit the details of such monitoring system to the Engineer for approval prior to commencement of dredging works.

804. Hydrographic Survey

804.1 Echo Sounder

Refer to SECTION 100.

804.2 Pre- and Post-Dredging Survey

The seabed levels pf the areas to be dredged as shown on the Drawings are solely for the purpose of guide and assistance in estimating the extent of the Work.

Upon receiving 48 hours notice from the Contractor of his intention to carry out the survey, the Engineer will provide and Inspector to verify the acceptability of such work. No such survey will be accepted which has been carried out without an Inspector on board the survey boat.

Survey Area:

Spacing between sounding lines shall comply with the following table. Cross lines shall be perpendicular to the main sounding lines. All lines shall wherever possible be extended beyond the dredging or dumping edges as described in the table:

	Main Sounding Line Interval (m)	Cross Line Interval (m)	Line Extension Beyond Edges (m)
Outer Channel	10	50	200
Inner Channel	10	50	200
Turning Basin	10	50	200
Dumping Area	100	500	500

Data Submission:

All survey charts to be produced by the Contractor shall be referred to Datum Level (DL), and the depths shall be plotted in nearest 10 cm. The charts shall be submitted to the Engineer by electronic files and hard copies. The followings also shall be submitted to the Engineer for approval:

- Echo roll with design dredging depth lines, cutting line, coordinates, and time indicated on it
- Manual tide gauge record
- Drawings (Hard Copy and CAD File)
- Backup data as may be instructed by the Engineer

804.3 Progress Survey

The Contractor shall carry out the progress survey monthly at the dredging areas for the purpose of dredging control and progress payment.

The Contractor shall carry out the hydrographic survey at the dumping area every 3 month from one month before start of dredging works until the date of the Taking-Over Certificate of the whole Works.

The Engineer reserves the right to order levels and soundings to be taken at any time as necessary for proper supervision and measurement of the work.

Survey Area:

Spacing between sounding lines shall comply with the following table. Cross lines shall be perpendicular to the main sounding lines. All lines shall wherever possible be extended beyond the dredging edges as described in the table:

	Main Sounding Line Interval (m)	Cross Line Interval (m)	Line Extension Beyond Edges (m)
Outer Channel	20	100	100
Inner Channel	20	100	100

Turning Basin	20	100	100
Dumping Area	100	500	500

Data Submission:

All survey charts to be produced by the Contractor shall be referred to Datum Level (DL), and the depths shall be plotted in nearest 10 cm. The charts shall be submitted to the Engineer by CAD files and hard copies, which the Engineer will instruct the formats and numbers duly. The followings also shall be submitted to the Engineer for approval:

- Echo roll with design dredging depth, cutting line, position of the boat, and time indicated
- Manual tide gauge record
- Drawings (Hard Copy and CAD File)
- Volume calculation and the backup data (dredging area)

805. Measurement of the Dredging Works

Dredging works will be measured as the volume between the agreed original seabed elevation (pre-dredging survey) and the specified design elevation and side slope as shown on the Drawings. Such volume shall be calculated by Average-End-Area Volume method. Cross sections shall be taken at minimum interval of 20 m. Individual sounding intervals along each cross section shall be spaced not more than 10 m.

No payment will be made for any material dredged below the design levels.

Volumes for progress payments shall be agreed with the Engineer on a monthly basis and shall be based on the Contractor's progress surveys.

806. Inspection and Records

The Engineer shall at all times be given free and unhindered access to the Site, the dredgers and survey boats for purpose of inspection of dredging and hydrographic survey operations.

The Engineer will occasionally provide an inspector onboard the dredger and hoppers during working shift and the Contractor must include the cost of victualling of the inspectors in the rates entered in the Bill of Quantities. The Contractor shall also provide a working area onboard the dredgers to be used as an office by the inspectors.

The Contractor shall keep daily written records showing the working times, the is-situ dredge volume, the measured volume of each load, the suction or dredging time, turning time, sailing time and dumping time of each load, trace of hoppers, and other applicable information depending on the type of dredger being used.

The written records shall also give full details of the location of dredging, the material being dredged and detail any delays to the dredging operation.

The Contractor shall submit the daily record to the Engineer on the day following actual dredging operations.

807. Method Statements

The Contractor shall submit a detailed statement of working methods not more than 28 days prior to the commencement of the dredging work for approval of the Engineer. The detailed statement shall include at least:

- Types and numbers of dredgers.
- Working method and sequencing of dredging and disposal works; including details of production output/cycle times/control and monitoring of production output.
- Construction schedule
- Positioning system, and gauge or sensor to measure the depth of the dredge head to the accuracies required by the dredging tolerance
- Measuring, recording, and relaying of the position of hoppers
- Safety, communications, plan for unobstructed free movement of other vessels, and coordination with Port
- Method of controlling and monitoring progress.
- Method of controlling and monitoring environmental requirements.
- Survey equipment and system for echo sounding.
- Traffic safety
- Structural stability study when dredging in front of JICT

SECTION 900 – STRUCTURAL STEEL WORKS

901. General

901.1 Scope of Works

The scope of work covered by this section of the Specifications includes the supply, fabrication, protective treatment, delivery and erection of all steelwork required for the navigation aids system.

901.2 Materials

Refer to SECTION 400.

901.3 Shop Drawings

The Contractor shall prepare Shop Drawings and submit them to the Engineer for approval. The Shop Drawings shall indicate the position, size and dimensions of all members, details of joints, size and dimensions of anchor bolts. Details of bolt joints shall indicate the diameter, gauge, pitch and clearance of bolts and details of welded joints shall indicate root opening, groove angle and groove depth of butt weld and size of fillet weld.

Refer also to SECTION 100.

901.4 Storage of Steel and Fabricated Steelwork

The Contractor shall take precautions to minimize exposure to chemical pollution of steel awaiting fabrication.

Fabricated steelwork which is stored, awaiting delivery to site or erection, shall be kept clear of the ground and shall be laid out or stacked so as to prevent water or dirt accumulating on or against any of the surfaces. Suitable packing shall be placed between layers of stacked steelwork. Where cover is provided it shall be ventilated sufficiently to keep condensation to a minimum.

902. Welding

902.1 Welding Method

Procedures of metal-arc welding shall comply with AWS D1.1 or BS 5135 or equivalent.

The general welding schedule for shop site welds, including particulars of the preparation of fusion faces, the method of preheating where required, the methods of making the welds, and the types of electrodes shall be submitted to the Engineer for approval before the work is put in hand. No departure from the agreed welding schedule or from the details shown on the Drawings shall be made without the agreement of the Engineer. Electrodes and fluxes shall be so chosen that the properties of the deposited metal are not inferior to those of the parent metal.

902.2 Welding Plant

The welding plant shall be capable of maintaining, at the weld, the voltage and current specified by the manufacturer of the electrodes. The Contractor shall supply instruments for verifying voltages and current as and when required by the Engineer.

902.3 Type of Electrodes

Electrodes for manual metal arc welding shall comply with the requirements of BS 153 and BS 639, or equivalent.

Electrode wires and fluxes for submerged-arc welding shall comply with BS 4165, or equivalent.

Weld metal deposited by an automatic or semi automatic process, except submerged arc, shall comply with the requirements of BS 153 or equivalent.

902.4 Qualification and Testing of Welders

Welders shall show evidence to the satisfaction of the Engineer of having satisfactorily completed appropriate tests in accordance with JIS 23801, or BS 4871 and BS 4872 or equivalent.

Welding shall be carried out only under the direction of an experienced and competent supervisor. Unless otherwise agreed by the Engineer a record shall be kept to enable major butt welds to be identified with the welders responsible for the work, but finished work shall not be marked by hard stamping for this purpose.

902.5 Defect of Weld

Defects of weld found after the materials are delivered at the site shall also be corrected as directed by the Engineer but the materials with serious defects shall be rejected.

903. Painting

903.1 Preparation of Surface to Receive Protective Coating

All steelwork shall be dry blast cleaned to an adequate surface prior to the application of paint to a surface finish to SIS 05 5900 preparation grade SA 2.5.

The abrasive used for blast cleaning shall be free from harmful contamination and any recovered material shall be cleaned. The maximum roughness (highest peak to lowest trough) of the blast cleaned surface for new steelwork shall not exceed 60 microns and for old steelwork 100 microns.

Steelwork which cannot by reason of its shape or profile be blast cleaned, may be pickled and hot dip galvanised and painted where approved by the Engineer.

903.2 Paint System Sheets

The Contractor shall submit to the Engineer a copy of Paint System Sheets relating to each of the paints he proposes to use in accordance with the type of paint specified in SECTION 900. These shall be accompanied by the manufacturer's Paint Data Sheet.

Paint System sheets shall show the manufacturer's name, the brand name, reference number, colour and description of the paint; the surface preparation to which it is to be applied; the minimum wet and dry film thickness; the coverage per litter and the number of coats to be applied, all to the Engineer's requirements.

Following the Engineer's written instruction, the requirements of the Paint System Sheets shall be adopted for the works. The Contractor shall ensure that the paint manufacturer's Data

Sheets cover the conditions at works and at Site, including temperature and humidity, under which the paints are to be applied.

903.3 Paint Application Trials

Where instructed by the Engineer the Contractor shall carry out paint application procedure trials at the fabricator's works or at site as appropriate, with the equipment and labor to be used in the Works. The Contractor shall supply suitable blast cleaned steel and sufficient paint for the trials and must demonstrate his ability to apply each coat of paint of a designated paint system in accordance with the specification and the paint manufacturer's data sheet. No painting of the contract steelwork will be permitted until the procedure trials have been completed to the satisfaction of the Engineer.

903.4 Application of Paint

All painting shall be carried out by skilled and experienced painters under constant supervision by competent qualified staff.

Paint shall not be applied under the following conditions:

- When the relative humidity rises above 90 per cent.
- During rain, fog or mist.
- Where the amount of moisture on the surface or that likely to be caused by subsequent condensation may have a harmful effect.

All shop painting shall be carried out in a fully enclosed workshop unless otherwise agreed by the Engineer.

903.5 Repaired to Damaged Surfaces

Areas of paint which have been damaged shall be cleaned to bare metal and the edges of the undamaged paint bevelled with sandpaper.

The full specified painting system, excepting blast or etch primers which may be omitted at the recommendation of the paint manufacturer, shall then be applied in such a manner that the new paint overlaps the existing paint by at least 50 mm all round the affected part.

904. Galvanizing

904.1 Galvanizing Method

Galvanizing shall be by the hot dip process. The steelwork shall first be blast cleaned to SIS 05 5900 SA 2.5 then picked in accordance with this Specification and BS 729 or equivalent.

The coating shall be to a thickness of not less than 140 microns.

All galvanized components other than chain links and fixings for chain links, or other articles subject to chafing, shall be allowed to weather for not less than 6 months and then be cleaned and degreased prior to the application of a coat of calcium plumbate primer type A to BS 3698 or approved zinc chromate primer followed by a coal tar epoxy paint system to BS 5493 to a film thickness of 350 microns in not less than 2 layers.

All bolts, nuts and threading fittings shall be hot dip galvanized. Nuts shall be retapped after galvanized, if necessary. A minimum thickness of zinc of 45 microns shall be achieved.

SECTION 1000 – NAVIGATION AIDS

1001. General

1001.1 Scope of Works

The works shall include, but shall not necessarily be limited to:

- Installation of Zero Buoy (No. 0)
- Installation of Channel Buoys (No. 1 and 2)
- Installation of Entrance Beacon (No. 4) on the New Dam Barat
- Installation of Marker Beacon (No. 5) on the New Dam Tengah-1
- Installation of Marker Beacon (No. 7) on the New Dam Tengah-2
- Installation of Sector Light, including the concrete foundation

1001.2 Maritime Buoyage System

The buoyage system shall be in accordance with the International Association of Lighthouse Authorities (IALA) Maritime Buoyage System "A", and the normal visibility range of the lights shall be calculated using an atmospheric transmission factor of 0.74 as recommended by IALA.

1001.3 Submission to the Engineer

The Contractor shall submit the Shop Drawings and detailed specifications of the navigation aids to the Engineer for approval prior to manufacturing them. The information shall at least contain the followings:

- Body, Tower (structural design calculation, weight calculation, painting scheme)
- Lighting Equipment (lens, light source, luminous range calculation)
- Power Source (solar cell out put, battery capacity)

1001.4 Operation and Maintenance Manual

The Contractor shall submit the operation and maintenance manual to the Engineer before the Taking-Over Certificate of the work is issued.

The Contractor shall render training to the Employer, whom the Engineer will nominate, in regard to operation and maintenance of the supplied navigation aids when the navigation aids become in operation.

1001.5 Spare Parts and Tools

The Contractor shall provide the Employer of the spare parts and maintenance tool of the Lighting Equipment and Power Supply for two year operation, which are recommended by the manufacturer. The Contractor shall submit the Engineer for approval the list of the spare parts and maintenance tools prior to the delivery of the navigation aids equipment.

1002. Navigation Buoys

1002.1 Location

The locations of the Zero Buoy (No. 0) and Channel Buoys (No. 1 and 2) are shown on the Drawings. Zero Buoy (No. 0) shall be located on the center line of the Outer Channel as shown on the Drawings. The sinkers for Channel Buoys shall be located on the intersection point of the dredged Outer Channel base and the side slope.

1002.2 Buoy Body

The buoys, which shall be from an approved manufacturer and of an approved design, shall be of steel construction with welded steel plate bodies and bolted mild steel on aluminum alloy superstructure and shall of a type suitable for channel marking in moderate open sea conditions.

All the buoys shall be fitted with topmarks as stipulated in IALA Maritime Buoyage System "A".

The navigation buoys shall be of size and shape indicated on the Drawings. The thickness of buoy must not less than 10 mm. The buoys shall be complete with topmark, 2 lifting eyes, 2 mooring eyes, lantern, solar cell module, battery, and radar reflector, marking plate fitted to the superstructure.

Each buoy body shall be shot-blasted or sand-blasted in accordance with SIS Sa 2.5. The body color shall be white (No. 0), read (No. 1), and green (No. 2). The coating system shall be as follows:

Part	No. of Coating Layer	Coating Layer	Paint Type	Minimum Dry Film Thickness (μ)
Above Water Line	4	Under Coat (1) + Under Coat (2) + Top Coat (1) + Top Coat (2)	Epoxy primer + Epoxy resin + Polyurethane resin + Polyurethane resin	30 + 130 + 35 + 35
Below Water Line	3	Under Coat (1) + Under Coat (2) + Top Coat	Epoxy primer + Epoxy resin + Epoxy resin	30 + 130 + 130
Internal Parts	2	Under Coat + Top Coat	Epoxy primer + Epoxy resin	30 + 130

The effective range of the Radar Reflector shall be minimum 13 km.

1002.3 Lanterns for Navigation Buoys

The navigation light for each buoy shall be a solar battery operated electric lantern. The lantern shall include an electric light flasher with timer to provide the required coded flash character. The characteristics of the lanterns shall be as follows:

Characteristic	Buoy No. 0	Buoy No. 1	Buoy No. 2
Light Character	Mo(A) 10 sec. (0.5 + 0.5 + 1.5 + 7.5)	Fl. 3 sec. (0.5 + 2.5)	Fl. 3 sec. (0.5 + 2.5)
Light Color	White	Red	Green
Luminous Range (minimum)	6.2 NM	4.0 NM	4.0 NM

1002.4 Power Source

The power for the lanterns shall be provided by solar system operating via rechargeable batteries with a 15 days autonomy minimum. Battery components shall be lockable and shall be fitted with approved type padlocks.

1002.5 Moorings

The buoys shall be provided with bridle-type mooring of open link chain: main chain 36 mm diameter and bridle chain 36 mm diameter, swivel, 3-eye piece, shackles and including 7-ton concrete block sinker. The chain and shackles shall comply with BS 970, BS 3082, BS MA70, JIS F3303, JIS B2801 or approved equivalent.

The length of the mooring chains shall be the minimum necessary to accommodate the actual depth of water at each location, taking into account the tidal range, wave, swell, wind, or current so as to minimize the horizontal locus of the buoy under the various combinations of the above conditions.

1003. Light Beacons

1003.1 Location

The locations of the Entrance Beacon (No. 4) and Marker Beacons (No. 5 and 7) are shown on the Drawings. Entrance Beacon (No. 4) shall be located on the tip of the New Dam Barat, and served as a pair with the existing Entrance Beacon (No. 3). Marker Beacons (No. 5 and 7) shall be located on the New Dam Tengah-1 and New Dam Tengah-2.

1003.2 Tower

The Light Beacons shall be complete with platform, ladder, lantern, solar cell module, battery, lightning protection, daymark (only No. 4), and radar reflector (only No. 4), fitted to the tower as shown on the Drawings. The structures shall be mono hull types, and made of galvanized steel as shown on the Drawings.

Entrance Beacon (No. 4) shall be fitted with daymark as stipulated in IALA Maritime Buoyage System “A”.

The height of the tower shall be 20 m (No. 4), 10 m (No. 5), and 6 m (No. 7) as shown on the Drawings.

Each tower shall be shot-blasted or sand-blasted in accordance with SIS Sa 2.5 prior to coating. The color shall be green (No. 4) and red (No. 5 and 7). The coating system shall be as follows:

Part	No. of Coating Layer	Coating Layer	Paint Type	Minimum Dry Film Thickness (μ)
Surface Parts	4	Under Coat (1) + Under Coat (2) + Top Coat (1) + Top Coat (2)	Epoxy primer + Epoxy resin + Polyurethane resin + Polyurethane resin	30 + 130 + 35 + 35
Internal Parts	2	Under Coat + Top Coat	Epoxy primer + Epoxy resin	30 + 130

1003.3 Lanterns for Light Beacons

The navigation light for each beacon shall be a solar battery operated electric lantern The lantern shall include an electric light flasher with timer to provide the required coded flash character. The characteristics of the lanterns shall be as follows:

Characteristic	Beacon No. 4	Beacon No. 5	Beacon No. 7
Light Character	Fl. 3 sec. (0.8 + 2.2)	Fl. 3 sec. (0.5 + 2.5)	Fl. 3 sec. (0.5 + 2.5)
Light Color	Green	Red	Red
Luminous Range (minimum)	7.0 NM	7.0 NM	7.0 NM

1003.4 Power Source

The power for the lanterns shall be provided by solar system operating via rechargeable batteries with a 15 days autonomy minimum. Battery components shall be lockable and shall be fitted with approved type padlocks.

1003.5 Installation

The tower shall be fixed to the designated location by stainless steel bolt & nut as shown on the Drawings. The anchor bolts shall be preinstalled in the coping concrete at the breakwaters.

1004. Sector Light

1004.1 General

The detailed specifications of the lanterns will be provided to the Contractor within a reasonable time after the commencement of the works. The Contractor shall then submit the details of his proposing lanterns to the Engineer for approval.

1004.2 Location

One Sector Light shall be installed on the center line of the Outer Channel at the land now occupied by shipyards as shown on the Drawings.

The exact location of the Sector Light shall be determined by the Contractor taking into account the existence of present buildings, structures and facilities, and shall be subject to the approval of the Engineer.

1004.3 Tower

The tower shall be complete with platform, ladder, lantern, solar cell module, battery, and lightning protection fitted to the tower as shown on the Drawings. The structures shall be lattice type, and made of galvanized steel as shown on the Drawings.

The height of the tower shall be 40 m as shown on the Drawings.

The body color shall be white.

1004.4 Lanterns for Sector Light

The navigation light shall be a solar battery operated electric lantern. The lantern shall include an electric light flasher with timer to provide the required coded flash character. The characteristic of the lantern are planned be as follows:

Light Character	:	Fixed
Sector Angles	:	Total 3.5 degrees
Light Color	:	Green, White, Red
Luminous Range (minimum)	:	Daytime: 3.9 NM (green), 4.0 NM (red), 5.9 NM (white) Nighttime: 10 NM (green), 10.8 NM (red), 19 NM (white)

1004.5 Power Source

The power for the lanterns shall be provided by solar system operating via rechargeable batteries with a 5 days autonomy minimum. Battery components shall be lockable and shall be fitted with approved type padlocks.

1004.6 Installation

The tower shall be fixed to concrete foundations by stainless steel bolt & nut as shown on the Drawings. The anchor bolts shall be preinstalled in the concrete foundations.

The concrete foundation shall be constructed as shown on the Drawings.

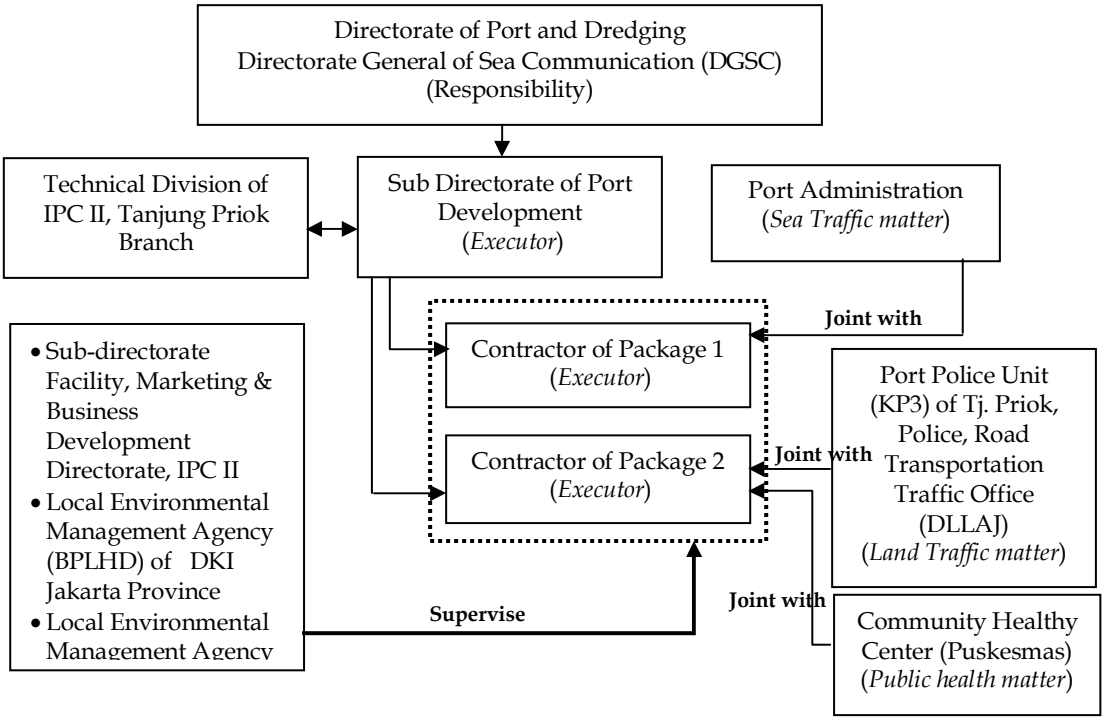
SECTION 1100 – ENVIRONMENTAL MONITORING AND PROTECTION

1001. General

1001.1 Environmental Management Program (EMP)

Environmental Impact Assessment (EIA) documents for the Project had been prepared by the Directorate General of Sea Communication (DGSC), and approved by the State Ministry of Environment (MENEG LH) on March 26, 2004. Such EIA documents consist of Environmental Analysis (ANDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL).

The organization structures for the implementation of RKL and RPL are as shown in the following figure:



Source: EIA documents prepared by GOI

The Environmental Management Program (EMP) has been purpose-built by DGSC for detailing the monitoring, feedback, and mitigation plans during the construction and operation stages based on the approved RKL and RPL.

The Contractor shall strictly observe the regulations and stipulations in the EMP for the construction stage. The mitigation obligations of the Contractor are summarized in the Appendix 1101. Operational delays of the Works or incurring additional costs due to observance of the EMP shall not be considered valid ground for any extension of time or additional monies.

1001.2 Scope of Works

The works covered under this section of the Specification shall include, but not limited to:

- Execution of mitigation measures in order to minimize negative environmental impacts as stipulated in Appendix 1101.
- Monitoring of the environmental parameters in order to examine whether or not the level of impacts meet the criterion, which is summarized in Appendix 1103.
- Preparation and implementation of the additional mitigation measures if the monitoring results fail to meet the monitoring criteria.
- Liaisoning with the concerned authorities and parties in regard to environmental issues.
- Preparation and submission of the monitoring report, mitigation plan, and any other environmental reports which may be requested by the Engineer.

1001.3 Environmental Officers

The Contractor shall have on his staffs on the Site the officers dealing with only with questions regarding the environmental issues. These officers shall be qualified for this work, and shall coordinate with the concerned authorities and parties, and shall advise the mitigation measures to minimize the environmental adverse impacts.

The Contractor shall submit to the Engineer for approval the proposal for the officers, organization of the team, and duties and functions of each officer prior to commencement of any works.

1002. Environmental Monitoring

The Contractor shall carry out the environmental monitoring in accordance with the following schedule as stipulated in Appendix 1102. The monitoring reports shall be submitted to the Engineer and the concerned parties. The monitoring locations shall be as shown on the Appendix1104.

The method of the analysis for each monitoring parameter is summarized in Appendix 1102.

1003. Mitigation Measures

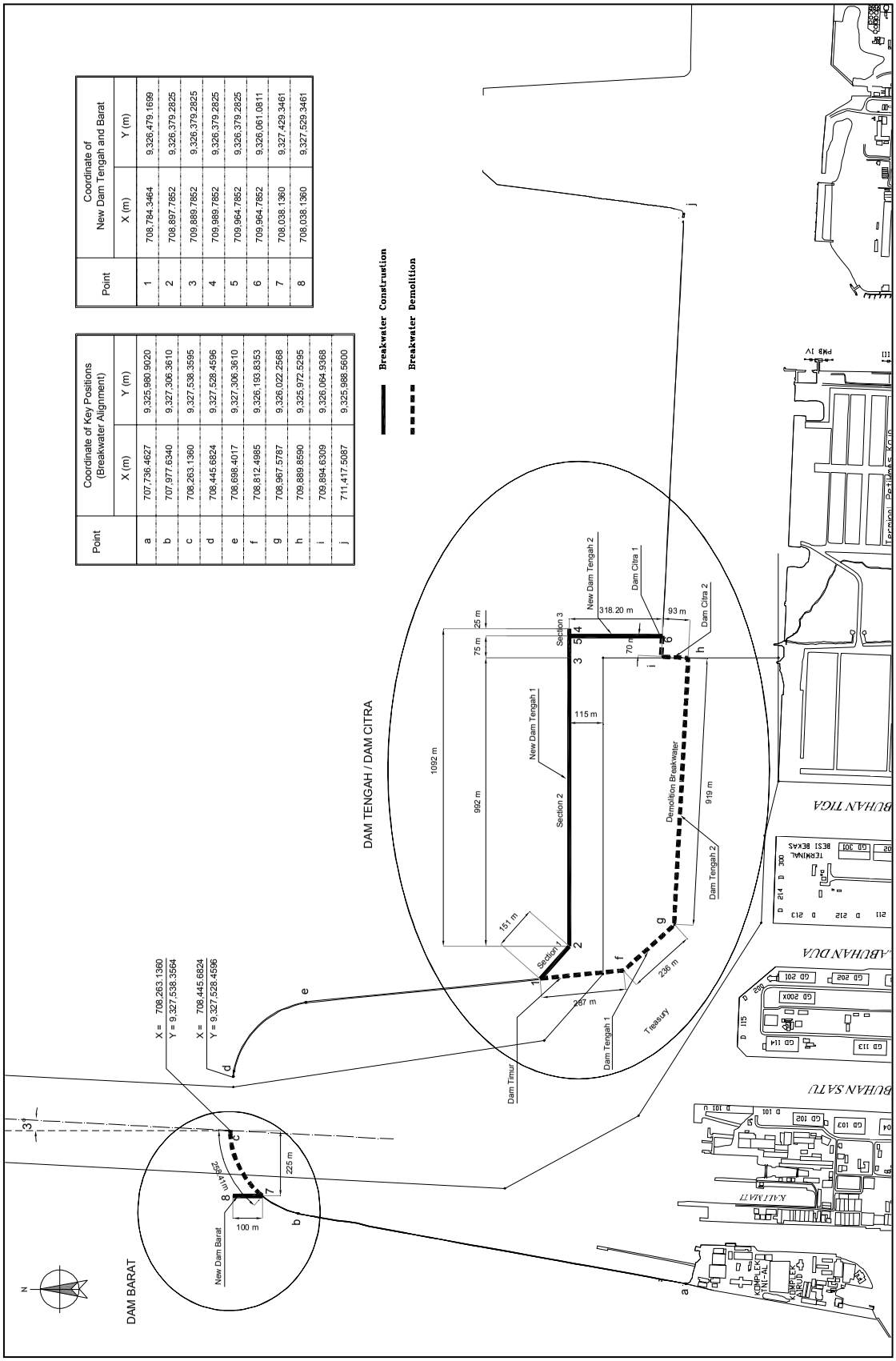
If the monitoring and test values exceed the criterion as specified, the Contractor shall propose the mitigation measures to the Engineer for approval and shall implement such measures as specified in Appendix 1102.

APPENDIX 101 a.

Breakwater Demolition and Construction

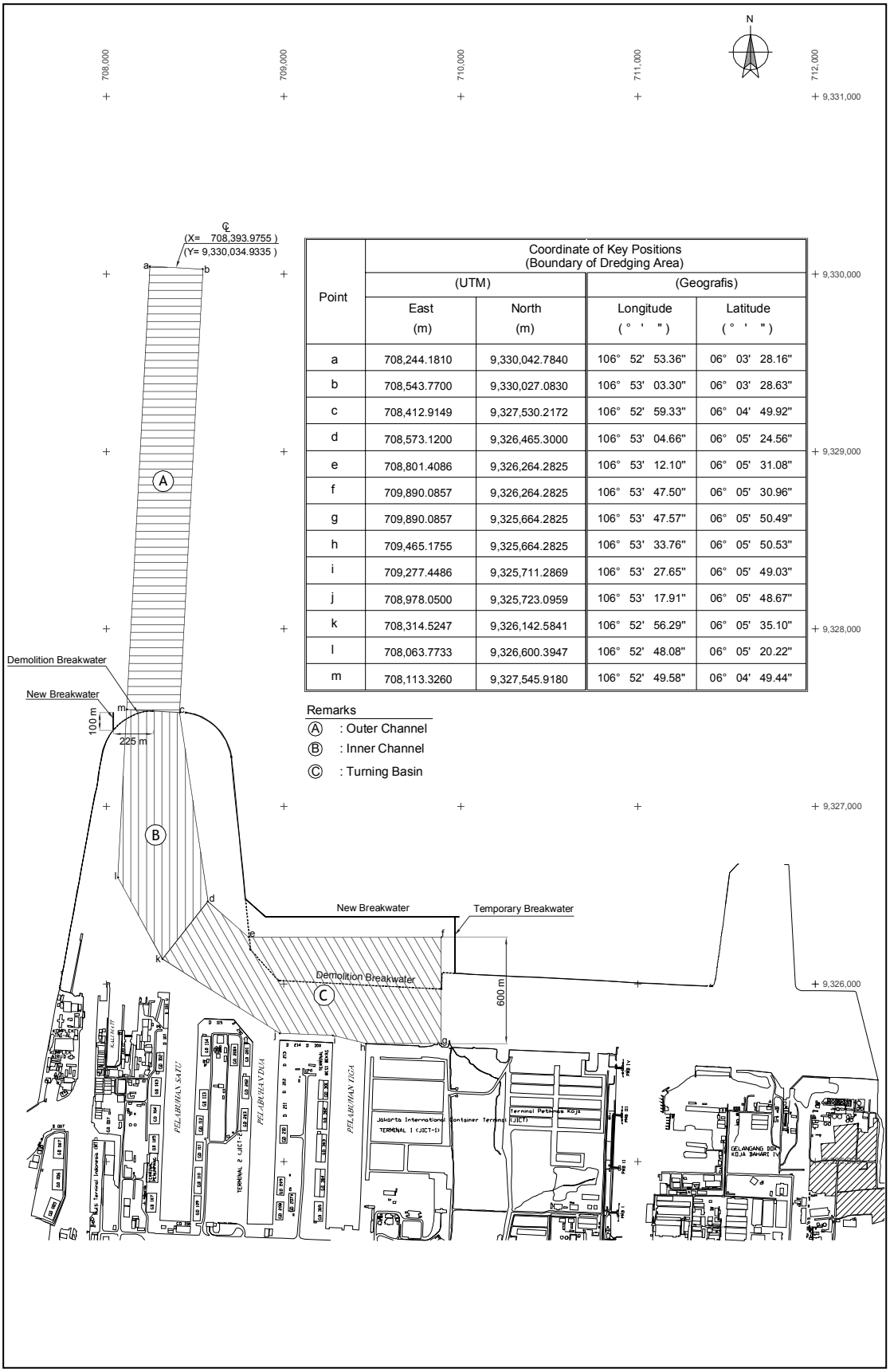
Point	Coordinate of Key Positions (Breakwater Alignment)	
	X (m)	Y (m)
a	707,736.4627	9,325,980.9020
b	707,977.6340	9,327,306.3610
c	708,263.1360	9,327,538.3595
d	708,445.6824	9,327,528.4596
e	708,698.4017	9,327,306.3610
f	708,812.4985	9,326,193.8353
g	708,967.5787	9,326,022.2568
h	708,889.8590	9,325,972.5295
i	708,894.6309	9,326,064.9368
j	711,417.5087	9,325,988.5600

Point	Coordinate of New Dam Tengah and Barat	
	X (m)	Y (m)
1	708,784.3464	9,326,479.1699
2	708,897.7852	9,326,379.2825
3	709,889.7852	9,326,379.2825
4	709,989.7852	9,326,379.2825
5	709,964.7852	9,326,379.2825
6	709,964.7852	9,326,061.0811
7	708,038.1360	9,327,429.3461
8	708,038.1360	9,327,529.3461



APPENDIX 101 b.

Dredging Areas



Point	Coordinate of Key Positions (Boundary of Dredging Area)			
	(UTM)		(Geografis)	
	East (m)	North (m)	Longitude (° ' ")	Latitude (° ' ")
a	708,244.1810	9,330,042.7840	106° 52' 53.36"	06° 03' 28.16"
b	708,543.7700	9,330,027.0830	106° 53' 03.30"	06° 03' 28.63"
c	708,412.9149	9,327,530.2172	106° 52' 59.33"	06° 04' 49.92"
d	708,573.1200	9,326,465.3000	106° 53' 04.66"	06° 05' 24.56"
e	708,801.4086	9,326,264.2825	106° 53' 12.10"	06° 05' 31.08"
f	709,890.0857	9,326,264.2825	106° 53' 47.50"	06° 05' 30.96"
g	709,890.0857	9,325,664.2825	106° 53' 47.57"	06° 05' 50.49"
h	709,465.1755	9,325,664.2825	106° 53' 33.76"	06° 05' 50.53"
i	709,277.4486	9,325,711.2869	106° 53' 27.65"	06° 05' 49.03"
j	708,978.0500	9,325,723.0959	106° 53' 17.91"	06° 05' 48.67"
k	708,314.5247	9,326,142.5841	106° 52' 56.29"	06° 05' 35.10"
l	708,063.7733	9,326,600.3947	106° 52' 48.08"	06° 05' 20.22"
m	708,113.3260	9,327,545.9180	106° 52' 49.58"	06° 04' 49.44"

APPENDIX 102

List of Drawings

NUMBER	DRAWING TITLE	NUMBER	DRAWING TITLE
P-G-001	Project Location	P-B-001	Breakwater Relocation Plan
P-G-002	Project Plan	P-B-002	Plan and Section, New Dam Barat
P-G-003	Offshore Boring and Seismic Tomography Locations	P-B-003	Head Treatment Plan and Section (1), New Dam Barat
P-G-004	Geological Profile (1)	P-B-004	Head Treatment Plan and Section (2), New Dam Barat
P-G-005	Geological Profile (2)	P-B-005	Connection between Exsiting Dam Barat and New Dam Barat
P-G-006	Geological Profile (3)	P-B-006	Coping Concrete (1) - New Dam Barat
P-G-007	Geological Profile (4)	P-B-007	Coping Concrete (2) - New Dam Barat
P-G-008	Geological Profile (5)	P-B-008	Coping Concrete (3) - New Dam Barat
P-G-009	Geological Profile (6)	P-B-009	Foundation of New Dam Barat
P-G-010	Bathymetrical Information Plan	P-B-010	Arrangement of Bamboo Mattress and Piles,New Dam Barat
P-G-011	Outer Channel Area (1)	P-B-011	Manufacturing of Bamboo Mattress and Pile,New Dam Barat
P-G-012	Outer Channel Area (2)	P-B-012	Excavation bettween Existing Dam Barat and New Dam Barat
P-G-013	Outer Channel Area (3)	P-B-013	Excavation of Re-Use Material (Dam Barat)
P-G-014	Outer Channel Area (4)	P-B-014	Plan and Section (1)(Dam Tengah-1)
P-G-015	Outer Channel Area (5)/Inner Channel Area (1)	P-B-015	Plan and Section (2)(Dam Tengah-1)
P-G-016	Inner Channel Area (2)	P-B-016	Typical Cross Section (1) (New Dam Tengah-1)
P-G-017	Inner Channel Area (3)	P-B-017	Typical Cross Section (2) (New Dam Tengah-1)
P-G-018	Turning Basin Area (1)	P-B-018	Connection between Existing Dam Tumur and New Dam Tengah-1
P-G-019	Turning Basin Area (2)	P-B-019	Cross Section of Section 1 of New Dam Tengah-1
P-G-020	Turning Basin Area (3)	P-B-020	Corner of New Dam Tengah-1
P-G-021	Wreck, Sunken Vessel and Debris in Project Site	P-B-021	Head Treatment Plan New Dam Tengah-1
P-G-022	Bench Marks for Marine Work	P-B-022	Head Treatment Section New Dam Tengah-1
P-D-001	Dredging Plan - General Area	P-B-023	Coping Concrete (1) New Dam Tengah-1
P-D-002	Cross Sectional Dredging Plan	P-B-024	Coping Concrete (2) New Dam Tengah-1
P-D-003	Cross Sectional Dredging Plan - Outer Channel	P-B-025	Coping Concrete (3) New Dam Tengah-1
P-D-004	Cross Sectional Dredging Plan - Inner Channel	P-B-026	Excavation bettween Existing Dam Timur and New Dam Tengah-1
P-D-005	Cross Sectional Dredging Plan - Turning Basin	P-B-027	Excavation for Replacement of Dam Tengah-1
P-D-006	Dredging Section - Outer Channel (1)	P-B-028	Excavation of Re-Use Material (Dam Timur and Dam Tengah-1)
P-D-007	Dredging Section - Outer Channel (2)	P-B-030	Plan and Section (1) New Dam Tengah-2
P-D-008	Dredging Section - Outer Channel (3)	P-B-031	Section (2) New Dam Tengah-2
P-D-009	Dredging Section - Inner Channel (1)	P-B-032	Excavation of Dam Citra New Dam Tengah-2
P-D-010	Dredging Section - Inner Channel (2)	P-N-001	Plan of Demolition/Relocation of Navigation Towers/Buoys
P-D-011	Dredging Section - Inner Channel (3)	P-N-002	Lighted Buoy No.0, No.1, No.2
P-D-012	Dredging Section - Inner Channel (4)	P-N-003	6m Navigation Tower (No.5)
P-D-013	Dredging Section - Turning Basin (1)	P-N-004	10m Navigation Tower (No.7)
P-D-014	Dredging Section - Turning Basin (2)	P-N-005	20m Navigation Tower (No.4)
P-D-015	Dredging Section - Turning Basin (3)	P-N-006	40m Navigation Sector Light Tower (No.8)
P-D-016	Dredging Section - Turning Basin (4)	P-N-007	Plan of Existing Relocating Buoys
		P-N-008	Relocation Plan of Navigation Aids (Temporary Marker Buoy)

APPENDIX 103

Furniture and Equipment for the Engineer's Office

The Contractor shall provide the following items of furniture, equipment, and utensils to the satisfaction of the Engineer. Prior to the provision and installation, the Contractor shall submit catalogue, photos or other documents for the approval of the Engineer. The Contractor shall maintain all items in good condition throughout the whole period of the Contract and shall replace any items as necessary when the provided instruments or goods are either under repair or are no longer usable.

Item	Equipment	Specifications	Q'ty
1	Working Desk	with 4 or more drawers	15
2	Chair for above	with arm rest (rotating)	15
3	Meeting Table	1.5m x 3m minimum	2
4	Chair for above	with arm rest	20
5	Filing Cupboard	steel and sliding door glasses with 4 shelves, size 90cm x 180cm	6
6	Filing Cupboard	steel with 4 shelves, size 90cm x 180cm	6
7	Sofa set	Set of 1 (one) 3 sitters, 2 (two) 1 sitter and 1 (one) table	1
8	Paper basket	4 shelves	2
9	Safety Box	50 x 50 x 70	1
10	Table Lamp	PL 11 watt	15
11	White Board	1.2m x 2.0m	2
12	Personal Computer set	Processor : 3.0Ghz, HD : 120Gb, RAM : 512Mb, FDD : 1.44Mb, DVDRW, Monitor : 17" Flat and LAN card : 10/100 Operation System : Microsoft Windows XP Professional (latest original version), MS Office XP Professional(latest original version), CAD (latest version), MS Project (latest version), Photoshop (latest original version)	5
13	Printer for above	Color Laser Printer (A3 size) Laser Printer (A3 size) Scanner (A3 size)	1 1 1
14	Flash Memory	256 Mb	2
15	LCD Projector	2,000 lumens or more	1
16	Telephone Line	Fix line	5

Item	Equipment	Specifications	Q'ty
17	Fax machine	Plain paper ink film, has a copy function	1
18	Photocopy Machine	30 ppm minimum	1
19	UPS	1,500watts	3
20	Air Conditioner	2 PK	6
21	Exhaust Fan	Dia. 25"	6
22	Water Dispenser	Hot and cool	1
23	Gas Cooking Hob	2 stoves	1
24	Gas Tube	LPG	2
25	Kitchen Utensil Set	Standard	1
26	Kitchen Sink	1 basin	1
27	Refrigerator	200 liter capacity minimum	1
28	Rubbish Waste	Plastic	10
29	First-aid Box	complete set	1
30	Fire Extinguisher	3.5 Kg minimum	6

APPENDIX 104

Survey Equipment for the Engineer

The Contractor shall provide and maintain for the Engineer's exclusive use surveying equipment, spare parts, and consumable which shall include the following:

A. Equipment:

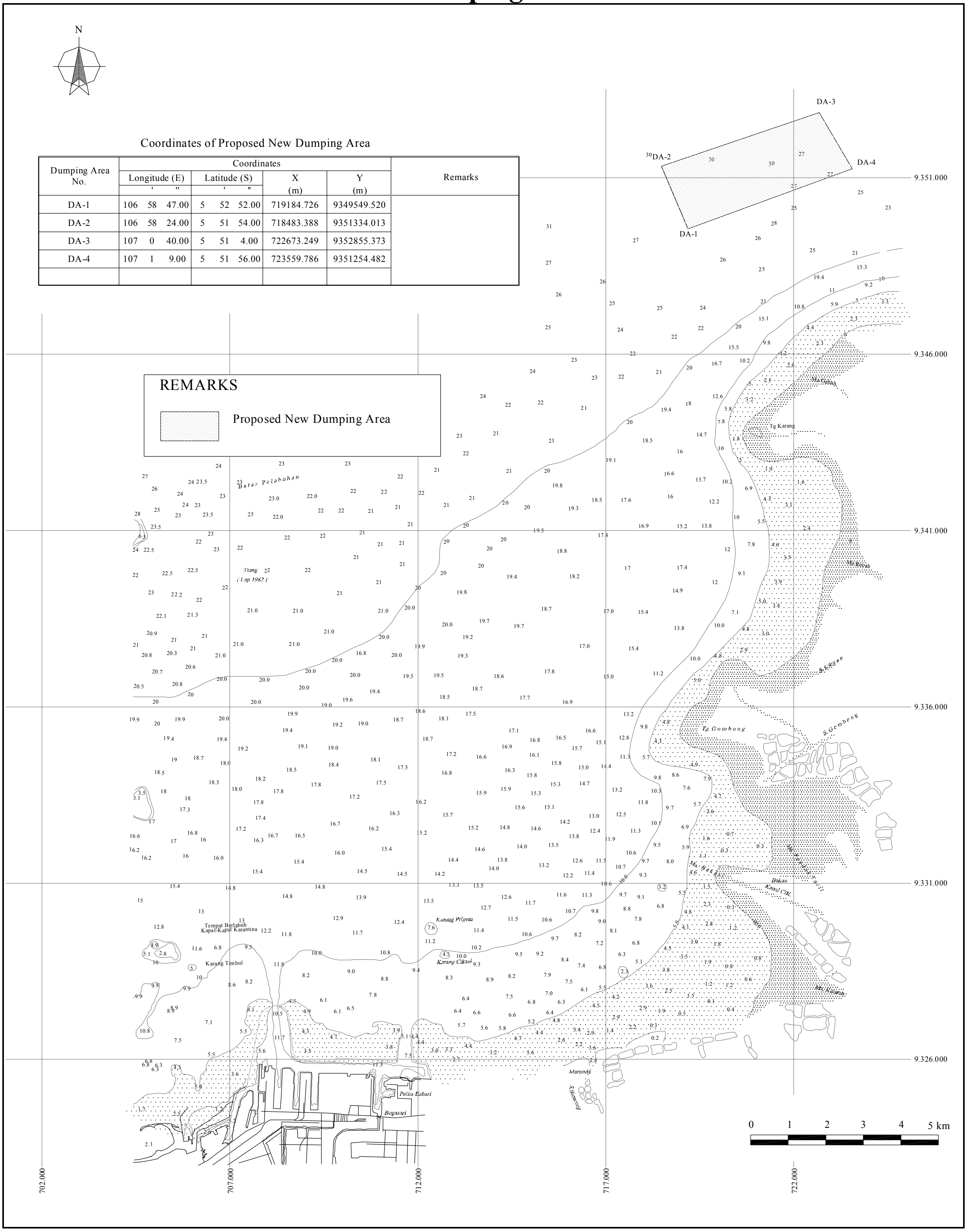
- One (1) no. of Portable Turbidity Meter
- Two (2) no. of hand held GPS
- One (1) no. of Precise Surveying Sextant.
- Four (2) nos. of 4 m long Metric Staffs graduated to 0.5 cm
- Twenty (10) nos. of 3 m long Ranging Poles
- Two (2) nos. of 100 m long graduated Steel Measuring Band
- Two (2) nos. of 30 m long graduated Steel Measuring Tapes
- Three (3) nos. of 30 m long graduated Vinyl Measuring Tapes
- Two (2) nos. of 3 kg Hammers
- Three (3) nos. of 7 x 50 mm Binoculars

B. Consumables:

- Wooden survey pegs
- Steel survey pins
- Paint and paint brushes

APPENDIX 701

Sea Dumping Area



Coordinates of Proposed New Dumping Area

Dumping Area No.	Coordinates								Remarks
	Longitude (E)			Latitude (S)			X	Y	
		'	"		'	"	(m)	(m)	
DA-1	106	58	47.00	5	52	52.00	719184.726	9349549.520	
DA-2	106	58	24.00	5	51	54.00	718483.388	9351334.013	
DA-3	107	0	40.00	5	51	4.00	722673.249	9352855.373	
DA-4	107	1	9.00	5	51	56.00	723559.786	9351254.482	

APPENDIX 1101 Potential Impacts and Mitigation Measures

No	Item of Impact	Source of Impact	Impact Indicator	Objective of Mitigation	Mitigation Measure	Mitigation Site	Mitigation Period	Institution for Mitigation		
								Executor	Supervisor	Report
1	**Construction Phase**									
A	**Spatial Aspect**									
1	Maritime Traffic Activity	i. Mobilization and demobilization of construction material and equipment ii. Offshore work • Widening of channel & basin • Breakwater relocation • Dumping of dredged material	• Increase of maritime traffic volume and accident • Complaint from local fishermen	To minimize disturbance on existing maritime traffic	i. CP-1 clearly indicates construction areas, dumping area and access routes by placing temporally buoys. ii. CP-1 cooperates with ADPEL to make sure temporally operation rules among relevant port users. iii. CP-1 informs their daily construction activities to ADPEL and fishing parties on regular basis. iv. CP-1 cooperates with ADPEL to plan operation route of dredgers and barges between dredging sites and dumping area. v. CP-1 establishes Safety Manual and Prevention Manual against accidents likely occur in water area.	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	SDPD C-P1	SD-IPCII ADPEL EAs DGSC	SD-IPCII ADPEL EAs DGSC
2	On Land Traffic Activity	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover • Material stock and fabrication	• Increase of on land traffic volume and congestion • Increase of on land traffic accident • Complaint from local community	To minimize disturbance on existing on land traffic	i. CP-2 select appropriate access routes to construction areas and material stock and fabrication yards considering existing road's capacity. ii. CP-2 use well-maintained vehicles for transportation purpose to ensure smooth traffic condition. iii. CP-2 indicate distinctive signs on construction related vehicles in accordance with Decree of Communication Minister No. KM69, 1993 to distinguish them form others. iv. CP-2 cooperate with Port Police Unit of Tanjung Priok (KP3) and Local Policemen (POLSEK) to place sign boards, traffic signs, traffic lights and to set up detours. v. CP-2 prepare dedicated parking areas and loading / unloading facilities to minimize waiting vehicles on loads and traffic congestion. vi. CP-2 schedule material and equipment transportation in nighttime, not in peak hour to avoid traffic congestion. vii. CP-2 instruct sub-contractors and vehicle drivers to follow traffic regulations and drive safely. viii. CP-2 compensate (repair and maintenance) road damage caused by their construction related works to ensure safe and smooth traffic. ix. CP-2 selects sea route transportation of bulky construction material in stead of land route by tracks as much as possible to avoid traffic congestion.	• On land construction area • Material stock and fabrication yard • Access road to / from TP port: JI. Jampea JI. Enggano JI. RE Martadinata JI. Sulawesi	During construction phase	SDPD C-P2 in collabo. with KP-3 and POLSEK	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC

No	Item of Impact	Source of Impact	Impact Indicator	Objective of Mitigation	Mitigation Measure	Mitigation Site	Mitigation Period	Institution for Mitigation		
								Executor	Supervisor	Report
B	**Physico-chemical Aspect**									
1	Air Quality	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover • Material stock and fabrication	• Degradation of air quality • Complaint from local community	To minimize air pollution	i. CP-2 uses low environmental impact type construction equipment to minimize air pollution. ii. CP-2 maintains engine-drive construction equipment in good condition to minimize gas emission. iii. CP-2 uses covering sheet on bulky construction material (sand and gravel) during transportation to avoid dust dispersion. iv. CP-2 places construction materials in stock yard far from residential area and sprinkle water on dry days. v. CP-2 selects sea route transportation of bulky construction material in stead of land route by tracks as much as possible to avoid dust pollution.	• On land construction area • Access road to / from TP port JI. Jampea JI. Enggano JI. RE Martadinata JI. Sulawesi • Material stock and fabrication yard	During construction phase	SDPD C-P2	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC
2	Noise and Vibration	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover	• Increase of noise and vibration level • Complaint from local community	To minimize noise and vibration pollution	i. CP-2 uses low environmental impact type construction equipment to minimize noise and vibration pollution. ii. CP-2 places noisy construction equipment at least 63m far away from housing and residential area. iii. CP-2 refrain intensive construction works, such as pile driving, beam placing for flyover) during busy time of local activities. iv. CP-2 selects sea route transportation of bulky construction material in stead of land route by tracks as much as possible to avoid noise and vibration pollution.	• On land construction area	During construction phase	SDPD C-P2	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC
3	Sea Water Quality	i. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	• Degradation of sea water quality • Complaint from local fishermen	To minimize degradation of sea water quality.	i. CP-1 selects less environmental impact dredging and dumping method. ii. CP-1 considers oceanographic condition especially current, tide during offshore work to localize turbid water dispersion. iii. CP-1 maintains maritime construction equipment in good condition to avoid oil leakage to sea.	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	SDPD C-P1	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC
4	Solid Waste (Dredged soil, gravel and removed concrete)	i. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	• Deposition of solid waste in and around TP port • Degradation of seabed sediment quality • Complaint from local fishermen	• To minimize solid waste in and around TP port • To minimize degradation of seabed sediment quality	i. CP-1 covers dredged material in transporting barge to avoid drop and leaking out to sea during transportation to dumping area. ii. CP-1 arranges transportation schedule of dredged material properly, considering dredger's and barge's maximum loading capacity. iii. CP-1 tries to reuse construction waste material as much as possible with environmentally friendly technology. iv. Location of dumping area must be approved by ADPEL and local government.	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	SDPD C-P1 in colabo. with TD-IPCII-TPB	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC

No	Item of Impact	Source of Impact	Impact Indicator	Objective of Mitigation	Mitigation Measure	Mitigation Site	Mitigation Period	Institution for Mitigation		
								Executor	Supervisor	Report
C	**Biological Aspect**									
1	Aquatic Biota	i. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	Change in quantity, diversity of plankton, benthos and nekton due to alteration of water and sediment quality	To minimize impact factor on habitat condition of plankton, benthos and nekton	i. CP-1 minimizes degradation of seawater and sea bed sediment quality as explained in **1B3** and **4.**	• Offshore construction area • Access route to / from dumping area • Dumping area	During offshore construction period	SDPD C-P1	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC
D	**Socio-economic and Cultural Aspect**									
1	Public Health	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover • Material stock and fabrication iii. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	• Complaint from construction workers and local community • Record of disease in local community	To minimize health hazard to construction workers and local residents in vicinity	i. CP-1 and CP-2 prepare safety measures for construction workers (insurance, first aid kit and medicine). ii. CP-1 and CP-2 train construction workers to promote understanding on health care and public sanitation. iii. CP-1 and CP-2 train construction workers to maintain and improve working environment. iv. CP-1 and CP-2 provide construction workers working in extreme condition with masks and ear protectors to minimize health hazard. v. CP-1 and CP-2 minimize degradation of air quality, sea water quality, sea bed sediment quality and noise and vibration level as explained in **1B1**,**2**, **3** and **4**.	• On land construction area • Offshore construction area • Local community (Kerulahan Tanjung Priok and Koja)	During construction phase	SDPD C-P1 C-P2	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC

Note: CP-1: Contractor of Package-1 (Breakwater, Channel and Basin Dredging), CP-2: Contractor of Package-2 (Road and Flyover), SDPD: Sub-Directorate of Port Development, ADPEL: Tanjung Priok Port Administration
SD-IPC-II: Sub-directorate Facility, Marketing & Business Development Directorate, IPC II, TD-IPC-II-TPB: Technical Division of IPC II, Tanjung Priok Branch, EAs: Environmantal Agency, BPLHD-DKI Jakarta and North Jakarta

APPENDIX 1102 Monitoring Plan

No	Item of Impact	Source of Impact	Monitoring Plan						Institution for Monitoring			Possible Feedback Auction (if monitoring results failed to meet monitoring criteria)
			Objective of Monitoring	Monitoring Method	Monitoring Site	Monitoring Period	Monitoring Frequency	Analysis Method	Executor	Supervisor	Report	
1	**Construction Phase**											
A	**Spatial Aspect**											
1	Maritime Traffic Activity	i. Mobilization and demobilization of construction material and equipment ii. Offshore work • Widening of channel & basin • Breakwater relocation • Dumping of dredged material	To monitor increase of maritime traffic volume and accident in and around TP Port caused by construction activities	i. Item Traffic volume and number of accident ii. Method • Collection of information on traffic volume and accident through ADPEL • Interview with local fishermen iii. Criteria Increased / Maintained / Decreased	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	Every week	Interview and statistical analysis method	SDPD C-P1 in collaboration with ADPEL	SD-IPCII ADPEL EAs DGSC	SD-IPCII ADPEL EAs DGSC	In case monitoring results were classified into "Increased", SDPD instructs C-P1 to review construction and transportation method and schedule. SDPD, C-P1, ADPEL and other parties concerned (fishermen, etc.) have meeting to develop additional mitigation measures, such as strengthening information network among parties concerned.
2	On Land Traffic Activity	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover • Material stock and fabrication	To monitor: • Increase of on land traffic volume and congestion • Increase of on land traffic accident In and around TP Port caused by construction activities	i. Item Traffic volume and number of accident ii. Method • Collection of information on traffic volume and accident through Port Police Unit of Tanjung Priok (KP3) and Local Policemen (POLSEK). • Interview with local residents iii. Criteria Increased / Maintained / Decreased	• On land construction area, especially flyover • Material stock and fabrication yard • Access road to / from TP port: JI. Jampea JI. Enggano JI. RE Martadinata JI. Sulawesi	During construction phase	Every week	Interview and statistical analysis method	SDPD C-P2 in collaboration with KP-3 and POLSEK	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC	In case monitoring results were classified into "Increased", SDPD instructs C-P2 to review construction and transportation method and schedule. SDPD, C-P2, KP-3, POLSEK and other parties concerned (local residents, etc.) have meeting to develop additional mitigation measures, such as setting alternative detour.
B	**Physico-chemical Aspect**											
1	Air Quality	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover • Material stock and fabrication	To monitor: degradation of air quality caused by construction activities	i. Item Air quality ii. Method Field sampling (8 times / 24 hours) and laboratory analysis: SO_2, CO, NO_2 and TSP iii. Criteria Indonesian Government Degree No. 41, 1999	• On land construction area • Access road to / from TP port JI. Jampea JI. Enggano JI. RE Martadinata JI. Sulawesi • Material stock and fabrication yard	During construction phase	Every 6 months (rainy / dry seasons)	NDIR, Spectro-photometric and Gravimetric method	SDPD C-P2	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC	In case monitoring results failed to meet criteria, and it is confirmed that pollutants have been originated from construction activities, SDPD instructs C-P2 to take additional mitigation measures, such as sprinkling water over earthwork site and access roads.

No	Item of Impact	Source of Impact	Monitoring Plan						Institution for Monitoring			Possible Feedback Auction (if monitoring results failed to meet monitoring criteria)
			Objective of Monitoring	Monitoring Method	Monitoring Site	Monitoring Period	Monitoring Frequency	Analysis Method	Executor	Supervisor	Report	
2	Noise and Vibration	i. Mobilization and demobilization of construction material and equipment ii. On land work • Inner road improvement • Construction of flyover	To monitor increase of noise and vibration level caused by construction activities	i. Item Noise and vibration ii. Method Field measurement (8 times / 24 hours) iii. Criteria DKI Jakarta Province Governor Decree No. 551, 2001	• On land construction area, especially flyover near mosque • Access road to / from TP port Jl. Jampea Jl. Enggano Jl. RE Martadinata Jl. Sulawesi	During construction phase	Every 6 months (rainy / dry seasons)	Direct measurement	SDPD C-P2	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC	In case monitoring results failed to meet criteria, and it is confirmed that pollutants have been originated from construction activities, SDPD instructs C-P2 to take additional mitigation measures, such as installation of noise prevention cover on construction equipment (pile driver, generator, concrete breaker, etc.).
3	Sea Water Quality	i. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	To monitor degradation of sea water quality caused by construction activities	i. Item Sea water quality ii. Method Field sampling from 2 layers, field measurement and laboratory analysis: • Every week Temperature, pH, Salinity, Turbidity (equivalent SS), DO • Every month COD, SS • Every 6 months (dry/rainy seasons) BOD, Coliform, T-N, T-P, Hg, As, Pb, Cr, Cd, Oil, PCB, PAH iii. Criteria • Indonesian Government Degree No. 51, 2004 and No. Kep-02 /MenKLH/I/1988 • Japanese Water Quality Standard	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	• Every 6 months (rainy / dry seasons) • Every month • Every week during maintenance dredging	Electrometric, Gravimetric, Titrimetric, and Atomic Absorption Spectro-photometer (AAS) method	SDPD C-P1	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC	i. Every week items: In case turbidity (equivalent SS) failed to meet criteria, and it is confirmed that pollutants have been originated from construction activities, watch results in subsequent 2 times. If failed in consecutive 3 times, SDPD instructs C-P1 to take additional mitigation measures, such as: • reducing daily dredging and dumping volume. • installation of silt screen. ii. Every month and 6 months items: In case monitoring results failed to meet criteria, and it is confirmed that pollutants have been originated from construction activities, SDPD instructs C-P1 to take additional mitigation measures considering nature of pollutants.

No	Item of Impact	Source of Impact	Monitoring Plan						Institution for Monitoring			Possible Feedback Auction (if monitoring results failed to meet monitoring criteria)
			Objective of Monitoring	Monitoring Method	Monitoring Site	Monitoring Period	Monitoring Frequency	Analysis Method	Executor	Supervisor	Report	
4	Solid Waste (Dredged soil, gravel and removed concrete)	i. Offshore work • Widening of channel & basin • Breakwater relocation • Disposal of dredged material	To monitor: • Deposition of dumping materials in and around TP port • Degradation of seabed sediment quality caused by construction activities	i. Item Sediment quality ii. Method Field sampling and laboratory analysis: Hg, As, Pb, Cr, Cd, Ignition loss, G-size iii. Criteria • Every 6 months Degrade / Maintained / Improved • Once before start dredging World Bank Technical Paper No. 126, Reference Value / Testing Value	• Offshore construction area • Existing navigation route • Access route to / from dumping area • Dumping area	During offshore construction period	• Every 6 months (rainy / dry seasons) in dumping route and dumping area • Once before start dredging at areas to be dredged	Gravimetric and Atomic Absorption Spectro-photometer (AAS) method	SDPD C-P1	SD-IPCII EAs DGSC	SD-IPCII EAs DGSC	i. Every 6 months items: In case results classified into "Degraded", and it is confirmed that degradation has been caused by project activities, SDPD instructs C-P1 to take additional mitigation measures, such as: • reducing daily dredging and dumping volume. ii. Once before start dredging items: In case monitoring results failed to meet criteria (Reference or Testing Values) conduct second survey within 1 month from 1st sampling. If 2nd results still failed to meet Testing values, SDPD instructs C-P1 to abandon disposal of dredged materials into proposed dumping area. Instead, contaminated dredged materials must be dumped into designated controlled containment dumping location. (see Fig. 10.4.14) If 2nd results still failed to meet Reference values but lower than Testing Values, SDPD instructs C-P1 to take additional mitigation measures, such as • smaller volume dumping into wider area within planned offshore dumping area.

Note: CP-1: Contractor of Package-1 (Breakwater, Channel and Basin Dredging), CP-2: Contractor of Package-2 (Road and Flyover), SDPD: Sub-Directorate of Port Development, ADPEL: Tanjung Priok Port Administration
SD-IPC-II: Sub-directorate Facility, Marketing & Business Development Directorate, IPC II, TD-IPC-II-TPB: Technical Division of IPC II, Tanjung Priok Branch, EAs: Environmantal Agency, BPLHD-DKI Jakarta and North Jakarta

APPENDIX 1103 Monitoring Criteria

Item	Parameter	Unit	Permissible Value
Air Quality	TSP	µg/m3	230 24hr (I)1
	NO2	µg/m3	150 24hr (I)1
	SO2	µg/m3	365 24hr (I)1
	CO	µg/m3	10,000 24hr (I)1
Noise Level	-	dBA	70 (I)2
Vibration Level	-	mm/sec	20 (I)2
Water Quality (Surface Layer)	pH	-	6.5 - 8.5 (I)3
	SS	mg/l	80 (I)3
	DO	mg/l	5 (I)3
	BOD	mg/l	20 (I)3
	COD	mg/l	80 (I)4
	T-N	mg/l	1 (J)
	T-P	mg/l	0.09 (J)
	Oil & Grease	mg/l	5 (I)3
	Coliform	MPN/100mg	1,000 (I)3
	Hg	mg/l	0.003 (I)3
	As	mg/l	0.012 (I)3
	Pb	mg/l	0.05 (I)3
	Cr6+	mg/l	0.005 (I)3
	Cd	mg/l	0.01 (I)3
	PCB	mg/l	0.01 (I)3
	PAH	mg/l	0.003 (I)3
Sediment Quality	T-Hg	mg/kg dry	0.3 (W)1 / 1.6 (W)2
	As	mg/kg dry	29 (W)1 / 85 (W)2
	Pb	mg/kg dry	85 (W)1 / 530 (W)2
	Cr6+	mg/kg dry	100 (W)1 / 480 (W)2
	Cd	mg/kg dry	0.8 (W)1 / 7.5 (W)2

APPENDIX 1104 Monitoring Locations