

1.11 GARBAGE DISPOSAL

1.11.1 Scope

- a The Contractor shall undertake the collection of and disposal of all garbage from within the Site, the Contractor's Site office, the Contractor's temporary facilities, the Engineer's Site office and other areas used in connection with the Works. Garbage collections shall be made at least twice each week and shall continue until completion of the Works.
- b Garbage shall be disposed of in a properly constructed incinerator followed by burial of the residue in an approved location. The Contractor shall submit the proposed design and layout of garbage disposal facilities for approval. Where available, garbage collection by local authorities shall be used in preference to disposal as noted above.

1.11.2 Payment

Separate payment will not be made for the provision for garbage disposal and the cost of this work shall be deemed to be included in the lump sum price entered in the priced Bill of Quantities for Contractor's Site Office and Facilities.

Payment for clearing of garbage is addressed in TS 1.

1.12 REMOVAL OF FLOATING RUBBISH

1.12.1 Scope

Removal of all floating rubbish which affects the progress of the Works shall be the responsibility of the Contractor.

All floating rubbish retrieved shall be removed from the Site in a manner for which the Engineer has given his prior approval.

1.12.2 Payment

Separate payment will not be made for the provision for Floating Rubbish Removal and the cost of this work shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.13 DIVERSION AND CARE OF WATER

1.13.1 General Requirements

The Contractor shall be responsible for the removal of all water encountered during the execution of the whole of the Works.

The Contractor shall design, construct and maintain all temporary diversion and protective works which are necessary for construction and to prevent surface, drainage and groundwater from entering excavations and shall furnish all materials required therefor.

The Contractor shall furnish, install, maintain and operate all necessary pumping and other equipment for dewatering the various parts of the Works on the surface, in open cut excavation and in the river channel and shall maintain the foundations and other parts of the work free from water as required for constructing each part of the Works and as required, and for a

period after any part of the Works is completed for inspection, safety or for any reason determined by the Engineer to be necessary.

The Contractor shall not interrupt or interfere with the natural flow of the Semarang River or of other existing drainage channels for any purpose without the written approval of the Engineer.

The Contractor shall not construct nor all to remain in place coffer dams in the Semarang River during the wet season (April to November).

The Contractor shall remove all water from the Sites of all construction work and shall keep the excavations free of water while excavating, preparing foundations, pile driving and while placing backfill or concrete or as otherwise required for completing the Works. The Contractor shall be responsible for and shall repair, at his expense, any damage to foundations, excavation slopes or any other parts of the Works caused by water, floods or by his failure to protect the Works in accordance with the requirements of this clause. Temporary diversion and protective works, conduits, and sumps shall be readily accessible at all times and the Contractor shall maintain in operating condition an assembly of standby transportable and portable lighting facilities which is adequate, as determined by the Engineer, to provide illumination, at short notice, to any or all of the temporary works.

All temporary cofferdams and protective work shall be removed or levelled as approved by the Engineer to give a neat appearance and so as not to interfere in any way with the operation or usefulness of the permanent works. Temporary cofferdams constructed within the boundaries of the permanent works shall be removed completely. Temporary cofferdams shall not be constructed on or against any part of the permanent works unless the Contractor can demonstrate that no damage to the permanent works will result and shall not be so constructed without the approval and the presence of the Engineer.

1.13.2 Payment

Payment for Coffering and Dewatering for specific items of work where payment items are included in the Bill of Quantities shall be made in accordance with Clause 1.2, Coffering and Dewatering, of the Technical Specification

For all other cases, no payment shall be made for complying with this general obligation of the Contractor described in this clause and the cost of this work shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.14 MAINTENANCE OF EXISTING PUBLIC ROADS

1.14.1 General

The Contractor shall maintain all roads within the vicinity which he uses for purposes of carrying out the Works required by this Contract

1.14.2 Contractor's Operations

- a If the Contractor's operations obstruct or hinder the passage of traffic on the roads described in this Clause, the Contractor shall provide and maintain for the duration of such disruption an alternative route, approved by the Engineer, of a standard not less than that of the road so affected.

- b Existing roads and bridges have their load limits and the Contractor shall be responsible for determining such load limits. Before moving any heavy construction traffic into highways, roads, and bridges, the Contractor shall make suitable arrangements with the relevant authorities and obtain their approval for the passage of such traffic.
- c The Contractor shall not travel tracked vehicles or equipment on any bituminous sealed road surface. Rubber tyred vehicles conforming to applicable load restrictions will be permitted to use bituminous sealed road surfaces.
- d All the work of improvements or modifications on the existing public roads made by the Contractor for his own convenience shall be at the Contractor's own risk and expense.

1.14.3 Maintenance of Roads

- a The Contractor shall be wholly responsible for maintenance of the public roads used by him in the execution of the Works.
- b In maintaining these roads the Contractor shall:
 - i reinforce to pass his traffic, if necessary, and keep in good working condition at all times all road structures, bridges, culverts, drains and other waterways;
 - ii patch potholes with approved materials, keep the road surfaces in good repair, and perform all grading and necessary resurfacing;
 - iii maintain all fenders, posts, guideposts, guard posts, rails, fencing, signs, signposts and other roadside structures;
 - iv keep road surfaces and shoulders free from all earth, mud, stones, timber, rubbish, and other debris and materials removed from the Works;
 - v adequately maintain cut-slopes and fill-slopes of the roads and appurtenant drainage ditches; and
 - vi keep the road surface watered where dust is likely to be a safety or health problem.

1.14.4 Payment

Separate payment will not be made for complying with the requirements of this Clause, and the cost of this work shall be deemed to be included in the various rates and lump sum prices entered in the priced Bill of Quantities.

1.15 PLANT, EQUIPMENT AND MATERIALS TO BE FURNISHED BY THE CONTRACTOR

1.15.1 General

1.15.1.1 Plant, Equipment and Materials to be Furnished by The Contractor

The Contractor shall furnish all items of plant, equipment and materials required for the execution of the Works except as otherwise provided for in the Contract.

1.15.1.2 Trades Names and Catalogue Numbers

Unless specifically stated otherwise, any reference in this Specification or on the Drawings to trade names or catalogue numbers or to a particular manufactured product does not imply that article or product so mentioned is the only one that may be supplied or used. Any reference so made is purely given as to the standard of the quality, class, type and finish of the items specified to be used. Articles or products of similar type and quality produced by other manufactures shall be submitted by the Contractor to the Engineer for approval for use in the Works.

1.15.1.3 Conformity of Plant, Equipment and Materials with Specification.

- a All plant, equipment and materials which form part of the permanent Works shall be new and shall conform to the standards provided in the Specification. Where the requirements for any plant, equipment and materials are not stated in this Specification, the plant, equipment and materials shall conform with the appropriate and most recent Indonesian, Japanese or American Standard or such other standard as the Engineer may approve.
- b The Contractor shall make diligent effort to procure the specified materials but where, because of priorities or other causes, materials required by the Specification are not available, substitutes may be used with the prior approval of the Engineer. The approval will state the amount of price adjustment, if any, to be made. The Engineer's decision as to whether substitution will be permitted and as to what substitute materials may be used will be final, binding and conclusive.

1.15.1.4 Payment

- a When a separate item, which includes the furnishing of any plant, equipment or materials, is provided in the Bill of Quantities, the cost of furnishing, transporting, storing and handling such plant, equipment or materials shall be deemed to be included in the rate or lump sum price entered for that item in the priced Bill of Quantities.
- b Where no separate item is provided in the Bill of Quantities for furnishing any plant, equipment or materials required to be furnished by the Contractor, the cost of furnishing, transporting, storing and handling such plant, equipment or materials shall be deemed to be included in the rates or lump sum prices entered in the priced Bill of Quantities for the items for which plant, equipment or materials are required.

1.15.2 Inspection of Plant, Equipment and Materials

- a Plant, equipment and materials furnished by the Contractor shall be subject to inspection in accordance with the Contract at any one or more of the following locations as determined by the Engineer:
 - The place of production or manufacture.
 - The shipping point.
 - The Site.
- b The Contractor shall furnish without additional charge all facilities, labour and materials reasonably needed for performing the inspections, examinations and tests as may be required by the Engineer.
- c The Contractor shall submit the Engineer all information covering the plant, equipment and materials required by the Engineer for the purpose

of inspection which shall in no way relieve the Contractor from his responsibility for furnishing plant, equipment and materials in compliance with the Specifications.

- d Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the rates and lump sums entered in the priced Bill of Quantities.

1.16 SAFETY, HEALTH CONTROL AND SECURITY

1.16.1 General

The Contractor shall be responsible for all safety, health controls and security and shall submit to the Engineer details of the organisation and regulations for these purposes.

1.16.2 Safety Precautions

1.16.2.1 General

The Contractor shall comply with any safety instruction given by the Engineer. In the performance of the Works, the Contractor shall exercise every reasonable precaution to protect from injury persons or property. The Contractor shall erect and maintain all necessary temporary fencing, barricades, barriers, signs and lights and provide fire alarm, fire extinguishing and fire fighting services at strategic points on the Site and adequate ventilation, lighting and safe working conditions for his workmen engaged in the performance of the Works. The Contractor shall adopt and enforce such rules and regulations as may be necessary and desirable in the work and in its supervision. Safety measures shall include but shall not be limited to those measures mentioned in this clause.

1.16.2.2 Safety Officer

The Contractor shall constantly employ during the progress of the Works an employee qualified in safety, and familiar with the type of work being performed, whose assignment shall include initiation of measures for the protection of health and the prevention of accidents and who shall see, by personal inspection, that all safety rules and regulations are enforced. The Contractor shall hold regularly scheduled safety meetings at least once each month with his Engineers, supervisors and foremen and, when directed, with the Engineer. The Contractor shall keep the Engineer advised as to when these meetings are to be held and shall provide the Engineer with a copy of the proposed agenda.

1.16.2.3 Temporary Fencing

The Contractor shall erect, maintain and remove suitable and approved temporary fencing to enclose such areas of the Permanent Works and areas of land occupied by the Contractor within the Site as may be necessary to implement his obligations under the Contract in approved manner. Where any temporary fence has to be erected alongside a road, footpath, or other public thoroughfare, it shall be of the type required by and shall be erected to the satisfaction of the Government authority concerned.

1.16.2.4 Lighting

- a In the event of night work being carried out, the Contractor shall provide sufficient lighting to ensure that in all places where work is in progress :
- i safe working conditions are provided for the Contractor's personnel and the Engineer;
 - ii the Works can be constructed in complete compliance with the Contract; and
 - iii a complete inspection of all Works in progress can be made by the Engineer.
- b Unless otherwise directed by the Engineer, the minimum service illuminance on ground or working surfaces to be provided for the various operations or work areas shall be as tabulated below :

ILLUMINANCE		
OPERATION OR AREA	Design Minimum	
	Value (Lux)	Measured Value (Lux)
Earthworks and excavation	50	20
Temporary Bridge	20	10
Access and haul roads where cross traffic or other hazardous conditions exist	20	10
Concrete placing	100	50
Maintenance shops and Auxiliary buildings	300	200

- c All moving equipment or plant used during night operations or in tunnels shall be equipped with sufficient lights and reflectors.
- d Not less than fourteen (14) days before the start of any night operations, the Contractor shall submit to the Engineer his proposals for lighting in the areas in which he proposes to work at night. The Contractor shall modify the proposals if directed and shall not begin operations at night, until the proposals for lighting have been approved.
- e The submission to or approval by the Engineer of the Contractor's proposals for lighting shall not relieve the Contractor of any of his liabilities or obligations under the Contract.

1.16.2.5 Signs

- a The Contractor shall provide all necessary signs for the Works. These shall include, but not be limited to
- i standard road signs;
 - ii warning signs;
 - iii danger signs;
 - iv control signs;
 - v safety signs; and
 - vi direction signs.

- b Wording on all signs shall be in the Indonesian language. The size, colour, lettering and location of all signs will be subject to approval, and attention shall be paid to international system of signs.
- c The Contractor shall maintain all signs placed by himself as well as those placed by the Employer.
- d If the Engineer considers that the system of signs provided by the Contractor is inadequate to ensure safety, or unsatisfactory in other respects, the Contractor shall add to, amend, or otherwise change the system to the satisfaction of the Engineer.

1.16.2.6 Other Safety Measures

- a When working in the vicinity of electrical equipment and in the interest of safety and security, the Contractor shall complete the erection of any safety fencing around electrical and mechanical equipment by the time that the said apparatus is connected to any electrical supply.
- b Explosives - in the use, handling and storage of explosives, the Contractor shall comply with the guidelines given in Clause 1.16.4 and with all statutory regulations of Indonesia, and the 'Safety Regulations for Sensitised Ammonium Nitrate Blasting Agents' (United States Department of the Interior, Bureau of Mines). The handling or use of explosives shall be discontinued during the approach and progress of a thunderstorm. All persons shall be removed from danger areas to a place of safety during such periods. The Contractor shall supply and install a suitable approved instrument to continuously measure atmospheric electric activity during blasting operation and to sound an alarm when such activity reaches danger levels.
- c Use of Lasers - The use of lasers on the Site shall be done with due regard to eye hazard and all personnel working on the site shall be warned accordingly.
- d Safety instructions - Within sixty (60) days of receiving the Letter of Acceptance, the Contractor shall, at his own cost, supply and issue to his employees, those of his subcontractors and the Engineer, in English, Bahasa Indonesia and in other languages used by his employees at the Site, a booklet containing safety regulations based on good practice. The booklet shall be pocket size and issued to each person employed at the Site. Proof copies of the booklet shall be submitted to the Engineer for approval before printing and amendments shall be made to the booklet to his entire satisfaction. The Contractor shall issue the booklet immediately after printing as required by this clause and ensure that all employees are fully conversant with the instructions. Safety instructions shall deal with all safety including but not limited to the following items where relevant to the Works :
 - i protective clothing, headgear and footwear;
 - ii use of lifting equipment;
 - iii use and storage of explosives;
 - iv earthmoving;
 - v formwork and reinforcement erection;
 - vi concreting;
 - vii structural steelwork;
 - viii compressed air;

- ix welding and painting;
- x routine for accidents or fires; and
- xi watchman, warning notices and barriers.
- xii electrical safety

The Contractors shall allow for ten (10) booklets in the English language for the use of the Engineer.

- e Accident Report - The Contractor shall promptly report to the Engineer, in a form to be prescribed, all accidents involving death or serious injury to staff or workmen, and shall furnish monthly reports of all accidents to staff or workmen involving loss of time, giving such information as may be directed.

1.16.2.7 Provision of Safety Equipment

All persons employed on the Works are to be provided with safety equipment appropriate to the tasks upon which they are engaged such as helmets and safety equipment shall be compulsory as deemed necessary by the Engineer.

1.16.2.8 Payment

Separate payment will not be made for complying with the provisions of this Clause and all costs shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.16.3 Sanitary Arrangements

1.16.3.1 Scope of Work

- a The Contractor shall keep the Site in a clean and hygienic condition, and shall provide and maintain sanitary conveniences for use of the persons employed in the Works to the extent, in the manner and at such places as approved by the Engineer and by any Government health authority concerned. All persons connected with the Works shall be enjoined to use these conveniences.
- b The Contractor shall install, operate and maintain an adequate treatment process for disposal of sewage from all temporary buildings including houses, offices, camps, etc., to be constructed by the Contractor, and from all temporary toilet facilities at the Site. Sewage shall be disposed of in a hygienic manner. The Contractor shall post notices and take such other necessary precautions as may be necessary to keep the Site clean. The sewage treatment plant shall be subsequently removed upon completion of the Contract.

1.16.3.2 Payment

Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the item in the priced Bill of Quantities for Contractor's Site Office and Facilities.

1.16.4 Explosives and Fuels

1.16.4.1 General

- a The Contractor shall make arrangement for the transportation, storage and handling of explosives and fuels in a safe manner to protect the public in accordance with the laws and security regulations of Republic of Indonesia.
- b The Contractor shall obtain all necessary licences and shall pay all fees and charges as may be necessary for moving explosives and fuels from place to place and storing at the same. The Contractor shall prepare and file all applications and obtain the approvals from the authorities of the Government of Indonesia concerned.
- c The Contractor shall furnish and install an efficient warning system, such as, but not limited to sirens and signs, so that adequate warning may be given to all workers and the public endangered by the charging or firing the explosives. The Contractor shall ensure, prior the discharging an explosive, that the area to be blasted is clear of all residents, pedestrians, and vehicular traffic. In addition, he shall post all flagmen on each of the roads leading to the areas so as to stop and prevent any traffic and person from entering the area until the "all clear" notice is given.
- d Explosives shall be stored at a safe distance from the public areas, work areas and living quarters. The location of explosives magazines compound shall be as approved by the Engineer. The compound shall be surrounded with barbed wire and the magazine shall be protected by safety locks, shall be well-ventilated, and shall be fitted with lightning arresters. The explosive magazine shall be surrounded by earth dikes, if so required by safety regulations or directed by the Engineer, according to the location of the Site of the magazine. Adequate air space shall be provided between the ceiling and the roof to prevent internal room temperatures rising to dangerous levels. The Contractor shall not make use of any explosive without the approval of the Engineer. Approval by the Engineer shall not relieve the Contractor from any of his obligations and responsibilities for all blasting operations.
- e The Contractor shall keep a record of use of each kind of explosive, detonator and lead wire by preparing a daily record of warehousing, delivery and in-stock quantities, and shall report periodically to the Engineer as directed.
- f If electrical blasting is used, possible electric discharge in the ground due to thunderstorm, electric lines, electric motors, etc., shall be carefully observed. As soon as a discharge which could affect the safety level of detonators is noted or anticipated, electrical blasting operation shall be interrupted.
- g Above-ground gasoline and liquefied petroleum gas storage tanks shall not be located within the limits of the camp Site or closer than 1,000 meters to any building in the Site.

1.16.4.2 Payment

Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the item in the priced Bill of Quantities for Contractor's Site Office and Facilities.

1.16.5 Fire Prevention

1.16.5.1 General

The Contractor shall take every precaution to prevent fire occurring on or about the Site. The Contractor shall comply with the laws and regulations of the appropriate Government authority relating to fires and shall provide fire fighting equipment, which the Engineer considers to be suitable and adequate, ready to use in all structures, buildings or the works under construction, including his labour camps and ancillary buildings. The Contractor shall maintain such equipment and such additional fire fighting equipment as may be required, in good working condition until the Works are accepted by the Employer.

The Contractor shall extinguish promptly any fire which may occur on the Site wherever the fire may originate. In this regard, he shall employ all requisite equipment and manpower for fire fighting up to the limits of his equipment and manpower employed at the Site including the equipment and manpower of his subcontractors.

1.16.5.2 Payment

Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the various rates and lump sums entered in the priced Bill of Quantities.

1.16.6 Earthing

1.16.6.1 General

All appliance and facilities which are possibly subject to lightning strikes shall be electrically grounded and the effectiveness of such grounding shall be periodically checked by the Contractor.

1.16.6.2 Payment

Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the various lump sums and rates entered in the priced Bill of Quantities.

1.16.7 Medical and Health Services

1.16.7.1 General

- a The Contractor shall make his own arrangement on the Site for treatment of casualties in a first aid unit in conformity with the requirement of all duly constituted medical and health authorities. The Contractor shall provide such first aid units and shall be responsible for and bear all costs in connection with the first aid services including removal by ambulance of injured or sick employees to hospital in Semarang or other places.
- b The Contractor shall provide first aid services for the Employer's and Engineer's staff working on the Site.

1.16.7.2 Payment

Separate payment will not be made for medical and health facilities provided by the Contractor for his employees, for his subcontractors and the

Employer's and Engineer's staff, as required by this clause, and all costs shall be deemed to be included in the various rates and lump sums entered in the priced Bill of Quantities.

1.16.8 Security

1.16.8.1 Responsibility of the Contractor

- a The Employer will specify overall security requirements for the project and the Contractor shall perform to such requirements and be responsible for such action of his personnel in respect of such requirements.
- b The Contractor shall be responsible for the security of the Works and the Employer's Quarters at Site and shall provide and maintain continuously and adequate security force to fulfil these obligations. The duties of the Contractor's security force shall include, but not be limited to, maintenance of order on the Site, provision of all lighting, fencing, guards, flagmen, all other measures necessary for the protection of the Works within the Site, all material delivered to the Site, the public, and all persons employed in connection with the Works, continuously throughout working and non-working periods, including nights, Sundays and holiday, for the duration of the Contract.

1.16.8.2 Payment

- a. Separate payment will not be made for the provisions of security services and all costs shall be deemed to be included in the various rates and lump sum prices entered in the priced Bill of Quantities.

1.17 SURVEY AND MEASUREMENT OF THE WORKS

1.17.1 Bench Mark and Reference Point

Horizontal Control

Reference points have been established on the Site by the Employer as shown on the Drawings or as advised by the Engineer. The Contractor shall use the co-ordinates of such reference points in setting out the Works. Any reference points damaged as the result of action by the Contractor shall be replaced by the Contractor at his own expense.

The Contractor may establish temporary reference points for his own convenience but each point shall be of a design and at a location approved by the Engineer. Each point shall be accurately related to the points established by the Employer.

Vertical Control

The Site is subject to ongoing subsidence and all elevations previously established by the Employer are unreliable.

The Contractor is required to establish new bench marks as described below which will then be used as the basis for all construction irrespective of any settlement which may occur during the construction period. In addition, for the purposes of settlement monitoring the Contractor shall measure the elevations of 8 previously-established bench marks in the vicinity of the site as described below.

The Contractor shall construct a minimum of four (4) bench marks in areas which will not be affected by the Works in the vicinity of the Site to be used for all vertical control surveying operations. A bench marks shall consist of a concrete block measuring at least 700 mm deep by 500 mm base width with

a 20 mm dia steel rod vertically embedded in it an protruding for a distance of 20 mm at the top to act as a levelling point. Alternatively, clearly identifiable, rigid, parts of existing major structures may be used. The choice of bench marks and/or the design of constructed bench marks and their locations shall be subject to the approval of the Engineer.

The elevations of such bench marks shall be established by means of a closed levelling traverse conducted by a specialised firm of surveyors engaged by the Contractor. The maximum permitted elevation difference error shall be $10\sqrt{D}$ mm where D is the length of the traverse expressed in km. The reference for the levelling traverse shall be a government bench mark (TTG) to be nominated by the Engineer located on firm high ground in Semarang City where subsidence is not occurring. This survey shall be carried out (i) initially, (ii) after 1 year, (iii) after 2 years and (iv) after 3 years.

The Contractor may establish temporary bench marks for his own convenience but each point shall be of a design and at a location approved by the Engineer. Each point shall be accurately related to the main reference bench marks described above.

1.17.2 Responsibility for Setting Out

The Contractor shall be solely responsible for the correct setting out of the Works and shall employ experienced and qualified surveyors approved by the Engineer.

The Contractor shall furnish all materials, labour and equipment including stakes, templates, patterns, platforms and special labour that may be required by the Contractor in setting out any part of the Works. The Contractor shall use survey equipment of the type and accuracy to permit correct setting out and control of the Works.

The Contractor's obligations for surveying shall include the surveying of the original surface levels where works are to be performed. The method used and spacing of cross-sections shall be agreed by the Engineer prior to commencement of the survey. The spacing of cross sections shall be 30 m for the Semarang River and 20 m for the Asin River.

Before surveying the original surface levels to be plotted in the working drawings as described in Clause 1.4.4, the Contractor shall give the Engineer at least 7 days notice before commencing such survey in order that the Engineer or his representative can witness and verify levels so determined. The original surface level determined shall be subject to the Engineer's approval.

Owing to the very soft mud in the bed of the Semarang and Asin rivers, a foot plate of a size approved by the Engineer or similar device to prevent excessive penetration into the mud shall be attached to all levelling staves.

The Contractor shall co-operate with the Engineer in checking the setting-out and in performing the measurement surveys for record and payment purposes. The Contractor shall render all necessary assistance to the Engineer and shall provide, as required for the use of the Engineer, sufficient quantities of pegs, poles, straight edges, stagings, mounds, templates, profiles, survey assistants, labourers and transport for checking the Contractor's setting-out and measurement of the Works.

1.17.3 Survey Data and Calculations

The Contractor shall submit all survey data, information, calculations, results and records to the Engineer as soon as they are available.

1.17.5 Payment

Payment for surveying shall be made at the lump sum entered in the priced Bill of Quantities. Monthly progress payments shall be made in proportion to the progress of the Work.

1.18 OTHER ITEMS

1.18.1 Information Board

The Contractor shall provide a free-standing board for the purpose of providing information about the project to the public. The board shall be not less than 2 m x 1.5 m. The information to be displayed and the location shall be directed by the Engineer. The design of the display and the supporting structure shall be subject to the Engineer's approval.

1.18.2 Securities and Insurance

1.18.2.1 Performance Security and Advance Payment Security

The Contractor shall furnish an Advance Payment Security and a Performance Security and in accordance with Clause 52 of the Conditions of Contract to ensure the refund of the Advance Payment and for the due performance of the Contract respectively.

1.18.2.2 Insurance

The Contractor shall effect certain insurances relating to the Contract in accordance with Clause 13 of the Conditions of Contract. In handling compensation to workmen under the above Clauses, the Contractor shall arrange that any compensation amount determined shall be paid without delay by the Contractor to the workmen entitled to such compensation irrespective of the time for payment of insured amount from the Insurance company to the Contractor.

1.18.2.3 Payment

Separate payment will not be made for complying with this Clause and the Conditions of Contract and all costs shall be deemed to be included in the rates and lump sums for the various items entered in the priced Bill of Quantities.

1.18.3 Audits by the Employer

1.18.3.1 General

The Employer shall be entitled at his discretion to conduct audits as necessary for his own investigation in connection with :

- a Cost incurred in relation to any compensation event as provided in clause 44 of the Conditions of Contract;
- b Cost incurred in the event of termination of the contract as provided in Clause 59 or 63 of the Conditions of Contract; and
- c Any other costs that the Contractor may claim to the Employer, which are not specifically covered by the terms of the Contract.

1.18.3.2 Records

The Contractor is obligated to keep accurate and up-to-date accounts and records concerning the above items.

1.18.3.3 Payment

Separate payment will not be made for complying with the requirements of this Clause and all costs shall be deemed to be included in the rates and lump sums entered in the priced Bill of Quantities.

1.18.4 Liquidated Damages

1.18.4.1 Amount of Liquidated Damages

If the Contractor should fail to complete the Works by the Intended Completion Date as defined in Clause 1.1 of the Conditions of Contract, the Contractor shall pay to the Employer liquidated damages pursuant to clause 49 of the Conditions of Contract.

1.18.4.2 Maximum Damages

The maximum amount of liquidated damages payable or allowable to the Employer will be limited to the percentage of the final Contract Price stated in the Contract Data.

1.18.4.3 Other Rights of the Employer

Nothing contained in this Clause shall prejudice or affect any other rights of the Employer under the Contract.

1.18.5 Monthly Statement

1.18.5.1 General

The Contractor shall submit a monthly statement in accordance with the requirements of Clause 42 of the Conditions of Contract. The monthly statement shall be accompanied by copies of all survey notes, records of measurements and calculation which the Engineer has directed to be prepared by the Contractor in support of the amounts claimed for the claimed for the work executed.

1.18.5.2 Payment

All costs associated with the submission of the monthly statement shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.18.6 Hours and Days of Working

Before commencement of work on the Contract, the Contractor shall notify the Engineer, in writing, of the days, hours and of the number of shifts that he proposes to work and shall give at least 48 hours notice to the Engineer of any changes to such hours of working and/or number of shifts that may be necessary during the currency of the Contract.

The Contractor shall not carry out work between sunset and sunrise without the prior written approval of the Engineer.

1.18.7 Prevention of Water Pollution

1.18.7.1 Scope

The Contractor's construction activities shall be performed by methods that prevent entrance or accidental spillage of solid matter, contaminants, debris and other objectionable pollutants and wastes into streams, flowing or dry water courses and underground water sources. Such pollutants and wastes include but not restricted to refuse, garbage, cement, concrete, sewage effluent, industrial waste, oil and other petroleum products. The Contractor shall submit his plan showing the location and design of the water pollution prevention systems and facilities to the Engineer for approval.

1.18.7.2 Payment

Separate payment will not be made for complying with the provisions of this Clause, and the costs shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.18.8 Noise Control

1.18.8.1 Noise Level Limitations

The Contractor shall conduct all his operations such that noise levels created are within the limits stated in the decree of the State Minister of Environment Nomor : Kep - 48/Men LH/1996, dated 25/10/96.

1.18.8.2 Payment

Separate payment will not be made for complying with the provisions of this Clause, and the costs shall be deemed to be included in the rates and lump sum prices entered in the priced Bill of Quantities.

1.19 MEASUREMENT AND PAYMENT (GENERAL)

The method of measurement shall be in accordance with the methods and procedures stipulated in the particular clauses and as set forth herein.

The various unit rates and lump sums for each work item entered in the priced Bill of Quantities shall be deemed to have included full compensation for supplying all materials, labour, equipment consisting of owning, operation and repair costs, and other expenses necessary to complete the work in accordance with the Drawings, the Specifications, the instructions of the Engineer and compliance with all other obligations, including rectification of defects, as required under the Contract.

1.19.1 Tolerance for Measurement

This clause explains the tolerance for measuring the dimensions of the work and the method of calculation of the quantity of the work completed in the following categories:

(1) Category - 1 (linear metres, m)

The work item shall be measured to the second decimal place of a metre and be approved by the Engineer at every work stage on an inspection sheet.

The amount of payment will be determined by multiplying the measured length by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Drain Pipe, PVC Pipe Dia. 100 mm
- Expansion Joint
- Furnishing and Driving PC Test Pile, Dia. 500 mm, Type A
- Furnishing and Driving PC Sheet Pile (t=220 mm)
- Furnishing and Driving PC Piles, Dia. 500 mm, Type A
- Furnishing and Driving Steel Sheet Pile, Type II
- Log Pile, Dia. 150 mm L=2.0 m
- Log Pile, Dia. 150 mm L=3.0 m
- Log Pile, Dia. 150 mm L=4.0 m
- Utility Pipe, PVC Pipe Dia. 150 mm

(2) Category - 2 (square metres, m²)

The work item shall be measured to the second decimal place of a square metre by multiplying the two dimensions, measured to two decimal places, and rounded off, and approved by the Engineer at every work stage on an inspection sheet.

The amount of payment will be determined by multiplying the measured area by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Concrete Block Pavement
- Joint Filler, 10mm thick (Elastic Material)
- Pointing
- Chipping of Existing Dike Surface
- Sodding

(3) Category - 3 (cubic metres, m³)

The work item shall be measured to the second decimal place of a cubic metre by multiplying the three dimensions, measured to two decimal places of a metre, and rounded off and approved by the Engineer at every work stage on an inspection Sheet.

The amount of payment will be determined by multiplying the measured volume by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Aggregate Class A
- Aggregate Class B
- Backfill
- Backfill with Cobble
- Backfill with Gravel

- Backfill with Sandy Soil
- Backfill with Selected Soil
- Cement Mortar
- Cobble Stone
- Common Channel Excavation including Hauling and Treatment of Contaminated Soil
- Common Excavation including Hauling and Spoiling
- Concrete Kerb
- Concrete, Type B including Formwork
- Concrete, Type C1 including Formwork
- Concrete, Type C1 including Formwork and Falsework
- Concrete, Type C1 including Formwork, Scaffolding and Falsework
- Concrete, Type E including Formwork
- Embankment
- Excavation below Water Level including Hauling and Treatment of Contaminated Soil
- Gabion Mattress t=500mm (Galvanized)
- Gravel Bedding
- Gravel Filling
- Sand Bedding
- Secondary Concrete, Type C2
- Stripping of Top Soil
- Structural Excavation
- Structural Excavation with Shoring
- Wet Stone Masonry

(4) Category - 4 (Number {No.} or Set)

The work item shall be measured to the exact number of items or sets installed and approved by the Engineer at every work stage on an Inspection Sheet.

The amount of payment will be determined by multiplying the number by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Demolition of Existing Pumping Stations
- Elastomeric Bearing Pad (350 x 280 x 73.)
- Rubber Sheet (400 x 100 x 30)
- Supply of Backhoe, 0.35 m³
- Supply of Dump Truck, 8 t
- Supply of Garbage Container, 6 m³
- Supply of truck Crane, 2.2 t
- Weep Hole, Dia. 50 mm
- Diesel Engine Units
- Fuel Service Tank
- Fuel Transfer Pump
- Furnishing and Installing Main Pump Units
- Gate Leaf
- Gear Boxes
- Guide Frames
- Hoist
- Overhead Crane
- Stop Log

(5) Category - 5 (mass)

a) (Mass in kg)

The work item shall be measured to the second decimal place of a metre and multiplied by the approved mass per metre at every work stage on an inspection sheet.

The amount of payment will be determined by multiplying the calculated quantity by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Deformed Reinforcing Bars
- Hand Rail
- Safety Hand Rail (Type-I)
- Safety Hand Rail (Type-II)
- Dowel Bar. Dia. 19mm, 1.0 m long (round bar and PVC)

b) (Mass in tonne) Note: 1 tonne = 1000 kg mass

The mass shall be determined by reference to delivery notes from the specialised supplier, duly approved by the Engineer or his representative, to the accuracy of the third decimal place of a tonne (1 kg).

The amount of payment will be determined by multiplying the approved quantity by the unit rate and then rounding the result to the nearest integer.

The following items are to be included in this category :

- Asphalt Concrete
- Asphalt Treated Base

(6) Category - 6 (Lump Sum Item)

The method of measurement and payment shall be as set out in the respective payment clause for each of the following items for which payment is by lump sum.

- Cable Connection Works
- Auxiliary Drainage Pump System
- Clearing of Garbage
- Coffering and Dewatering
- Contractor's Site Office and Facilities
- Control Panel for Auxiliary Drainage Pump
- Demolition of Existing Revetment
- Door
- Drawings
- External Works
- Felling and Grubbing of Trees
- Fuel Tank and Accessories
- Garage
- Generator System
- Grounding
- Inspection and Test
- Ladder
- Local Switch
- Main Control Panel
- Maintenance Tools
- Management Office
- Mobilization and Demobilization

- Pipe Connection Works
- Piping System
- Precast Concrete Panel
- Precast Concrete Panel including erection
- Precast Prestressed Concrete Beam including tensioning and erection
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DIVISION B
TECHNICAL SPECIFICATIONS
CIVIL WORKS

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SECTION TS 1. PREPARATORY WORKS

1.1 GENERAL

This section of the Technical Specification covers the preparatory works to be carried out by the Contractor .

The work shall include, but not be limited to :

1. Felling and Grubbing of Trees
2. Coffering and Dewatering
3. Demolition works
4. Clearing of Garbage
5. Relocation of Existing Facilities

1.2 FELLING AND GRUBBING OF TREES

1.2.1 Scope

Existing trees occupy part of the site where works are to be performed and are therefore required to be entirely removed and disposed of.

The work shall consist of felling, cutting into manageable lengths, grubbing of stumps and roots, removal of all timber, leaves and debris from the site. The material shall be disposed of, off-site, in a manner approved of by the Engineer.

Where directed by the Engineer, the holes resulting from grubbing operations shall be filled with approved materials which shall be placed and compacted to the same density as the adjoining soil.

1.3 COFFERING AND DEWATERING

1.3.1 General

The Contractor shall provide coffering and dewatering wherever it is required in accordance with his general obligations for diversion and care of water as described in clause 1.13 of the General Specification.

The work shall include the provision of all labour, material and equipment for the construction of coffer dams and other equipment required for dewatering the areas to be protected from water during the course of their construction.

The Contractor shall submit to the Engineer for his approval three copies of Drawings , showing his proposed method of cofferdam construction and of the type and number of units of dewatering equipment to be used. Construction shall not commence until the Engineer's approval has been given. Such approval shall not relieve the Contractor of his obligations for the adequacy of the cofferdam or of the sufficiency of the dewatering equipment.

The Drawings showing the Contractor's proposals for cofferdams shall be consistent with the Construction Plan described in Clause 1.5.3 of the General Specification and in particular, shall comply with the mandatory requirements described in clause 1.5.3.2 regarding coffering in the Semarang River.

1.3.2 Method of Construction

Cofferdams shall be constructed in accordance with the design approved by the Engineer. Where sheeting is used it shall be carried well below the bottom of footings and shall be well braced and shall be as water-tight as practicable. The clearance between the inner face of coffer dams and the outer face of permanent works to be constructed shall be 600 mm in order to allow sufficient space for formwork, access and pumping equipment.

Cofferdams which move out of position due to any cause during the course of the work so as to endanger the permanent works or to reduce the clearance specified above shall be corrected at the sole expense of the Contractor.

Cofferdams shall be constructed so as to protect green concrete against damage from the effects of rising river level and to prevent damage to foundations of the permanent works damage caused by erosion. Struts or braces shall not extend to any part of the permanent works without the approval of the Engineer. Following completion of the portions of the permanent works under the protection of the coffering works, the cofferdams shall be removed in such a manner as not to disturb or damage the finished work.

The removal of cofferdams shall include the excavation and disposal of all temporary earth fill used as part of cofferdams and the complete reinstatement of the area to the approval of the Engineer.

1.3.3 Dewatering

Pumping for the inside of any coffered area shall be done in such a manner as to preclude the possibility of damage to the permanent works and, in particular, the carrying away of concrete materials.

No pumping shall be carried out during the placing of concrete or for a period of 24 hours thereafter unless it is done from a suitable sump, separated from the concrete work by a water-tight wall.

1.4 DEMOLITION WORKS

1.4.1 General

The work consists of the complete demolition and removal of the following:

- existing concrete and masonry revetments which are required to be removed for the purposes of constructing the permanent Works, and;
- existing pumping stations along the Asin River
- existing road pavements

Demolition shall include the demolition of the entire structure or item described down to and including its foundations unless otherwise instructed in writing by the Engineer.

1.4.2 Method of Execution

Prior to commencement of demolition, the Engineer shall direct the Contractor which, material shall be regarded as salvageable. Following such directive, all salvageable materials shall remain the property of the Employer or other private owners as advised by the Engineer and shall be transported and stacked at locations as directed by the Engineer.

Structures to be demolished shall be broken into units of sufficiently small size so as to be safely handled and removed from the site.

Road pavements shall be broken by hand or by mechanical equipment into units of sufficiently small size so as to be safely handled and removed from the site.

All non-combustible materials shall be transported to a dumping site approved by the Engineer then spread and buried to the approval of the Engineer.

Any combustible material shall be removed from the site and burnt.

Demolition of the existing pumping stations shall not be commenced until the provision of alternative pumping facilities as described in clause GS 1.5.3.2 of the General Specification have been complied with and the Engineer has informed the Contractor, in writing, that such demolition may commence.

1.5 CLEARING OF GARBAGE

1.5.1 General

The work consists of the complete removal from the Site and disposal of accumulated garbage from areas of the Site where Works are to be carried out.

1.5.2 Method of Execution

Garbage shall be loaded onto trucks and hauled to garbage disposal facilities administered by the local authorities for disposal.

Fees levied by the local authorities for disposing of garbage shall be borne by the Contractor.

1.6 RELOCATION OF EXISTING UTILITIES

1.6.1 General

The work consists of the following:

- Locating all existing above-ground and underground utility services which will be affected by the Works.
- Relocating the existing utilities to positions clear of the Works
- Paying all of the cost relating to such relocation.

The utilities concerned include, but are not limited to, of all existing above-ground and underground utility services which will be affected by the Works including electric cables, telephone cables, water pipes and associated facilities such as poles, ducts, distribution panels, transformers, valves, etc.

The main area in which existing utilities are to be relocated is the construction area for the Asin Box Culvert which is a street in a built-up area. Other utilities requiring relocation may exist in other areas but are considered to be low in number.

It shall be the responsibility of the Contractor to locate, relocate or arrange for relocation of utilities by the responsible authorities in a timely manner.

1.6.2 Method of Execution

The extent of the Works shall be set out and the locations of all existing utility services therein shall be determined by means of visual inspection, consultation with utility authorities, cable/pipe detecting equipment, exploratory trenches and other means as appropriate. The location of existing utilities shall be made as soon as practicable after award of contract in order to avoid delaying implementation of the Works.

Utility services, which the authorities responsible for such service permit to be relocated others, shall be relocated by the Contractor in a manner complying with the requirements of the respective authorities.

Other utilities shall be relocated by the authorities responsible for the services. In such cases the Contractor shall pay all of the costs involved.

Accurate records of the positions of all relocated utilities shall be kept and shown on as-built drawings.

1.7 MEASUREMENT AND PAYMENT

1.7.1 Felling and Grubbing of Trees

Payment for felling and grubbing of trees completed to the Engineer's approval will be made at the lump sum entered in the priced Bill of Quantities which includes the entire cost of completing the work including materials, labour, equipment, transportation, disposal of materials, cleaning up and all associated costs.

Items to be paid under this clause are as follows:

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Felling and Grubbing of Trees	L.S.

1.7.2 Coffering and Dewatering

Payment shall be made for each system of cofferdam, for the dewatering of the enclosed area within, and the subsequent removal of the cofferdam and all associated equipment, to the approval of the Engineer.

Payment of each of the lump sums for coffering and dewatering shall be as follows:

- 40 % on completion of the cofferdam
- 30 % on completion of all dewatering following completion of the permanent works protected by the cofferdam
- 30 % on the complete removal of the cofferdam to the approval of the Engineer

Payment for coffering and dewatering shall include the entire cost of completing the work including materials, labour, equipment, transportation and all other associated costs.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Coffering and Dewatering	L.S.

1.7.3 Demolition Works

Demolition of Existing Pumping Stations

Measurement shall be made of the number of existing pumping stations demolished in accordance with clause TS 1.4.2 of the Technical Specification.

Payment shall be made at the rate entered in the priced Bill of Quantities which shall include the entire cost of completing the work including materials, labour, equipment, transportation, and all other associated costs including allowance for delaying the execution of this work until the Asin Pumping Station is operational.

Demolition of Existing Revetments

Payment shall be made for each section of existing revetments demolished in accordance with clause TS 1.4 of the Technical Specification, to the approval of the Engineer. Payment shall be made in accordance with the lump sums for the various sections of existing revetments to be demolished entered in the priced Bill of Quantities which shall include the entire cost of completing the work including materials, labour, equipment, hauling to disposal area, spreading and handling material at disposal area and all other associated costs.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Demolition of Existing Pumping Stations	No.
Demolition of Existing Revetment	L.S.

1.7.4 Clearing of Garbage

Payment shall be made for areas to be cleared of garbage in accordance with clause TS 1.5 of the Technical Specification, to the approval of the Engineer.

Payment shall be made in accordance with the lump sums entered in the priced Bill of Quantities which shall include the entire cost of completing the work including materials, labour, equipment, hauling to approved garbage disposal area, payment of dumping fees all other associated costs.

Categories of work to be paid under this clause are as follows:

Pay Item No.	Description	Unit of Measurement
B.1.2	Clearing of Garbage	L.S.

1.7.5 Relocation of Existing Utilities

Payment shall be made for the relocation of utilities carried out in accordance with clause TS 1.6 of the Technical Specification to the approval of the Engineer.

Payment shall be made in accordance with the lump sums entered in the priced Bill of Quantities which shall include the entire cost of completing the work including materials, labour, equipment, payment of fees to utility authorities, payment of costs of relocation work required to be performed by the utility authorities or their specialised contractors all other associated costs.

Progress payment shall be made in accordance with the break down of the lump sums submitted by the Contractor with his bid.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Relocation of Existing Utilities	L.S.

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STATE OF NEW YORK
IN SENATE

January 11, 1911.

REPORT
OF THE
COMMISSIONERS OF THE LAND OFFICE
IN ANSWER TO A RESOLUTION PASSED BY THE SENATE
MAY 11, 1909, AND BY THE ASSEMBLY
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ALBANY:
J. B. WARD, STATE PRINTER,
1911.

SECTION TS 2. EARTHWORKS

2.1 GENERAL

This section of the Technical Specification covers the general and specific requirements of earthworks.

2.1.1 Character of Strata

The Contractor shall acquaint himself with all available data regarding earthworks and the character of strata and materials to be excavated and used as filling. He shall satisfy himself as to :

- the general circumstances at the Site of the Works
- any obstructions thereon
- the form of riverbeds and banks
- the flow of water in the river and channels
- the surface of the ground
- possible subsidence of soft ground
- poor materials
- possibility of floods
- his obligations for diversion and care of water under clause 1.13 of the General Specification
- slipping clay
- running sand
- gravel and boulders
- springs, subsoil and river water, loose or solid rock and stones
- trees, brushwood, timber and debris
- obstructions of any kind and material of whatever nature.

Rates entered in the Bill of Quantities shall reflect the Contractor's own assessment of risk and influence that these matters may have on his costs and no subsequent adjustments shall be made to rates for any reason.

2.1.2 Earthworks to Dimensions, Lines and Levels

All earthworks shall be carried out to the dimensions, lines and levels as shown on the Drawings, or to such other dimensions, lines and levels as may be ordered by the Engineer. Dimensions and lines, which are based on or related to ground levels, shall be referred to the Engineer before commencing earthworks at any location.

For the purpose of the Specification the term original surface level shall refer to the ground or the river bed surface before the start of earthworks in accordance with the provisions provided for in clause 1.17 in the General Specification.

The Contractor shall be completely and solely responsible for setting out the works and establishing an adequate number of bench marks and reference

points. Surveys to be performed by the Contractor are described in clause 1.17 of the General Specification.

2.1.3 Method of Excavation

The Contractor shall carry out excavation in whatever material may be encountered and by any method or combination of methods he considers most suitable subject to any restrictions herein.

The Contractor shall give due consideration to the matters in clause TS 1.1.1 (Character of Strata), clause GS 1.13 (Diversion and Care of Water) of the General Specification, location and access to soil disposal areas, fill and stock pile areas and all other relevant factors.

2.1.4 Unsuitable Materials

Excavated materials which, in the opinion of the Engineer, do not meet required Specifications for fill, embankment or backfill shall not be used for such purpose and shall be transported to spoil dumps or stockpiles.

All spoil excavated from the bed of the Semarang and Asin Rivers is deemed as being unsuitable for other purposes and shall be regarded as contaminated soil which is to be treated as described elsewhere in this specification.

2.1.5 Transportation of Excavated Material

The transportation of excavated material to fill embankment, backfilling or stockpile site or disposal of excess or unsuitable materials shall be carried out in accordance with the approved schedule of earthworks operations. The Contractor shall transport material by the most appropriate route between excavation and placement or disposal areas using, as far as practical, access and haul roads within the site in order to minimise disruption to the population in the vicinity of the Works. Protective measures shall be made and maintained throughout for the safety of operations both on-site and off-site.

When hauling is done off-site loads shall be trimmed to prevent spillage. Wet materials to be hauled shall be dried sufficiently prior to loading to prevent spillage by leaking. Any damage or unsightly appearance on the surface of any road caused by the Contractor's hauling operation shall be reinstated by the Contractor at his own expense.

2.1.6 Disposal of Excavated Materials

Excavated material which, in the opinion of the Engineer, is suitable for use in filling, embankment or backfill may be transported directly to its final position, stock piled, or placed as otherwise approved by the Engineer.

Unsuitable soil or surplus excavated materials shall be disposed of in approved disposal areas as directed by the Engineer. The Contractor shall trim and grade spoil tips to profiles, heights and levels approved by the Engineer. He shall also maintain without interruption the flow of water courses affected by tips and comply with any other arrangement at the site existing between the Engineer and any other parties involved.

The requirement for treatment of contaminated soil in spoil disposal areas specified below is to be read in conjunction with this clause.

2.2 STRIPPING TOPSOIL

2.2.1 General

Stripping topsoil shall consist of the removal of all organic materials such as sod, topsoil and roots from areas where earth fill or embankment are to be constructed.

2.2.2 Method of Execution

Stripping of topsoil shall be to the depth and area limits shown on the drawings or as directed by the Engineer. All topsoil stripped, except that as may be used or saved in accordance with the Engineer's order, shall be disposed of in the manner described for soil unfit for reuse in clause 2.1.6. The minimum depth of topsoil stripping shall be 250 mm unless otherwise specified on the Drawings or directed by the Engineer.

2.3 EXCAVATION

2.3.1 Channel Excavation

2.3.1.1 General

The work covered by this clause relates to the excavation of the improved waterway channels of the Semarang River, the Asin River and the relocated portion of the Semarang River.

For the purposes of this Contract the following arbitrary definition shall apply:

Excavation Below Water Level

This sub-category of channel excavation shall mean excavation carried out in the existing channel of the Semarang River.

Common Channel Excavation

This sub-category of channel excavation shall mean excavation carried out in the relocated portion of the Semarang River and in the Asin River.

The Contractor shall carry out all channel excavation in whatever material may be encountered in accordance with these Specifications, the Drawings and any directions of the Engineer. The Contractor shall provide and operate all necessary excavating, lifting, hauling, transport and other equipment to deal with any type of material encountered. Excavation for the various works shall be carried out to such widths, lengths, depths and profiles as shown on the Drawings, or to such other dimensions as may be ordered by the Engineer in writing.

2.3.1.2 Trimming Tolerances

Excavated surfaces shall be trimmed to the lines and grades as shown in the Drawings or to other lines and grades as may be directed by the Engineer. Cross-sections on completion of excavation in waterway channels shall conform to the following tolerances :

a) Over-excavation of the depth of the low water channel	500 mm
b) Under-excavation of the depth of the low water channel	Nil
c) Over-excavation of the width of the river channel	500 mm
d) Under-excavation of the width of the river channel	Nil
e) Deviation of the shoulders of low and high water channels towards the channel centreline	Nil
f) Deviation of the shoulders of low and high water channels away from channel centreline	500 mm
g) Over-excavation of bed of the high water channel	200 mm
h) Under-excavation of the bed of the high water channel	Nil

Note that the above tolerances shall not apply when channel dimensions are specified to structures such as revetments or gate structures.

2.3.1.3 Excavation Beyond True Line

The waterway channels shall be cut to the lines and level as shown in the Drawings and to the tolerances stated in clause 2.3.1.2 above.

For all parts of the waterway channels, with the exception of the low water channel, any over-excavation, for whatever reason and cause, unless as a result of the Engineer's direction, the Contractor shall, at his own expense, make good the excavation to the required line and level with approved material and in such a manner as the Engineer may approve. Where over-excavation is not detrimental to river flow and not unsightly, the Engineer may, at his sole discretion, waive the requirement for making good such over-excavation.

2.3.1.4 Inspection and Survey

The Contractor shall measure work in progress by means of appropriate survey methods and in the presence of the Engineer or his representative.

The Engineer will carry out inspection of work progress and measurement of work completed assisted by the Contractor who shall provide boats, boatmen, labourers, materials and all other items necessary for the Engineer's use.

2.3.2 Common Excavation and Structural Excavation

2.3.2.1 General

This clause refers to all common excavation and structural excavation to be carried out under the Contract and shall be read in conjunction with clause 2.1.

The Contractor shall carry out all common and structural excavation in whatever material may be encountered in accordance with these Specifications, Drawings and any directions of the Engineer. The Contractor shall provide and operate all necessary excavating, lifting, hauling, transport and other equipment to deal with any type of material encountered. Excavation for the various works shall be carried out to such widths, lengths, depths and profiles as shown on the Drawings, or to such other dimensions as may be ordered by the Engineer in writing.

Where necessary the sides of all excavations shall be properly shored up and supported with strutting and planking, and the sides shall be close sheeted where necessary to prevent the entry of running sand, mud and the

like. Sheet piling shall be used where site constraints preclude the use of strutting and planking.

When any excavation has been completed and trimmed, the Engineer shall be informed so that he may make a formal inspection. No excavation shall be backfilled or covered with concrete until it has been inspected and the Contractor has been authorised to proceed.

2.3.2.2 Excavation Beyond True Line

Where any over-excavation occurs for whatever reason or cause, unless as a result of the Engineer's direction, the Contractor shall, at his own expense, make good those excavations to the required line and level with :

- 1) approved material and in such manner as the Engineer may direct where the excavation is other than for concrete work; or
- 2) concrete of the same grade as that to be used in the true excavated shape, unless directed otherwise by the Engineer, where the excavation is for concrete work.

2.3.2.3 Common Excavation

Common excavation shall mean any excavation works, other than that covered by Clause 2.3.1 (Channel Excavation), Clause 2.3.2.4 (Structural Excavation)

2.3.2.4 Structural Excavation

Except where otherwise shown on the Drawings or directed by the Engineer, Structural Excavation shall comprise excavation associated with the construction structures including, but not limited to, culverts, protection works, revetments, gabions, retaining walls, and any other works where the Engineer determines that Structural Excavation is appropriate.

Except where otherwise shown on the Drawings or directed by the Engineer the Contractor shall perform structural excavation to one of the two relevant typical profiles described below.

- 1) Where soil conditions do not require shoring, the side slope shall be at 1.0 unit vertical to 1.0 unit horizontal with a horizontal clearance at the underside of the proposed footing to the start of the excavation slope of 500 mm.
- 2) Where shoring is necessary owing to constricted working area, the need to prevent the entry of running sand or mud, or where it is a mandatory requirement (refer to GS 1.5.3.2.b), shoring or sheet piling shall be placed such that there is a horizontal clearance of 1000 mm between the underside of the proposed footing and the inner face of the shoring.

The base and side slopes of excavation against which concrete is to be placed shall be finished accurately to the dimensions shown on the Drawings or prescribed by the Engineer and the surface so prepared shall be thoroughly compacted with suitable equipment to obtain a satisfactory foundation. If at any point the natural foundation material is disturbed during the excavation process or otherwise, it shall be compacted in place to obtain a satisfactory foundation, or it shall be removed and replaced with approved compacted materials or concrete, all the Contractor's expense.

2.3.3 Treatment of Contaminated Soil

2.3.3.1 General

Sediments in the Semarang River and the Asin River are known to contain contaminants which include heavy metals. Thus all material excavated from the Semarang River and from the Asin River shall be hauled to a soil disposal area and treated by means of cement stabilisation as described below.

2.3.3.2 Method of Treatment of Contaminated Soil

Soil to be treated shall be spread in uniform layer not exceeding 200 mm within a spoil disposal area.

The soil shall be allowed to dry until the moisture content has lowered sufficiently such the soil has enough strength to support pedestrian weight.

The moisture content and layer depth shall be determined

The amount of ordinary Portland cement to give a 7% cement content (per unit dry weight of soil) shall be calculated using the parameters of soil density, moisture content and depth of layer. The required rate of cement shall be expressed as 1 bag per calculated area.

Cement bags shall be laid out according to the calculated spacing.

When the actual bag spacing has been approved by the Engineer or his representative, bags shall be opened and cement spread uniformly over the surface of the soil layer to be stabilised.

Cement shall be thoroughly mixed with the soil by means of a multi-disc plough which has an effective working width of not less than 2.5 m. The number of passes of the plough required to achieve thorough mixing shall be directed by the Engineer following observation of the first stabilising operation.

The elapsed time between the spreading of cement and completion of mixing shall not exceed 2 hours to ensure that that thorough dispersal of cement has been achieved before hydration of the cement has occurred.

To ensure that mixing can be achieved within the above time limit the Contractor shall limit the size of any area being treated to that which can be adequately handled by his mixing equipment.

The above procedure shall be repeated for successive layers to the extent and depth practicable. The surface of the final layer of treated soil shall be level and uniform.

Alternative methods of treatment by cement stabilisation may be proposed by the Contractor for the Engineer's approval. Any alternative proposal shall ensure that a verifiable 7% cement content (per unit dry weight of soil), uniformly mixed with the contaminated soil, is achieved.

2.4 FILL

2.4.1 General

The work described in this clause shall consist of the furnishing of necessary materials and selecting, stockpiling and blending if required, transporting, placing, spreading, adjustment of moisture content, compaction, shaping and doing incidental items of work to construct the finished fill to the lines,

grades and profiles as shown on the drawings or as directed by the Engineer.

The Contractor shall make due allowance for consolidation and settlement whether compaction is specified or not, such that the levels, widths and dimensions of the finished surfaces at the end of the Defects Liability Period shall not be less than the levels and dimension shown on the Drawings.

All filling and embankments shall be constructed to the lines and levels shown on the Drawings or established by the Engineer.

2.4.2 Materials

Materials to be used for the various types of fills shall conform to the requirements specified herein or as approved by the Engineer.

The Contractor shall submit to the Engineer for approval, samples and grading analyses (as applicable) of all materials proposed to be used for the various types of fill as specified below.

Earth Fill for Embankment, and Backfill with Selected Soil

Material to be used shall be extracted and selected from excavated material including that from common excavation, structural excavation or channel excavation (but excluding contaminated soil) and shall not contain roots, turf or clod exceeding 75 mm in size or organic matter of any kind and shall be approved by the Engineer.

Generally material shall not be used, unless permitted by the Engineer, where:

- 1) its 60% particle size is less than four times its 10% particle size.
- 2) it contains less than 8% passing 0.075 mm test sieve.

Gravel

Gravel for use in gravel bedding or gravel backfill shall consist of hard durable stone which will not break down or deteriorate in service and shall be clean and free from clay or other deleterious materials. Unless otherwise specified or directed, gravel shall be natural gravel or crushed stone with grading, by weight, determined in accordance with AASHTO test methods, conforming to the grading shown in the following table:

Sieve Size	Percentage Passing
2 inch	100
1½ inch	95-100
¾ inch	50-100
½ inch	-
⅜ inch	15-55
No 4	0-25
No 8	0-5
No 200	0-3

Cobble

Cobble shall consist of hard durable natural or crushed stone which will not break down or deteriorate in service with particle size between 75 mm and 300 mm or as directed by the Engineer and shall be clean and free from organic or other deleterious material.

Sand

Sand for sand bedding and sand backfill shall be hard, clean, free of clay and mud and shall be well graded within following limits:

Sieve Size	Percentage Passing
9.52 mm	100
4.75 mm	95-100
2.36 mm	80 - 100
1.18 mm	50 - 85
600 mm	25 - 60
300 mm	10 - 30
150 mm	5 - 15
075 mm	1 - 10
Moisture Content	Less than 10 %
Clay Content	Less than 3 %

Sandy Soil

Sandy soil shall consist of natural soil free of clay lumps, organic matter or other deleterious material and shall be well graded with a maximum dimensions of 10 mm and not more than 5 percent smaller than 0.075 mm.

Blinding Stone

Blinding stone shall consist of clean, hard, durable natural or broken stone which will not break down or deteriorate in service and having a particle size of 200 mm + or - 20 mm measured along the major axis.

2.4.3 Placing, Compaction and Moisture Content of Filling

This clause relates to the earth fill used in backfill with selected soil and embankment as shown on the drawings.

Prior to commencement of filling, the Contractor shall carry out, under direct supervision and to the satisfaction of the Engineer, a series of field tests to determine optimum conditions and minimum number of passes of each type of equipment required to achieve the specified compaction for each type of fill material.

Fill material shall not be placed when, in the opinion of the Engineer, satisfactory results cannot be achieved due to heavy rain or other adverse conditions.

Fill shall be spread and compacted in approximately horizontal layers of uniform moisture content and uniform compacted thickness not exceeding 300 mm (or to lesser thickness as specified elsewhere). Filling, operations shall be such as to ensure that materials will be blended sufficiently to achieve the highest practicable dry density, and stability. Where the surface of any layer of filling is too dry or too smooth to bond properly with the next layer of material, it shall be moistened and/or scarified in an approved manner to provide a satisfactory bonding surface before the next layer is placed.

The moisture content of filling shall be carefully controlled, either by natural drying or wetting with a fine spray, to achieve optimum values. Fill material shall be compacted to a density of not less than 90% maximum standard dry density determined in accordance with AASHTO T 99. For portions of embankment upon which road pavements are to be constructed the upper 300 mm of fill material directly below the road pavement shall be compacted at optimum moisture content to a compaction of 90% maximum standard dry density in accordance with AASHTO T 99 for the full width of the roadway.

Where practical, as determined by the Engineer, moistening of the material shall be performed at the site of stockpiles but such moistening shall be supplemented by fine spraying at the time of compaction, if necessary. Where moisture content is beyond the optimum range, the operation shall not proceed except with the specific approval of the Engineer, until the material has been conditioned by wetting or drying to achieve a moisture content in the required range.

All compaction equipment shall be approved by the Engineer in writing before commencement of any filling operations.

At the end of each day, or whenever operations are suspended for any reason, the surface shall be rolled smooth and slightly crowned to shed water.

2.4.4 Preparation of Surface under Embankment

Filling shall not be placed on any portion of embankment foundation until such foundation has been cleared, stripped of topsoil, suitably prepared and has been approved by the Engineer. Tests pits, trenches and cavities resulting from the removal of unsound foundation materials or for inspection of sub-surface conditions shall be filled with selected materials.

Foundation material which does not have a density in the undisturbed condition as specified for the fill material to be placed upon it shall be moistened and compacted to specified dry density or shall be removed, filled and compacted or shall be treated in a manner as directed by the Engineer.

2.4.5 Filling Adjacent to Structures

Filling adjacent to structures shall be placed and compacted to avoid damage to such structures. Compaction adjacent to structures shall be carried out by hand or with suitable hand-operated equipment in horizontal layers not exceeding 150 mm thickness after compaction.

Unless otherwise specified or permitted by the Engineer, filling shall not be placed and compacted adjacent to concrete until at least fourteen (14) days after the placing of the concrete.

2.4.6 Embankment Construction

Filling for embankment construction shall mean completion of all filling constructed in accordance with the requirements of clause 2.4.3 and to the lines, levels and profiles shown on the Drawings or as directed by the Engineer and shall include the following :

- construction of embankments for earth dikes
- construction of embankments for roads
- construction of any other embankments shown on the drawings or as directed by the Engineer

2.4.7 Soil Tests

Tests on materials for use as filling shall be performed by the Contractor and shall enable determination of soil characteristics, suitability, dry density/moisture content relationships and the like. A formal report of all tests shall be prepared by the Contractor and approved by the Engineer. Tests shall be performed by the Contractor prior to commencement of

earthworks, and every time soil characteristics change. Tests shall include but not be limited to the following :

- a) Compaction (AASHTO T 99) (Dry Density)
- b) Particle size distribution
- c) Specific gravity
- d) Moisture content
- e) Plastic limit
- f) Direct shear

Test results shall be submitted to the Engineer for approval.

Field moisture content tests of compacted filling shall be made on each layer and at a frequency of one test for every 200 m².

The Contractor shall prepare a soil test programme in conjunction with his earthworks operation schedule and submit it to the Engineer for approval.

For gravel, only particle size distribution tests are required.

2.4.8 Backfill

Backfill comprising approved materials complying with the specification for filling provided in clause 2.4.2, shall be placed and compacted adjacent structures as shown on the Drawings or as directed by the Engineer.

Prior to commencement of backfilling adjacent to structures, the area shall be cleared of all formwork and other temporary works. Compaction shall be carried out by hand or with suitable hand operated equipment so as to achieve specified compaction without damage to structures. Backfilling material shall be wetted or allowed to dry in order achieve optimum moisture content for compaction.

Backfilling shall be placed and compacted in continuous horizontal layers of not more than 150 mm compacted thickness. Unless otherwise specified, backfilling shall be compacted to 90% of the maximum dry density as determined in the laboratory compaction test referred to in clause TS 2.4.8.

Unless otherwise specified or permitted by the Engineer, backfilling shall not be placed and compacted adjacent to concrete until at least fourteen (14) days after the placing of concrete.

Compaction of backfilling material placed above buried concrete, however, shall not be permitted to be carried out with vibrating equipment except with the prior approval of the Engineer.

2.4.9 Backfill with Gravel

Gravel backfill shall be placed adjacent to structures or footings in the special locations shown on the Drawings or as directed by the Engineer. Selected soil shall comprise imported or otherwise approved material as specified in clause 2.4.2.

Prior to commencement of backfilling adjacent to structures, the area shall be cleaned of all formwork and other temporary works. Compaction shall be carried out by hand or with suitable hand operated equipment so as to achieve a dense stable matrix without damage to structures. Backfilling material shall be wetted or allowed to dry in order achieve optimum moisture content for compaction.

Gravel Backfill shall be placed and compacted in continuous horizontal layers of not more than 200 mm compacted thickness. Each layer shall be compacted until it is stable and dense and shows no movement under compaction.

Unless otherwise specified or permitted by the Engineer, backfilling shall not be placed and compacted adjacent to concrete until at least fourteen (14) days after the placing of concrete.

Compaction of backfilling material placed above buried concrete, however, shall not be permitted to be carried out with vibrating equipment except with the prior approval of the Engineer.

2.4.10 Backfill with Cobble

Cobble, as specified in clause 2.4.2 shall be placed in the locations and to the lines, levels and profiles as shown on the drawings. Stones shall be placed by machine or hand placed with smaller stones placed in the spaces between the larger stones so as to form a stable matrix.

2.4.11 Gravel Bedding and Filling

Gravel bedding and gravel filling shall be placed in the locations shown on the Drawings or as directed by the Engineer. Gravel material shall comprise imported or otherwise approved material as specified in clause 2.4.2.

Gravel bedding shall be placed and compacted using mechanical compaction equipment in continuous horizontal layers of the compacted thickness specified on the drawings. Each layer shall be compacted until it is stable and dense and shows no movement under compaction.

2.4.12 Cobble Filling

Cobble, as specified in clause 2.4.2 shall be placed in the locations and to the lines, levels and profiles as shown on the drawings. Stones shall be placed by machine or hand placed with smaller stones placed in the spaces between the larger stones so as to form a stable matrix.

2.4.13 Blinding Stone

Blinding Stone, as specified in clause 2.4.2 shall be placed in the locations and to the lines, levels and profiles as shown on the drawings. Stones shall be placed by hand placed with their major axes vertical. Smaller stones shall be placed in the spaces between the larger stones so as to form a stable matrix. The upper surface of the layer of blinding stone shall be true to line and level within a tolerance of + or - 20 mm

2.5 SODDING

2.5.1 General

This work shall consist of furnishing, placing and compacting topsoil and laying grass sods in accordance with the Specification where shown on the Drawings or ordered by the Engineer.

2.5.2 Material Requirements

2.5.2.1 Topsoil

Topsoil shall be clean friable soil free of stones larger than 20 mm and free of weed or other deleterious matter.

2.5.2.2 Grass Sod

The sod shall consist of a healthy, dense and well rooted growth of living grass with roots surrounded by topsoil and shall not contain weeds or other undesirable plants.

The grass sod shall be cut into uniform squares approximately 300 mm and shall have a minimum thickness of 50 mm (excluding grass blades). The type of grass to be used shall be subject to the approval of the Engineer.

2.5.3 Method of Construction

2.5.3.1 Sodding

The surface of the area to be sodded shall be trimmed to the profile as shown on the drawings to the approval of the Engineer.

Units of grass sod shall be placed in uniform rows with the sides of adjacent sods in close contact to each other.

Unless otherwise required, the sod on slopes shall be laid horizontally, beginning at the bottom of the slopes and working upwards.

The areas to be sodded shall be as shown on the Drawings or as specified by the Engineer. The surface of the areas to be sodded shall be loosened and brought to a reasonably fine texture to a depth of approximately 20 mm. The bed upon which the sod is to be placed shall be moistened to the loosened depth, if not naturally sufficiently moist, and the sod shall be placed thereon within 24 hours after having been cut.

On all slopes steeper than one vertical to three horizontal the sod shall be pegged with stakes, 200 - 300 mm in length, spaced as required by the nature of the soil and steepness of slope. Stakes shall be driven into the sod at right angles to the slope until flushed with the bottom of the grass blades.

After the placement has been completed, the surface shall be cleared of loose sod, excess soil, or other foreign material, whereupon a thin layer of topsoil shall be scattered over the sod as a top dressing and the areas shall then be thoroughly moistened by sprinkling with water.

The Contractor shall regularly water and maintain sodded areas in satisfactory condition for the duration of the Contract and until final acceptance of the work by the Engineer.

2.6 MEASUREMENT AND PAYMENT

2.6.1 Stripping of Topsoil

Measurement shall be made of the volume of topsoil stripped in accordance with the requirements of clause TS 2.2 of the Technical Specification. No measurement shall be made of stripping in excess of 250 mm unless authorised by the Engineer.

Payment shall be made at the rate entered in the priced Bill of Quantities and shall include the entire cost of completing the work including materials, labour, equipment, transportation and any other associated costs.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Stripping of Top Soil	m ³

2.6.2 Excavation

2.6.2.1 Channel Excavation

Measurement of the volume of the various categories of channel excavation will be made using the average end area method of calculation for the respective portions of the channel excavation as defined in clause 2.3.1.

Measurement for payment shall not be made of over-excavation beyond the lines, levels and profiles shown on the drawings.

Payment shall be made at the rates entered in the Bill of Quantities and shall include the entire cost of completing the excavation from the approved original surface levels down to the lines, levels and profiles shown on the drawings including materials, labour, equipment, transportation and any other associated costs.

Payment shall be deemed to include allowance for the cost of:

- 1) excavation through any material and to any depth
- 2) trimming to the correct profiles, lines and levels as shown in the Drawings
- 3) separating and setting aside those excavated materials suitable for re-use for other purposes and transporting to spoil those materials unsuitable for re-use
- 4) transporting, for a distance of up to three (3) kilometres one-way, excavated materials to spoil dumps, spoil disposal areas, stockpiles or to areas where contaminated soil is to be treated and further handled.
- 5) treating contaminated soil (where applicable) in accordance with the Specification.
- 6) preparation, clearing and operation of spoil disposal areas as described in this Specification

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Common Channel Excavation including Hauling and Spoiling	m ³
Excavation below Water Level including Hauling and Treatment of Contaminated Soil	m ³
Common Channel Excavation including Hauling and Treatment of Contaminated Soil	m ³

2.6.2.2 Common Excavation

Measurement of the volume of the common excavation will be made using the average end area method or other method approved by the Engineer.

Measurement for payment shall not be made of over-excavation beyond the lines, levels and profiles shown on the drawings.

Payment shall be made at the rate entered in the Bill of Quantities and shall include the entire cost of completing the excavation from the approved original surface levels down to the lines, levels and profiles shown on the drawings including materials, labour, equipment, transportation and any other associated costs.

Payment shall be deemed to include allowance for the cost of:

1. excavation through any material and to any depth
2. trimming to the correct profiles, lines and levels as shown in the Drawings
3. separating and setting aside those excavated materials suitable for re-use for other purposes and transporting to spoil those materials unsuitable for re-use
4. transporting, for a distance of up to three (3) kilometres one-way, excavated materials spoil disposal areas or stockpiles
5. preparation, clearing and operation of spoil disposal areas as described in this Specification

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Common Excavation including Hauling and Spoiling	m ³

2.6.2.3 Structural Excavation

Measurement shall be made of the volume of materials acceptably removed, measured in the cubic meters in its original position and computed by the average end area method. Measurement shall include authorised excavation of unsuitable material below grade. Measurement shall also include the volume of the clearance and the side slope specified in clause TS 2.3.2.4.

Payment shall be made for the quantity of work, accepted and measured as provided above, at the rate entered in the priced Bill of Quantities, and shall include the entire cost for furnishing all shoring, and other related temporary work except work items measured separately in the Bill of Quantity and for all materials, labour, plant, tools and incidentals necessary to complete the work in accordance with the Drawings and these Specifications and as directed by the Engineer.

For structural excavation in waterway channels or retarding ponds, separate payment will be made for coffering and dewatering which is paid elsewhere and the rate for structural excavation will not include for such.

For structural excavation outside waterway channels or retarding ponds where coffering and dewatering is not provided as a separate pay item, the price shall include the cost of the necessary coffering and dewatering to complete the structural excavation.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Structural Excavation	m ³
Structural Excavation with Shoring	m ³

2.6.3 Fill

2.6.3.1 Embankment

Measurement of the volumes of the various items of embankment shall be made of the actual volume in cubic meters as determined by the measurement taken before and after filling operation. No measurement and payment shall be made for unauthorised filling outside the lines shown on the Drawings.

Payment shall include the cost of quarrying (in case of borrow), sorting, grading, handling, hauling, placing, watering, levelling, compacting and testing of the materials of in-place fill. Payment shall also include cost of preparation for surface and trimming of slopes and all labour, materials and equipment necessary to complete the work.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Embankment	m ³

2.6.3.2 Backfill

Measurement shall be made of the volume of the backfill for backfill with the various materials as described in clause TS 2.4. Measurement will not be made of the volume of backfilling of structural excavation beyond the limits described in clause 2.3.2.4 of the Technical Specification.

Payment will be made at the rate entered in the Bill of Quantities and shall include the entire cost of completing the work including material, labour, equipment, transportation and any other associated costs.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Backfill with Cobble	m ³
Backfill with Gravel	m ³
Backfill with Sandy Soil	m ³
Backfill with Selected Soil	m ³
Backfill	m ³
Backfill	m ³
Backfill	m ³

2.6.3.3 Cobble Stone, Gravel Bedding and Gravel Filling, Sand Bedding

Measurement shall be made of the volume of Sand Bedding, Gravel Bedding, Cobble Stone and Gravel Filling as described in clause TS 2.4.

Payment will be made at the respective rates entered in the priced Bill of Quantities and shall include the entire cost of completing the work including material, labour, equipment, transportation and any other associated costs.

Categories of work to be paid under this clause are as follows:

Description	Unit of Measurement
Sand Bedding	m ³
Gravel Bedding	m ³
Cobble Stone	m ³
Gravel Filling	m ³

2.6.4 Sodding

Measurement shall be made of the area of solid sodding completed in accordance with clause 2.5 of the Technical Specification.

Payment will be made at the rate entered in the priced Bill of Quantities and shall include the entire cost of completing the work including materials, labour, equipment, transportation, maintenance and any other associated costs.

Payment will be made as follows:

- Payment will be made at 60% of the rate in the Bill of Quantities.
- The remaining 40% shall be paid on satisfactory establishment of the sodding.

The following pay items shall be measured and paid for under this clause:

Description	Unit of Measurement
Sodding	m ²