

SECTION 1200 EMPLOYER'S AND ENGINEER'S FACILITIES

1201 Employer's and Engineer's Offices

- 1) This Sub-Section shall consist of the construction, maintenance and cleaning of the Employer's and Engineer's offices as well as the furnishing and maintenance of the office furniture including the air-conditioners for the sole use of the Employer and the Engineer and their staff together with the provision, installation, maintenance and services. The buildings, furniture and appliances shall be delivered to the Employer after the issuance of the certificate of completion. The buildings shall be approved in advance by the Engineer.

The Contractor shall provide and maintain the Employer's and Engineer's offices throughout the Contract period.

The buildings and services shall be available in full working order within six (6) months after the commencement of the works and shall continue to be so available during progress of the works until the take-over of the works has been made according to the program approved by the Employer/Engineer.

The Contractor shall provide substitute facilities and/or space for the Employer's & Engineer's offices accepted by the Employer/Engineer during the period until the offices and residences specified in this sub-section and 1202 become available, for approximately 40 persons of the Employer and the Engineer.

The Contractor shall be responsible for the security of the buildings and its contents at all times and shall employ watchmen for this purpose.

- 2) Location of the Employer's and Engineer's offices will be directed by the Engineer in the vicinity of the Site.

The buildings for the Employer's and Engineer's offices shall have the following rooms and total area of these buildings shall not be less than 600 sq.m.:

- a) Room for Employer's Manager
- b) Room for Employer's Staff Members
- c) Room for Engineer's Manager
- d) Room for Engineer's Staff Members
- e) Drafting Room
- f) Administration Room
- g) Conference Room (Large)
- h) Conference Room (Small)
- i) Storage
- j) Kitchens
- k) Toilets

3) The buildings shall be furnished with new furniture and appliances. The following are lists of the minimum basic furniture and appliances to be provided by the Contractor for the Employer's offices furniture shall be approved by the Engineer. Dimensions of furniture shall be deemed as approximate size required.

	<u>Quantities</u>
a) Room for Employer's Manager	
- Wooden desk, W-1.9m x D-0.9m x H-0.7m 6~8 side drawers and 1 center drawer	1
- Revolving executive chair, on rollers, with armrests	1
- Conference table, W-1.8m x D-0.9m x H-0.7m	1
- Conference chair	2
- Storage cabinet, (lateral file, W-0.9m x D-0.45m x H-1.0m, 3 drawers and Bookcase, W-0.9m x D-0.45m x H-0.7m)	1
- Wood kitchen cabinet, W-0.6m x D-0.40m x H-0.9m	1
- Whiteboard, 1.80m x 0.9m with eraser	2
- Wastebasket, large, solid sides, no wire	2
- Air conditioner, (18,000 B.T.U or more)	1
b) Room for Employer's Staff Members	
- Wooden desk, W-1.5m x D-0.75m x H-0.7m 6~8 side drawers and 1 center drawer	5
- Executive chair with armrests	5
- Conference table, W-1.8m x D-0.9m x H-0.7m	1
- Conference chair	2
- Cabinet drawing	2
- Personal computer and printer set as directed by the Engineer	1
- Laser printer as directed by the Engineer	1
- Dry photo-copier machine	1
- Storage cabinet, (lateral file, W-0.9m x D-0.45m x H-1.0m, 3 drawers and Bookcase, W-0.9m x D-0.45m x H-0.7m)	2
- Wood kitchen cabinet, W-0.6m x D-0.40m x H-0.9m	1
- Whiteboard, 1.80m x 0.9m with eraser	3
- Wastebasket, large, solid sides, no wire	2
- Air conditioner, (18,000 B.T.U or more)	2
- Drawing Hanger, 0.90 m x 1.20 m high	2
c) Room for Engineer's Manager	
- Same as those for Room for Employer's Manager	
d) Room for Engineer's Staff Members	
- Wooden desk, W-1.5m x D-0.75m x H-0.7m 6~8 side drawers and 1 center drawer	10
- Executive chair with armrests	10

Quantities

- Wooden desk, W-1.2m x D-0.75m x H-0.7m 3~4side drawers and 1 center drawer	5
- Executive chair	5
- Conference table, W-1.8m x D-0.9m x H-0.7m	1
- Conference chair	4
- Drafting table, MUTOH Model OT-3 or approved equal	1
- Drafting machine, MUTOH Model LYN-A1 set or approved equal	1
- Drafting equipment and instrument, complete set	1
- Drafting chair	1
- Square table, W-0.45m x D-0.45m x H-0.7m	1
- Cabinet drawing	2
- Personal computer and printer set as directed by the Engineer	1
- Laser printer as directed by the Engineer	1
- Dry photo-copier machine	1
- Storage cabinet, (lateral file, W-0.9m x D-0.45m x H-1.0m, 3 drawers and Bookcase, W-0.9m x D-0.45m x H-0.7m)	2
- Wood kitchen cabinet, W-0.6m x D-0.40m x H-0.9m	1
- Whiteboard, 1.80m x 0.9m with eraser	3
- Wastebasket, large, solid sides, no wire	10
- Air conditioner, (18,000 B.T.U or more)	2
- Drawing Hanger, 0.90 m x 1.20 m high	2
e) Drafting Room	
- Drafting table, MUTOH Model OT-3 or approved equal	1
- Drafting machine, MUTOH Model LYN-A1 set or approved equal	1
- Drafting equipment and instrument, complete set	1
- Drafting chair	1
- Square table, W-0.45m x D-0.45m x H-0.7m	1
- Drafting table & chair	1
- Tracing table, W-1.0m x D-0.70m x H-0.8m 5000 lux or more	1
- Wooden desk, W-1.2m x D-0.75m x H-0.7m 3~4 side drawers and 1 center drawer	1
- Executive chair	1
- Cabinet drawing,	1
- Drawing Hanger, 0.90 m x 1.20 m high	1
- Storage cabinet, (Lateral file, W-0.9m x D-0.45m x H-1.0m, 3 drawers and Bookcase, W-0.9m x D-0.45m x H-0.7m)	1
- Whiteboard, 1.80m x 0.9m with eraser	2
- A0 size blue printing machine, RICOH Model RICOPY SD 900AE or approved equal	1
- Wastebasket, large, solid sides, no wire	2
- Air conditioner, (18,000 B.T.U or more)	2

f) Administration	<u>Quantities</u>
- Wooden desk, W-1.5m x D-0.75m x H-0.7m 6~8 side drawers and 1 center drawer	2
- Executive chair with armrests	2
- Wooden desk, W-1.2m x D-0.75m x H-0.7m 3~4 side drawers and 1 center drawer	3
- Executive chair	3
- Public Telephone (extension line)	1
- Facsimile Machine	1
- Storage cabinet, (Lateral file, W-0.9m x D-0.45m x H-1.0m, 3 drawers and Bookcase, W-0.9m x D-0.45m x H-0.7m)	2
- Storage cabinet, (Book-case, W-0.9m x D-0.45m x H-0.7m)	1
- Wooden kitchen cabinet, W-0.6m x D-0.40m x H-0.9m	1
- Typewriter table and chair	1
- Electric typewriter, IBM Dual electric, Arabic and English or approved equal	1
- Dry photo-copier, electric, approved equal	1
- Whiteboard, 1.80m x 0.9m with eraser	1
- Wastebasket, large, solid sides, no wire	4
- Air conditioner, (18,000 B.T.U or more)	2
- IBM personal computer	2
- HD Laser jet Printer	1
- DOT MATRIX Printer Epson	1
- Computer Table	2
g) Conference Room (Large)	
- Conference table, on rollers W 1.80m x D 0.60m x H-0.70m	9
- Conference chair	18
- Whiteboard, 1.80m x 0.9m with eraser	2
- Telephone table	1
- Wastebasket, large, solid sides, no wire	3
- Air conditioner, (18,000 B.T.U or more)	2
h) Conference Room (Small)	
- Conference table, on rollers W-1.80m x D-0.60m x H-0.70m	2
- Conference chair	4
- Whiteboard, 1.80m x 0.9m with eraser	1
- Telephone table	1
- Television set with video deck, 24 inches	1
- Coffee table, W-1.4m x D-0.9m x H-0.4m	1
- Two seat sofa	1
- Lounge chair	2
- Wastebasket, large, solid sides, no wire	2
- Air conditioner, (18.000 B.T.U or more)	2

i) Kitchen

- Electrical refrigerator (300 lit or more) 1
- Wooden kitchen cabinet, W-0.9m x D-0.50m x H-1.8m 2
- Kitchen necessities 1 set
- Tea and coffee set including tea pot 1 set

4) The Contractor shall be required to employ and be responsible for the welfare and housing of the following staff to be available during the hours agreed by the Engineer.

- 4 cleaners
- 4 office boys

5) Following services shall be provided, installed and maintained in the Employer's and Engineer's offices by the Contractor.

- a) An adequate piped supply of clean, fresh water connected to the toilet and suitable sewage disposal facilities.
- b) Potable water
- c) Electricity supplies, with sufficient and suitable light fittings and socket outlets.
- d) Fire extinguishers
- e) Office supplies including stationery and copy paper

6) The Contractor shall provide a total of one hundred (100) sets of safety helmets, boots, raincoats in the Employer's and Engineer's offices for use of the Employer and the Engineer. Colour of these shall be white or other colour differing from those of the Contractor, and the qualities of these shall be subjected to approval of the Engineer.

7) The Contractor shall provide the following survey equipment, its required accessories and consumptives for the Engineer's assurance and check survey through the Contract period.

The said equipment etc. shall be the Contractor's properties but for the Engineer's exclusive use at all the times during the contract period.

8) The Contractor shall provide the construction schedule board with the size of approx. 0.9m x 3.6m at the place directed by the Engineer. The board shall be illustrated in such manner to indicate the time schedule of the main works with costs and be able to show the monthly and accumulated progress of the works.

1202 Employer's and Engineer's Residences

1) This Sub-Section shall consist of the construction and/or the rent, maintenance and cleaning of the Employer's and Engineer's residences as well as the furnishing and maintenance of the furniture including the air-conditioners for the sole use of the Employer and the Engineer and their staff together with the provision of services.

The buildings, furniture and appliances shall remain the property of the Contractor.

The buildings shall be approved in advance by the Engineer. The buildings, furniture, appliances and services shall be available in full working order within six (6) months after signing of the Contract, and shall continue to be so available during Contract period.

The Contractor shall provide and maintain the Employer's and Engineer's residences throughout the Construction Period.

The Contractor shall provide substitute facilities and/or spaces for the Employer's and Engineer's residences accepted by the Employer/Engineer during the period until the residences specified in this Sub-Section become available, for approximately 40 persons for the Employer and the Engineer.

A few bedrooms and related facilities and services shall be available during commissioning period before the date of the final inspection.

The Contractor shall be responsible for the security of the buildings and their contents at all times and shall employ watchmen for this purpose.

- 2) Location of the Employer's and Engineer's residences will be in the vicinity of the Site which shall be proposed by the Contractor and approved by the Engineer.
- 3) The building(s) for the Employer's and Engineer's residences shall have at least the following rooms and facilities and total area of the building(s) shall not be less than 1,400 sq.m.
 - a) Ten (10) single-bed bedrooms with bath and toilet in each room.
 - b) Three (3) twin-bed bedrooms with bath and toilet in each room.
 - c) Two (2) houses with a living room, two (2) twin-bed bedrooms, a kitchen, bath and toilet.
 - d) Sitting and recreation room(s).
 - e) Canteen facilities.
- 4) Each building of the Employer's and Engineer's residences shall be furnished with new furniture and appliances. The following furniture and appliances shall be at least provided with each of the residences by the Contractor as the minimum basic requirement:

<u>Description</u>	<u>Quantities</u>
Single-bed Bedroom	
- Single -bed with mattress	1
- Wooden bed table and bed lamp	1
- Wooden table with two chairs	1
- Coat and locker unit	1
- Pillow with two pillow cases	2
- Sheet for single-bed mattress	4

- Blanket	2
- Curtains for window with insect net	as required
- Mirror, 0.45 m x 0.60 m	1
- Refrigerator, 100 lit	1
- Air conditioner, (18,000 B.T.U or more)	1
- Cabinet, lock type	1
- T.V. set (22 inches or more)	1
Twin-bed Bedroom	
- Single-bed with mattress	2
- Wooden bed table and bed lamp	2
- Wooden table with four chairs	1
- Coat and locker unit	1
- Pillow with two pillow cases	4
- Sheet for single-bed mattress	6
- Blanket	4
- Curtain for window with insect net	as required
- Mirror, 0.45 x 0.60 cm	1
- Refrigerator, 100 lit except for the room of the house	1
- Cabinet, lock type	1
- Air conditioner, (18,000 B.T.U or more)	1
- T.V. set (22 inches or more)	1
Sitting Room	
- Wooden bookcase	1
- Lounge chair	12
- Wooden tea table	2
- Curtains for window with insect net	as required
- Air conditioner (18,000 B.T.U or more)	2
- T.V. set (29 inches or more)	1
Recreation Room	
- Wooden dining table for four persons	2
- Wooden chair for above table	8
- Wood kitchen cabinet	1
- Curtains for window with insect net	as required
- Air conditioner (18,000 B.T.U or more)	2
- T.V. set (29 inches or more)	1
Living room for the house	
- Wooden dining table for four persons	1
- Wooden chair for above table	4
- Sofa and tea table set	1

- Wooden kitchen cabinet, approx. 0.9 m x 0.5 m x 1.8 m	1
- Electrical refrigerator (300 lit)	1
- Curtains for window with insect net	as required
- Air conditioner (18,000 B.T.U or more)	1
- Telephone set	1
- T.V. set (29 inches)	1

- 5) Canteen facilities shall have the capacity to provide mess for at least 50 persons of the Employer and the Engineer.
- 6) The Contractor shall provide the sufficient number of personnel, such as cook, cleaners, housemaids, boys, etc., for the welfare and maintenance of the Employer's and Engineer's residences.
- 7) Following services shall be provided, installed and maintained in the Employer's and Engineer's residences by the Contractor:
 - a) Full board accommodation.
 - b) Adequate piped supply of clean water connected to toilets and bathrooms in the buildings and suitable sewage disposal facilities.
 - c) Potable water.
 - d) Electric water heaters in the bathrooms connected to the piped water supply.
 - e) Electricity supplies with sufficient and suitable light fittings and socket outlets.

1203 Employer's and Engineer's Transportation

(1) The Contractor shall provide and maintain

The Contractor shall provide and maintain until the end of the commissioning period vehicles for the Employer and the Engineer for both on-site and off-site transport. The vehicles shall be for the exclusive use of the Employer and the Engineer. The property of vehicles shall remain with the Contractor during and after the Contract Period. The mileage of monthly off-site transport shall not be more than 10,000 km.

(2) The Contractor shall be required to provide:

- a) Five (5) four wheel drive station wagon cars. 4,160 cc. 96 KW (4,000 rpm) diesel engine, air conditioned with power steering, or approved equal.
- b) Two (2) four-door sedan cars, air conditioned, power steering, 2,000cc engine with injection system, or approved equal.
- c) Two (2) micro-buses, of not less than 10 passenger seats per micro-bus, air-conditioned, 2,500 cc. 90 HP diesel engine with power steering, or approved equal.
- d) Three (3) pick-up trucks of 1 ton spacecab-type, 2,500 cc. 90 HP with power steering, air-conditioned or approved equal. Vehicles shall be right hand drive and shall be fitted with the following:

- Seat belts
- Fire extinguishers
- First aid kits

(3) Vehicles shall be regularly serviced

Vehicles shall be regularly serviced and repairs shall be made as soon as required. Vehicles which have to be kept out of service for more than 24 hours due to extensive repairs or maintenance work shall be substituted by similar serviceable vehicles within 24 hours from the time the original vehicles become out of service.

Any vehicle which has become permanently defective, unreliable or otherwise unfit for its intended use shall be replaced with a similar new vehicle within sixty (60) days from the time the supply of such new vehicle has been ordered by the Engineer. Until the new vehicle is available for use at Site, a temporary substitute, serviceable vehicle shall be provided.

Vehicle maintenance shall include, but not necessarily be limited to, all fuels, lubricants, tires and other supplies, all maintenance repairs, insurance, licenses and other operating requirements.

(4) Provision of Vehicles

The Contractor shall provide vehicles in accordance with the following delivery Schedule:

- a) Four (4) four wheel drive cars : within one (1) month after receipt of Notice to Proceed
- b) Two (2) sedan cars : within one (1) week after receipt of Notice to Proceed
- c) Two (2) micro-buses : within one (1) month after receipt of Notice to Proceed
- d) Three (3) pick-up cars : within one (1) month after receipt of Notice to Proceed

(5) Provision of Drivers

A licensed, competent and experienced driver shall be provided for each vehicle at all times respectively.

1204 Field Laboratory

The Contractor shall construct the field laboratory and maintain it during the Construction Period to the satisfaction of the Engineer. The field laboratory is for the use of the Engineer.

The field laboratory, which will be composed of laboratory, office, curing room, toilet and storage, shall be located at the vicinity of the Site which shall be proposed by the Contractor

and approved by the Engineer.

Building of the field laboratory shall have a total area of not less than one hundred (100) sq.m and shall be designed, proposed and constructed by the Contractor after getting the approval of the Engineer.

The contractor shall supply and furnish the field laboratory with the following listed, but not limited, new furniture and appliances:

<u>Description</u>	<u>Quantities</u>
- Wood desk, W 1.2m x D 0.75 x H 0.7m 3~4 side drawers and 1 centre drawer	4
- Executive chair	4
- Conference table, W 1.9m x D 0.9m x H 0.7m	2
- Conference chair	8
- Wastebasket, large, solid sides, no wire	4
- Whiteboard, 1.80m x 0.9m with eraser	4
- Storage cabinet, (Lateral file, W 0.9m x D 0.45m x H 0.7m 3 drawers and Book-case, W 0.9m x D 0.45m x H 0.7m)	2
- Test equipment storage cabinet, W 0.6m x D 0.40m x H 0.9m	1
- Air conditioner (4 kw or more)	2
- Telephone (extension) with telephone table	1

The Contractor shall furnish enough equipment and apparatus for the purpose of carrying out the required concrete and soil tests.

The laboratory equipment and apparatus shall be of approved types and shall be adequate in the opinion of the Engineer to carry out all the tests as listed in the Specifications.

The list of equipment and apparatus shall be at least furnished to the laboratory by the Contractor.

<u>Description</u>	<u>Quantities</u>
(1) Quality Control Test for Fill and Backfill (Soil Test)	
a) Compaction Test, ASTM D 698, AASHTO T 99 or JIS A 1210	
- Mold, 101.6 mm dia. x 116.43 mm high	3
- Detachable collar assemble, 101.6 mm dia. x 50.8 mm high	3
- Base plate	3
- Rammer, 2.5 kg, 305 mm drop	2
- Sample extruder	1
b) Compaction Test, ASTM D 1557, ASSHTO 180 or JIS A 1210	
- Mold 152.4 mm dia.x 116.43 mm high	2

	<u>Quantities</u>
- Detachable collar assembly, 152.4 mm dia. x 50.8 mm high	2
- Base plate 4.54 kg.	2
- Rammer, 4.5 kg x 457 mm drop	2
- Sample extruder	1
c) Field Density Test, ASTM D 1556, ASSHTO T 191 or JIS A 1214	
- Plastic Jug	3
- Sand Cone	3
- Template	3
- Digging tools and paint brush	3
- Glass plate, 5 mm thickness, 200 mm x 200 mm	1
- Cylindrical can for calibration sand, 2.5 liters	1
- Multi-purpose field scale capacity 16 kg. sensitive 1 g.	3
- Ottawa sand or clean air dry uniform sand passing No. 20 sieve and retained on the No. 30 sieve	50kg
d) Moisture Content Determination	
- Drying Oven, 100 x 75 x 60 cm internal size thermostatically controlled capacity of maintaining a temperature of 100 ± 5 degree C.	2
e) Sample Splitter	1
f) Sieve Analysis	
- 8”Dia. Fine Series, sieve No. # 4, # 8, # 10, # 16, # 18, # 20, # 30, # 35, # 40, # 50, # 100, # 200, pan & cover	1 set
- Sieve No.200 for wet washing	2
- Motorized sieve shaker (220 V, 50 Hz)	1
g) Atterberg’s Limit Test	
- Liquid limit	2
- Plastic limit	2
h) Balance and/or Scale	
- Heavy duty solution balance capacity 20 kg sensitivity 1g	1
- Even arm solution balance 5,000 gms sensitivity 0.5 gms	1
- Triple beam scale 2,610 gms sensitivity 0.1 gms	1
- Triple beam balance capacity 311 gms sensitivity 0.01 gms	1
(2) Concrete Test	
a) Slump Test, ASTM C 143 or JIS A 1101	
- Slump cone, 102 mm dia. top, 203 mm dia. bottom x 305 mm high	3

	<u>Quantities</u>
- Iron plate	3
- Tamping Rod, 16 mm dia. x 500 mm length	3
- Steel ruler	3
b) Making of Specimen, ASTM C 31 or JIS A 1132	
- Cylindrical mold, 150 mm dia. x 300 mm high	30
- Capping set	6
- Concrete curing bath	2
c) Compressive Strength, ASTM C 39 or JIS A 1108	
- Compression testing machine with electric pump capacity 150 tons	1
d) Abrasion Test ASTM C 131 or AASHTO T-96	
- Los Angeles machine	1
e) Specific Gravity and Absorption Fine aggregate, ASTM C 128	
- Sand absorption cone	1
- Tamping rod	1
f) Specific Gravity and Absorption Course Aggregate, ASTM C 127	
- Standard wire mesh bucket	1
g) Organic Impurities Test ASTM C-40, ASHTO T 21	1
h) Sieve Analysis	
- 8" dia. course series sieve No. 2", 1 1/2", 1", 3/4", 3/8"	1 set
(3) Miscellaneous	
- Straight edge, 300 mm long	3
- Beaker, 500 cc	3
- Small hand scoop	4
- Large hand scoop	4
- Vernier calipers, measuring length 300 mm	2
- Steel staff, 3.0 m long	2
- Tray, 400 mm x 300 mm	10
- Wire brush	5
- Sampling spoon	3
- Moisture content sample container with lid	40
- Portable cone penetrometer, 16 mm dia. x 500 mm long rod x 10, MARUTO Model SS44 or approved equal	1
- Concrete test hammer CT-320 equal	1
- Turbidity meter, measuring range 0-550 PPM	1

At the end of the Contract, all equipment, apparatus and furniture of the Field Laboratory shall become the property of the Contractor, and shall be removed from the Site.

The Contractor shall maintain the Field Laboratory and assist the Engineer for operation of the Laboratory.

The power, water, and gas shall be supplied to the Field Laboratory by the Contractor. The daily laboratory supplies shall also be supplied by the Contractor.

The Contractor shall supply one laboratory technician, who speaks English well, and two assistant technician and 7 skill laborers for operation of the Laboratory under the Engineer.

1205 Assistance

The Contractor shall provide the assistance and personnel which may be required by the Engineer's representative in relation to preparation of the daily statements and works supervision, such as messengers, staff holders, watchmen, etc. whether required permanently or on an occasional basis.

1206 Topographical Equipment

The Contractor shall make available to the Engineer, for his own use the following instruments (the latest types):

- 1) Theodolites of the WILD T2 type, with D14L equipment: 1 unit
- 2) Automatic levels of the Zeiss Ni 2 type: 2 units
- 3) Folding 4m staffs with incorporated level: 4 units
- 4) Tripods: 3 units
- 5) 50m steel ribbons: 2 sets
- 6) 20m steel ribbons: 2 sets
- 7) 10m steel ribbons: 3 sets
- 8) 1.5m straight rules: 2 sets
- 9) Rods, topographer's sunshades, wood and stakes, cones and other accessories necessary for topographical and dimension verification operations.

These instruments, made available within one month following the order to start the Works, shall be new, and in case of damage, they shall be replaced immediately on the Engineer's request. On delivery of the certificate of completion, the Contractor shall dispose of the equipment.

1207 Measurement and Payment

All the stipulations of Section 1200 <EMPLOYER'S AND ENGINEER'S FACILITIES> of the Technical Specifications shall be performed and fulfilled by the Contractor. The payment for the whole of the Works of this Section will not be made separately under specialized Pay Items. All the costs of the above-mentioned works are to be distributed over other Pay Items of the Bill of Quantities of the Contract.

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DIVISION 2 EARTH AND STONE WORKS

SECTION 2000 EXCAVATION WORKS

2001 General

(1) General

This section covers stripping and open cut excavation. The Contractor shall carry out the survey works to confirm the final elevation, and dimensions for the excavation site prior to preparation of Shop Drawings.

The Contractor shall submit to the Engineer for his approval, prior to commencement of excavation works, the excavation method at each excavation site including lists of equipment to be employed, detail work schedule, and layout plans of temporary facilities such as temporary access road, dewatering facilities including deep well system, temporary platform and safety measures, etc.

(2) Scope of Works

The Contractor's scope of excavation works shall include design, labor, materials, equipment and consumable required for the execution of excavation works.

The Works include, but are not limited to the following:

- Clearing at the Site
- Stripping
- Excavation
- Compaction of excavated surface
- Remedy of extra or excess excavation
- Dewatering for excavation

The division of the Site, for payment of earth and stone works, shall be as follows.

Division of the Site for Payment of Earth Works

Construction Work	Limit of Working Site	Remarks
Sand Settling basin and Connection Canal	KM108.466 ~ KM108.860	
Suction Sump & Pumping Station	KM108.680 ~ KM108.990	
Delivery Pressured Pipeline	KM108.990 ~ KM118.360	
Discharge Tank and Connecting Canal	KM118.360 ~ KM118.560	
Access Road No.3	RKM 0.000 ~ RKM 5.060	

2002 Applicable Codes and Standards

The excavation works shall conform to the following codes, standards and specifications or other equivalent codes and standards subject to approval of the Engineer, except as may be amended in this Specification:

ASTM A 328 Specification for Steel Sheet Piling

2003 Materials and Workmanship

(1) General

Material for remedy of extra or excess excavation shall consist of soil obtained from borrow areas, excavated soil from structures and pipeline and routes other sources as specified or directed by the Engineer. The materials shall not contain boulders and rock fragments larger than 100 mm.

The material shall be well graded as delivered to point of use. It shall conform to the requirements specified in the Specifications and the drawings and shall be free from organic materials, or any other unsuitable material.

Prior to the execution of remedy of extra or excess excavation, the Contractor shall submit samples of materials for remedy of extra or excess excavation with sufficient test results and data, and list of supply sources and quantities for the Engineer's approval.

(2) Remedy materials for extra or excess excavation

Remedy materials shall be the approved materials in compliance with above item (1) in this section "General" and the following requirements.

Material – A : Materials obtained from excavation for structures

(3) Workmanship

All workmanship shall be of the best quality in each respective category of the Works. Except where otherwise stated, or approved by the Engineer, all materials used in the Works shall be of the best quality, in the respective kinds specified or described in the Specifications, Drawings and Bill of Quantities, and shall comply wherever possible with the current issue of the reference Standards or other equivalent approved national standards, subject to the approval of the Engineer.

2004 Clearing at the Site

The Contractor shall clear the ground on the site and around the structures to be constructed. Such clearing shall comprise taking out trees, roots, and bushes and removal of other objectionable materials such as unstable stones and artificial things.

2005 Stripping

Stripping shall consist of removal and disposal of topsoil and surface vegetation, tree stumps, roots and any other organic materials.

Stripping shall be performed through the alignment and to such width and depth shown on the drawings or directed by the Engineer taking account that surface runoff is assured and impoundment of water is eliminated.

Standard thickness of stripping shall be 50 cm in average.

2006 Excavation

- (1) Materials excavated will not be classified for payment. Except as otherwise provided in the Specifications, material excavated will be measured in excavation, to the line as shown on the drawings or as provided in the Specifications.
- (2) Excavation shall be made to the lines, grades, and dimensions shown on the drawings or established by the Engineer. No unexcavated material shall be permitted to remain within the limits of the lines shown on the drawings.

The Engineer does even not represent, the excavation can be performed to or maintained at the pay lines shown on the drawings.

The Engineer reserves the right, during the progress of the work, to vary the slopes, grades, or the dimensions of the excavations from those specified on the drawings.

For the temporary excavation of the pumping station, the pipelines and other structures, the pay line is established as the slope of 1 : 2 shall have a step with 3 m width at each 5 m height, if height of excavation is more than 5 m and toe of slope shall be 1.0 m far from edge of the structure, unless otherwise shown in the drawings or prescribed by the Engineer.

All necessary precautions shall be taken to preserve the material below and beyond the established lines of all excavation in the soundest possible condition. Any damage to the work due to the Contractor's operations, including shattering of the material beyond the required excavation lines, shall be repaired at the expense of and by the Contractor.

- (3) Where practicable, as determined by the Engineer, suitable materials shall be excavated separately from the materials to be wasted and the suitable materials shall be segregated by appropriate manner during the excavation operations. The material shall be placed in the designated final locations directly from the excavation or shall be placed in temporary stock-piles where proposed by the Contractor and approved or directed by the Engineer.

Excavated materials which are unsuitable for backfill, as determined by the Engineer, shall be spreaded over around the pipeline routes as approved or directed by the Engineer. The Contractor

shall submit to the Engineer for his approval the Contractor's proposed plan on the disposal of the excavated materials to any spoil banks or areas, whether or not shown on the Contract drawings.

Where concrete is to be placed directly on the excavation surface, such excavations shall be sufficient at all points to provide for the minimum dimensions of concrete. Where dimensions of a concrete structure are shown on the drawings or if the elevation of the foundation is indicated, such dimensions shall be considered as the minimum requirement. Where a dimension or an elevation is not indicated on the drawings, minimum dimensions will be established by the Engineer.

2007 Special Care for Excavation

- (1) Where the vertical cut surface is in trenches, sumps, pits and other places, the excavation shall be close sheeted, or carried out within sheet piling made of timber or steel as may be necessary or as will be directed by the Engineer, so that the surrounding ground and all structures shall be secured against all risks of damage from landslide or other movement.
- (2) The Contractor shall take special precautions for the erection of barriers, removal of loose materials or other means, to prevent landslide or other movement such as might cause injury to persons, damage to the Works or hindrance to the progress of the Works.
- (3) The Contractor shall take particular care during construction to avoid deterioration of the ground, due to the exposure to weather or to the passage of construction plant; and in such locations the last 20 cm of excavation above the foundation or formation level shall be carried out by hand before the concrete placing is started.

2008 Compaction of Excavated Surface

The excavated surfaces, after being cleaned, trimmed and leveled, shall be well rammed and compacted wherever necessary to provide a firm formation. Wherever an excavated surface has been displaced by traffic or has softened or otherwise deteriorated under the action of water or has been broken by temporary drainage sumps or by any other cause, the Contractor shall excavate and remove the soil at such places to provide a firm foundation.

2009 Remedy of Extra or Excess Excavation

The Contractor shall make good remedy of any extra excavation with concrete or with properly compacted filling as directed by the Engineer, to whose satisfaction the Contractor shall remedy any other consequence of excess excavation.

The cost involved in complying with this section shall be included under the appropriate pay items in the Bill of Quantities.

2010 Dewatering for Excavation

Before commencing the Works of the El Salaam No.7 Pumping Station, the Contractor shall submit to the Engineer for approval his proposed program for dewatering and keeping the site of the Works free from water. The proposed program shall include the detailed description of all pumping arrangements, equipment to be employed and plan and profile of delivery pipeline route and temporary sheet piling cutoffs, etc. The Contractor shall provide one unit of standby dewatering equipment with sources of power for emergency care.

Except where otherwise specified, the Contractor shall construct all concrete work, and fill and backfill in the dry conditions. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly groundwater in the excavation sites, and keep such excavation dry so as to obtain a satisfactory undisturbed foundation until structure or fill to be built thereon will have been completed.

2011 Sheeting and Bracing

Relating to the Clauses 2006, 2007, 2008, 2009 and 2010, following requirements shall be applied to the sheeting and bracing works during the construction according to the Contractor proposal and subject to the Engineer's approval or as directed by the Engineer.

- (1) The Engineer will require that the drawings for the sheeting and bracing work shall be submitted for approval at least fifteen (15) days prior to the anticipated date of installation. Approval of the drawings by the Engineer will not relieve the Contractor of the responsibility in any manner for the adequacy of the design for strength and for the safety of the labors and inspectors working therein. If at any time during the course of the Works, the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, the Contractor may order additional supports to be put in by the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports.
- (2) The Contractor shall furnish, put in place, and maintain such wood and/or steel sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation necessary for proper construction. Care shall be taken to prevent voids outside the sheeting, but if voids are formed, they shall be immediately filled with granular materials and suitably compacted.
- (3) The Contractor shall leave in place to be embedded in the backfill all steel and wood sheeting and bracing which the Engineer may direct him in writing to leave in place at any time during the progress of the Works for the purpose of preventing injury to structures. The Engineer may direct that timber used for sheeting and bracing be cut off at any specified elevation.

All sheeting and bracing not to be left in place shall be carefully removed in such a manner as not to endanger persons and structures. All voids left or caused by withdrawal of the sheeting shall be immediately refilled with granular materials by compacting with tools especially adaptable for that purpose, by watering or otherwise as may be directed by the Engineer.

Wood for bracing and sheeting shall be of adequate section and quality and shall be sound, and free from knots, twists or other weakening effects. Steel sheeting shall conform to ASTM A 328 "Steel Sheet Piling" or approved equivalent. The sheeting shall be braced at all times to prevent slips and cave-in of walls or subsidence of adjacent areas.

- (4) Measurement, for payment, of the sheeting and bracing works required for construction will not be made, and the cost of the sheeting and bracing works shall be included in the price of appropriate pay items for the excavation in the Bill of Quantities.

2012 Measurement and Payment

- (1) Measurement, for payment, of stripping will be made of the areas stripped to the lines shown on the shop drawings and on the basis of the nominal thickness shown on the shop drawings or prescribed by the Engineer.

Payment for stripping will be made at the unit price per cubic meter, which unit price shall include the costs of clearing, stripping, stocking, disposing of the unsuitable stripped materials by burying, and incidental works necessary for the completion of stripping.

- (2) Excavation (1) shall be measured excavated earth volume above the elevation of operation and maintenance road along with open canal/ pipeline sections and vicinity of pumping station. Excavation (2) shall also measured excavated earth volume below the elevation of operation and maintenance road and vicinity of pumping station. Excavation (3) shall be measured excavated earth volume below the elevation 2.50 m above mean sea level at the No. 7 pumping station.
- (3) All required and accepted excavation shall be measured in the volume determined in cubic meters computed from the shop drawings of required and completed work. Interim payment may be made on actually executed. Measured excavation shall include excavation for removal of slides, breakage and cave-ins except where caused by carelessness or improper methods by the Contractor.
- (4) The unit prices for excavation shall include the cost of all labor, equipment, materials, timbering and sheeting, machinery for excavating and of all pumping, bailing, draining, and all other work necessary to maintain the excavations in good order during construction and of removing such temporary construction where required.

The unit prices for excavation shall also include the cost of transportation of materials from the excavation to points of final use, to spoil banks, to temporary stockpiles, and from temporary stockpiles to points of final use or spoil banks and also disposal of excavated waste materials.

All excavated materials actually placed in compacted fill and backfill constructions will again be measured for payment under appropriate pay items covering such fill and backfill constructions.

Cost of stripping and excavation required for the following works and to complete the following structures shall be included in the respective unit prices or prices.

- Common temporary works
- Temporary works including dewatering
- Guardrail
- Curbs
- Fence, Entrance gates
- Traffic sign, Lighting post, Guide post

SECTION 2100 FILL AND BACKFILL

2101 General

(1) General

The section covers the material to be used as fill and backfill, and the method of placing, compaction and testing for No. 7 Pumping Station, delivery pressured pipeline and appurtenant structures..

(2) Scope of Works

The Contractor's scope of fill and backfill works shall include design, labor, materials, equipment and consumable required for the execution of fill and backfill works.

The Works include, but are not limited to the following:

- Foundation preparation
- Placing of fill materials
- Compaction
- Testing of fill
- Dewatering for fill and backfill

2102 Applicable Codes and Standards

The fill and backfill works shall conform to the following codes, standards and specifications or other equivalent codes and standards subject to approval of the Engineer, except as may be amended in this Specification:

ASTM D 698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 4253	Standard Test Method for Maximum Index Density and Unit Weight of Soil Using a Vibratory Table

2103 Material and Workmanship

(1) General

Material for fill and backfill shall consist of soil obtained from borrow areas, excavated soil from structures and pipeline and routes other sources as specified or directed by the Engineer. The materials shall not contain boulders and rock fragments larger than 100 mm.

The material shall be well graded as delivered to point of use. It shall conform to the requirements specified in the Specifications and the drawings and shall be free from organic materials, or any other unsuitable material.

Prior to the execution of fill and backfill, the Contractor shall submit samples of materials for fill and backfill with sufficient test results and data, and list of supply sources and quantities for the Engineer's approval.

(2) Fill and Backfill Material

Fill and backfill materials shall be the approved materials in compliance with above item (1) in this section "General" and the following requirements.

Material - A: Materials obtained from excavation for structures

Material - B: Materials of Laterite from approved quarry sites and standard gradation of materials specified as follows:

Materials obtained from the approved borrow area not containing more than twenty (20) percent of particles passing the No.200 (0.074 mm) sieve and shall have the following grade:

Diameter(mm)	Percentage Finer by Weight (%)
40.00	100
25.00	75 to 95
9.500	40 to 75
2.000	20 to 45
0.106	0 to 30
0.074	0 to 20

(3) Fill and Backfill

Unless otherwise indicated, the materials for fill and backfill shall be "Material - A" specified in the item (2) above.

(4) Fill and Backfill with Selected Material

The materials for fill and backfill, to be carried out under the pay items as stated "Fill and backfill with Laterite material" in the Bill of Quantities, shall be "Material - B" specified in the item (2) above.

(5) Workmanship

All workmanship shall be of the best quality in each respective category of the Works. Except where otherwise stated, or approved by the Engineer, all materials used in the Works shall be of the best quality, in the respective kinds specified or described in the Specifications, Drawings and Bill of Quantities, and shall comply wherever possible with the current issue of the reference Standards or other equivalent approved national standards, subject to the approval of the Engineer.

2104 Foundation Preparation

The area of foundation for fill and backfill shall be stripped and excavated as shown on the drawings or as directed by the Engineer.

Before placing the first layer of fill and backfill on such compacted foundation area, the surface shall be scarified to a depth not less than 50 mm, in order to roughen the surface and provide good bonding of the fill placed thereon.

2105 Placing of Fill Materials

- (1) The fill and backfill material shall be placed and spread with continuous layers parallel with the major axis of the structure. Layers shall not exceed 250 mm compacted measure in thickness except as approved by the Engineer.

In area inaccessible to the compaction equipment selected for normal use, the fill and backfill shall be placed in layers not exceeding 50 mm compacted in thickness, and compacted by using hand operated vibrating roller and/or mechanical tamper as approved by the Engineer. The placing of fill and compaction with hand operated equipment shall be continued until satisfactory to the Engineer.

The surface of the filled layers shall slope transversely at a grade of 5 percent so that surface shall drain freely and away from structures. The fill shall not be contaminated by other materials and it shall be free of lenses, pockets, streaks or layers that are more previous and lumps or clods shall be broken down. Where the surface of the fill is considered by the Engineer to be too smooth for proper bonding with next layer, such surface shall be scarified or harrowed as directed immediately prior to the placing of the next layer of fill.

- (2) Where the surface has dried too much for proper bonding, it shall be uniformly sprinkled with water, scarified, harrowed and mixed until the moisture content of the in place material is within the required limits.

If the moisture content of the in place material is higher than the limit required, such fill shall be scarified, harrowed and treated until its moisture content is within required limits or it shall be removed from the fill site where directed by the Engineer.

- (3) The Contractor shall immediately suspend any or all fill placing operations during rain or at anytime the Engineer considers conditions or procedures to be unsatisfactory.

2106 Moisture Control of the Materials

The Contractor shall conduct his operations so that the moisture content of the fill and backfill material at the time of compaction shall be as uniform as practicable and the Contractor shall control the placement moisture content within the specified limits unless otherwise directed by the Engineer.

Unless otherwise directed by the Engineer, the placement moisture content of the fill and backfill shall be maintained compatible range in approximate laboratory optimum value as defined in ASTM D 698 (Standard).

2107 Compaction

Each layer of the fill and backfill material shall be compacted by an approved compactor so that the fill material shall form a single homogeneous mass. When so directed by the Engineer, hand operated heavy duty tampers and/or smooth faced vibrating rollers shall be used for the compaction of fill and backfill material placed in areas inaccessible to the compaction equipment selected for normal use. These tampers or rollers shall be air, gasoline or diesel powered. They shall be easily maneuverable and of sufficient capacity to obtain the specified density.

The dry density of the fill and backfill shall be as specified below:

Description of Work	Required Compaction*
Fill and backfill(Material-A)	90%
Fill and backfill with selected material(Material-B)	90%

*Percent of the maximum dry density as determined in accordance with ASTM D 698 (Standard)

In case of compaction on Material - A and Material - B, special care shall be taken to avoid the over compaction.

2108 Testing of Fill

The Engineer will perform tests on the specified fill materials. Testing by the Engineer will be done as frequently as deemed necessary and the Contractor shall furnish labor and construction equipment to assist in obtaining the samples for testing.

- (1) The compaction test of fill and backfill shall be conducted in accordance ASTM D 4253 to control density of filled material in place.
- (2) The Contractor shall, if directed by the Engineer, excavate test pits for inspection and testing of material. These pits shall be made the backfill and hand tamped, as directed by the Engineer.

2109 Borrow Area

The Contractor shall submit proposals to the Engineer for approval indicating excavation and working of borrow area showing the proposed extent of excavation required, especially No.7 Pumping Station.

- (1) The location of borrow areas and selection of materials shall be subjected to the approval of the Engineer. When the works carried out by the Contractor, the borrow areas shall be left in a safe, neat and well balance condition.
- (2) In case the Contractor may provide stockpiles, to stock material for convenience of construction method, the stockpiles shall be approved by the Engineer and shall be cleared, stripped, graded and compacted prior to the placement of usable material.
- (3) Should a borrow area be developed, all the expenses for preparation of temporary access road, clearing, grubbing and stripping of ground surface, disposal of top soil and unsuitable materials, excavating, extracting and hauling of suitable materials, royalty and right, drainage, cleaning and trimming during and after operation, and other incidentals shall be borne by the Contractor.

2110 Measurement and Payment

Measurement, for payment, of fill will be made of the materials in place in completed fill to the lines, grades, slopes, and thickness shown on the drawings or established by the Engineer.

Measurement, for payment, of backfill about structures will be made only for the volume actually placed within the limits of the established pay lines for excavation for structures.

Fill (1) shall be measured the fill volume of concrete lining portion of connecting canal of sand settling basin and discharge tank. Fill (2) shall be measured the fill volume of embankment portion of operation and maintenance road. Fill (3) shall be measured the fill volume of embankment portion of vicinity of steel pipeline laid.

Backfill (1) shall be measured the backfill volume above elevation 2.50 m above mean sea level at the No. 7 pumping station, and backfill (2) shall be measured the backfill volume below 2.50 m above mean sea level at No. 7 pumping station. Backfill (3) shall be measured the backfill volume at vicinity of main steel pipeline laid.

The fill and backfill caused by the extra excavation made to insure the Contractor's working spaces beyond pay lines shall not be measured for payment, and be deemed to be included in the rate of fill and backfill.

No allowance will be made in measurement for payment for settlement, shrinkage, and consolidation of the foundation or of the material in the fill and backfill.

No separate measurement will be made between fill and backfill. Payment for fill and backfill will be made at the unit prices per cubic meter, which unit prices shall include all the expenses for labor, equipment, machinery, right or royalty of material acquisition in quarry or borrow area, excavating, hauling, loading, unloading, spreading and compacting of materials, shaping and trimming of fill and backfill, cleaning and treatment of quarry or borrow area after worked out and incidental works necessary for the completion of fill and backfill works.

Cost of fill and backfill required for the following works and to complete the following structures shall be included in the respective unit prices or prices.

- Common temporary works
- Temporary works including dewatering
- Guardrail
- Curbs
- Fence, Entrance gates
- Traffic sign, Lighting post, Guide Post

SECTION 2200 STONE WORKS

2201 General

(1) General

This section covers the materials to be used and the placing for stone works such as “Stone pitching with Mortar Caulking” and “Crashed Gravel Bedding”.

The stones to be used for various purposes shall be the best kind, sound and durable, free from flaws and from soft, weathered or decomposed parts. The borrow area and quarry site to collect stone material shall be proposed to the Engineer for his approval by the Contractor. When required by the Engineer, samples of stone shall be submitted by the Contractor for testing

(2) Scope of Works

The Contractor’s scope of stone works shall include design, labor, materials, equipment and consumable required for the execution of stone works.

The Works include, but are not limited to the following:

- Foundation preparation
- Placing of stone pitching materials
- Mortar caulking of stone pitching
- Crashed gravel bedding
- Dewatering for stone works

2202 Applicable Codes and Standards

The stone works shall conform to the following codes, standards and specifications or other equivalent codes and standards subject to approval of the Engineer, except as may be amended in this Specification:

ASTM	C	33	Standard Specification for Concrete Aggregates
ASTM	C	128	Standard Test Method for Specific Gravity and Absorption of Fine Aggregates
ASTM	C	136	Standard Test Method for Sieve or Screen Analysis Fine and Coarse Aggregates
ASTM	C	150	Standard Specification for Portland Cement

2203 Materials and Workmanship

(1) Stone Pitching Material

The stone pitching material (riprap) and crashed gravel bedding materials shall be either field stone or rough rock stone at quarry. Material shall conform to the following gradation requirements except when otherwise described in the drawings.

Stone pitching with 400 mm in nominal thickness

Dia meter (cm)	Percent Finer by Weight (%)
40	100
20	30 to 100
15	0 to 50
10	0 to 10

The length of the rock shall not exceed 1.5 times of the diameter. The minimum density of rock shall be 1.5 and the density test shall be executed on each 5,000 cum of the riprap materials. Cement and sand shall conform to Division 3 "CONCRETE WORKS" .

(2) Crashed Gravel Bedding Material

The materials shall be previous mixtures of sand, gravel, and cobbles reasonably well graded from 2.5 to 40 mm in maximum dimensions. The material shall contain not more than 5 percent, by weight, of material passing 2.5 mm. The standard gradation of crashed gravel shall be as follows:

Diameter (mm)	Percent Finer by Weight (%)
40	95 to 100
20	50 to 80
5	15 to 40
2.5	5 to 25

(3) Workmanship

All workmanship shall be of the best quality in each respective category of the Works. Except where otherwise stated, or approved by the Engineer, all materials used in the Works shall be of the best quality, in the respective kinds specified or described in the Specifications, Drawings and Bill of Quantities, and shall comply wherever possible with the current issue of the reference Standards or other equivalent approved national standards, subject to the approval of the Engineer.

2204 Stone Pitching with Mortar Caulking

The stone pitching with mortar caulking as shown on the drawing shall be constructed of sound and durable rock obtained from approved quarry sites. The stone shall be free from cracks, seams, or defects that would tend to increase unduly its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay and rock fines shall not be permitted.

(1) Placing

a) Placed riprap and dumped riprap

Riprap shall be placed or dumped in such a manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed within the specified tolerance to the lines and grades shown on the drawings. For the placed riprap, stakes shall be set both ways at 5 m intervals, and at points of grade changes, before riprap is placed. A tolerance of plus 15 cm from the thickness shown on the drawings will be allowed in the finished surface of the riprap. Where thickness of riprap exceeds the allowable tolerance, excess riprap shall be redistributed or removed from the work. No minus tolerance will be permitted. Riprap shall be placed to its full course thickness in one operation and in such a manner to avoid displacing the underlying material. The large stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded. The finished riprap shall be free from pockets of small stones and/or clusters of larger stones.

Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes shall not be permitted. The desired distribution of the various sizes of stone throughout the mass shall be obtained by selective loading of the materials at the quarry or other sources, the controlled dumping of successive loads during final placing, or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand shall be required to the extent necessary to obtain a reasonably well-graded distribution of stone sizes.

For the dumped riprap, the Contractor shall submit the proposal of detailed manner for dumping riprap to the Engineer for his approval before commencement of the works.

The dumped riprap shall not vary in thickness more than 30 cm measured in right angle to the planned foundation line at any point. Rearranging of individual stones by mechanical equipment or by hand will be required to obtain a reasonably well-graded distribution of stones.

b) Mortar Caulking of the Riprap

Riprap shall consist of hand placed rock and interstices which shall be filled with sand-cement mortar.

Rocks shall be placed to form a layer of riprap 400 mm thick unless otherwise shown on the Drawings, measured perpendicular to the slope. Selected rocks, roughly squared and pitched to line, shall be placed at all wall angles and at all wall ends.

After the rock spalls have been placed, all loose stones and soil shall be removed and the rock spalls moistened. The interstices shall be filled with mortar consisting of one part cement to three parts sand (dry, by volume). The water content and consistency shall be suitable for working but not excessive such as to cause puddling and weakening the in-fill. The sand-cement mortar shall be worked into the interstices so that the joints are completely filled.

For rock protection to be used in flowing water such as at culverts, drain slopes, etc., the pointing pattern shall be flush with the rock spall to avoid abrupt changes in surface profile.

Within twenty four (24) hours of construction, the joints on all exposed faces shall be raked clear of loose mortar and pointed with the mortar specified. The texture of pointing shall match the texture of the rock used and shall be given a smooth finish. The riprap shall be kept wet while the pointing is being done.

Mortared riprap shall be protected from the sun and kept moist for at least three (3) days after pointing. Any existing riprap or new work which is damaged shall be removed and replaced.

The tolerances for finished surface shall be:

- Protrusions or depressions not to exceed 10 mm above or below the average plane level in any one square meter of surface.
- The thickness of mortared riprap not to be less than the stated dimensions on the drawings or these

2205 Crashed Gravel Bedding for Structure

(1) General

Bedding for structure shall be placed to the prescribed lines, grades, and thickness and at locations shown on the drawings and elsewhere as directed.

(2) Placing

The bedding for structure shall be compacted as specified in the section 5004 "Upper Sub-grade" of the Specifications. The minimum dry density of compacted bedding for structure shall not be less than 90% of the maximum dry density.

2206 Measurement and Payment

Measurement, for payment, of stone pitching (riprap) will be made in cubic meter on the basis of the area in place and the nominal thickness shown on the drawings or prescribed by the Engineer.

Measurement, for payment, crashed gravel bedding for structure will be made in volume completed and accepted in accordance with the specifications, lines, levels, grades and cross sections shown on the drawings or ordered in writing by the Engineer.

No allowance will be made in measurement for payment for loss of material by flowing, settlement, shrinkage, and consolidation of the foundation or of the material in the riprap and gravel bedding for structure.

Payment for riprap and crashed gravel bedding for structure, sand bedding will be made at the respective unit prices per cubic meter, which unit prices shall include all the expenses for labor, equipment, machinery, right or royalty of material acquisition in quarry or borrow area, extracting,

hauling, loading, unloading, spreading and compacting of materials, shaping and trimming, and cleaning and treatment of quarry or borrow area after worked out and incidental works necessary for the completion of the works.