

PSPP MANARA 156 MW

ISRAEL

RFP DOCUMENTS

VOLUME 2

SECTION IV

General Civil Specifications

REV 2.1

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- 2.0 Second edition: April 2019
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Note:

Owner means Owner/Employer and/or Owners Engineer (OE)

It is further hereby clarified that any approval/non-objection made by the Owner shall not, in any way, release the Contractor from any of its responsibilities and liabilities, nor shall it impose any obligation or responsibility on the Owner which fully relies on the Contractor's expertise. It is further clarified that in any event of Owner's reservations and/or comments, it shall be the sole responsibility of the Contractor to recheck and confirm any such comment.

The Owner disclaims any and all liability for any errors, inaccuracies or incompleteness contained in this document. To the extent that the terms and conditions set forth herein conflict with the terms and conditions of the EPC Contract Agreement and/or O&M Contract Agreement, as applicable, the terms and conditions of the EPC Contract Agreement and/or O&M Contract Agreement, as applicable, will prevail.

Notwithstanding anything to the contrary in this document or any other Project Document, the Design and Works and Services (as applicable) shall be done and executed in compliance and shall adhere to the Israeli applicable standards. Compliance with an applicable recognized international standard shall not in no way derogate from the above requirement to comply at all times with the Israeli applicable standards. In the event that no Israeli standard is applicable the Design and Works and Services (as applicable) shall be done and executed in compliance and shall adhere to the relevant standard specified in the list included in the general specifications (Volume 2 Section IV, Section VI of the RFP Documents).

1 GENERAL

1.1 Intent of Specifications

It is the intent of these specifications to describe primary features, materials, design and performance requirements and to establish minimum standards for the civil works.

It is not the intention of these specifications to specify in complete detail the various practices of contractor who shall perform all work and furnish equipment to meet, in all respects, the specified requirement in regard to performance, durability and satisfactory operation.

Deviation from these specific requirements must have written approval of the owner's engineer (OE).

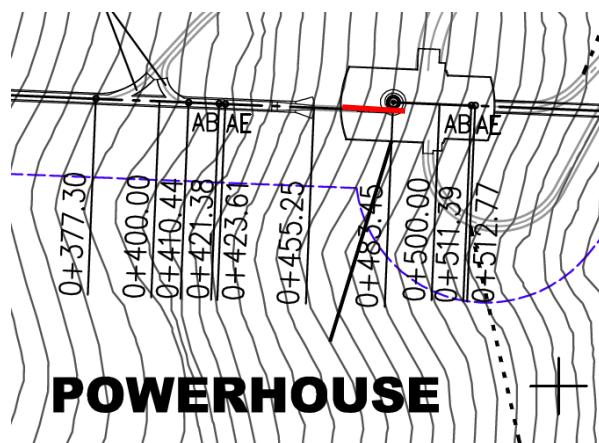
For the purposes of design, the life of the project shall be considered as 50 years.

1.2 Scope of Civil Works

The work to be carried out under this Contract is as shown in the study report and drawings performed by Pöyry Energy GmbH and in this document, issued as part of the RFP Documents and includes, but is not limited to, the following:

1. Upper reservoir of 1.17 Mm³ active storage:
 - Reservoir stripping, excavation, filling and treatment
 - Rock Fill Dam
 - Reservoir sealing with asphalt or PVC foil
 - Reservoir drainage system
 - Bottom outlet with valves and impact basin
 - Operation building
 - Access road, road at dam base and fences
 - Initial impounding
2. Power waterway:
 - Upper intake with trash rack, roller gate (able for emergency closure) and stop logs
 - A vertical High Pressure (HP) shaft of approximately 621 m height and 3.0 m inner diameter. Steel lined along the whole length
 - A horizontal HP tunnel of approximately 440 m length and 3.0 m inner diameter. Steel lined along the whole length including backfill concreting between the steel pipe and the rock and grout injection afterwards.

- A steel lined HP manifold (Part from fixpoint with cone till main inlet valve; see drawing below red line).



- An LP tunnel of approximately 1540 m length and 3.8 m inner diameter. Concrete lined along the whole length including grout injection works.
 - A throttled surge tank with a vertical shaft and one horizontal chamber
 - A access and aeration tunnel to the surge tank connected to the main access tunnel
 - At least one flexible joint cavern including a flexible joint element and a access tunnel to this chamber
 - Lower intake with trash rack, roller gate (able for emergency closure) and stop logs
3. Underground powerhouse (cavern):
- Housing the pumpturbine and motorgenerator, the main inlet valve (MIV), the draft tube gate, the main power transformer, the common starting equipment (Static Frequency Converter) and all associated equipment
 - Cranes and hoisting systems
 - All other building equipment such as HVAC, drainage, firefighting equipment.
 - Architectural finishing
4. Main Access Tunnel (MAT):
- Approximately 1400 m long
 - Pavement concrete or asphalt
 - Housing one set of 161 kV cables to the outdoor substation, the escape way, fresh air supply and smoke extraction channels
 - Ventilation system

- Main cavern dewatering pipe and several other pipes and cables for the cavern supply
 - An additional escape Tunnel
5. Lower reservoir of 1.24 Mm³ active storage:
- Reservoir stripping, excavation, filling and treatment
 - The stripped / excavated material has to be dried and conveyed to an approved dedicated waste location in accordance with any applicable law
 - Rock Fill Dam
 - Reservoir sealing with asphalt or PVC
 - Reservoir drainage system
 - Bottom outlet with valves and impact basin
 - Access road, road at dam base and fences
 - Initial impounding
6. A 161 kV outdoor substation for connection to the Israel Electric Corporation (IECo) transmission grid:
- Excavation and treatment for the substation area
 - Substation equipment for two switchboards
 - Foundations, channels, Pylons for the whole substation
 - One switchyard operation building inside the premises of the substation, including all secondary equipment for the entire switchyard which is under the operational responsibility of the IECO and the Owner
 - One control/operation building at the entrance of the site, and such control/operation building will also serve as a visitors centre, as will be determined by the Owner in a Variation Order
 - Emergency diesel generator
 - One guard house
 - Surrounding fences at the whole switchyard area
 - An electrical gate and
 - Access road, road to the MAT and car parking area
7. All relevant SCADA and communication equipment required for the overall monitoring and control of the power plant including the management of interfaces with external systems (IECo and Owner's office)

8. All other ancillary buildings and facilities of the project including the water supply pipes, whether situated within the site or outside the site (except if explicitly instructed otherwise hereinafter) and all access roads which may be required for accessing the site for the sake of executing the works, and long-term operation and maintenance. Project –dedicated water supply pipes may exist outside the site and their handling should be coordinated with the Water Supplier
9. In order to implement the project, a temporary work site will be built. The main construction site will be located at the site between the lower reservoir and the technical area according to laydown area building permit, ~~as detailed in chapter 5 below~~. The construction site will be built by the EPC for the use of all Sub-Contractors, the EPC site management and the Owner, and will be fully demobilized after the commissioning of the project and its area shall be restored to its original conditions
10. The detail design of all civil and hydro-mechanical works of the pump storage power plant and the switchyard

The scope work for Hydro Mechanical equipment as: Gates and trash racks at upper and lower reservoir, bottom outlets at upper and lower reservoir, steel lining of high pressure shaft and high tunnel as well as steel lining of HP and LP manifold, jet throttle of surge tank and at least one flexible joint element is specified in Volume 2, Section VI and Section VIII.

The above scope represents the pump storage power plant Manara (The Project). A division of the PSPP Manara construction into different contracts is not foreseen. Therefore the construction has to be executed **by one responsible EPC Contractor**.

1.3 Responsibility of Contractor

First it will be stated that this is a Turnkey-Project.

- Contractor shall guarantee and be responsible for:
- Surveys, design, supply, construction and installation of the temporary and permanent works; commissioning and bringing the plant into commercial service according to the tender documents
- the quality of all materials and workmanship of the complete works as per the requirements

All as required under the EPC Contract.

1.4 Co-operation with Owner's Staff during Construction

The Owner may allocate from time to time and for variable periods members of his operations and maintenance staff to observe the detailed activities of the Contractor in the construction and installation of parts of the works. The Contractor shall provide such Owner's staff with all reasonable assistance to enable them to observe his activities, including the provision on site of detailed information and explanations on the activities, materials and equipment involved.

1.5 Relations with local Authorities

The Contractor shall not be in liaison with the local Municipal and District Government authorities. The Owner may request the presence of the Contractor in certain meetings with such authorities.

1.6 Public Relations

The Contractor shall not publish or provide any information relating to progress or financial status of the work to any person or organization without the prior written consent of the Owner.

1.7 Standards and Codes

Notwithstanding anything to the contrary in this document or any other Project Document, the Design and Works and Services (as applicable) shall be done and executed in compliance and shall adhere to the Israeli applicable standards. Compliance with an applicable recognized international standard shall not in no way derogate from the above requirement to comply at all times with the Israeli applicable standards. In the event that no Israeli standard is applicable the Design and Works and Services (as applicable) shall be done and executed in compliance and shall adhere to the relevant standard specified in the list included in the general specifications (this Volume 2 Section IV and Section VI of the RFP Documents).

1.7.1 General

Standards or names of reputable manufacturers are referred to in these Specifications. Pertinent provisions of these standards shall apply to the work, and are hereby incorporated in these Specifications.

Where a manufacturer is named, other manufacturers' products will also be acceptable provided the designated material or workmanship is of equivalent or better quality.

All standards and codes employed or referred to shall be the latest current issue in effect at the date 28 days prior to the contract date.

One complete set of standards and codes adopted for the works shall be submitted free of charge by the Contractor to the Owner immediately after the Contract has come into force or upon the Owner's request. Such copies shall also be available at the Contractor's business domicile(s) and at Site, for the use also of the Owner and of the Owner's Engineer (OE). In each Method Statement prepared and submitted by the Contractor, he shall include a full list of all standards and codes used in that Method Statement.

In case of discrepancies between these Specifications and national or international standards and codes, these Specifications being part of Contract Documents shall govern, unless otherwise established by the Owner for each particular case.

1.7.2 Standards, codes, laws and regulations

Throughout the duration of the Contract, the materials, equipment, services, design and workmanship shall conform to applicable national codes, standards, laws and regulations in force in the country of the works, if not otherwise specified.

It is the Contractor's duty to acquaint himself with all available national codes, standards, laws and regulations related to the works in any way and he shall procure and keep at the Site a copy of each of such applicable documents. The following international standards/codes series may be adopted:

- Local/National (Israeli)
- US (ACI, ASTM, ANSI, USBR, AASHO)
- EU (EN)
- German (DIN, VDI)

provided:

The standards/codes proposed are at least as stringent as the equivalent national ones relevant to the works, or if there is no applicable national standard/code for the specific item concerned.

The Contractor states, prior to starting the work, the international standard/code he proposes to apply, giving full identification of each of them. These proposals are subject to the approval by the Owner.

Where reference is made in the technical documents to standards/codes of the country of origin for a supply item, it shall be a recognized national standard/code of the country, where the specific supply item is manufactured. To be acceptable under these Specifications, such standards/codes must comply in all respects with the quality requirements of above mentioned international standards/codes and must be approved by the Owner.

For following works the detailed descriptions of the relevant standards and codes will be provided in the general and the particular technical specifications:

- General Civil / HM Specifications
 - General Specification for Civil Works
 - General Specifications for Hydraulic Steel Structures
- Particular Civil Specifications
 - TS_00 Preamble
 - TS_01 Site_Installations
 - TS_02 Safety_Precautions
 - TS_03 Surveying_and_Setting_Out
 - TS_04 Care_of_Water
 - TS_05 Surface_Excavation
 - TS_06 Underground Excavation
 - TS_07 Rock_Stabilization_and_Support
 - TS_08 Slope Protection
 - TS_09 Concrete
 - TS_10 Sprayed_Concrete

- TS_11 Embankment_Construction+Instrumentation
- TS_12 Sealing
- TS_13 Drilling_Water_Pressure_Testing
- TS_14 Grouting
- TS_15 Road_Works
- TS_16 Metal Works
- TS_17 Structural Steelwork
- TS_18 Architectural Finishing
- TS_19 Miscellaneous
- TS_20 Drainage_Works
- TS_21 Masonry_Plastering_Works
- TS_22 Painting _Works
- TS_23 Metal_Siding_and_Roofing
- TS_24 Welding
- TS_25 Underground_Electrical_Cable_Ducts
- TS_26 Double_Floors

1.8 Abbreviations

The abbreviations given in ASTM E380, Standard Practice for use of the International System of Units, shall be employed.

1.9 Documentation by Contractor

Throughout the Contract period, Contractor is required to submit certain specified documentation. These submissions shall be in English, including the operating and maintenance manuals.

The majority of this documentation is described here but by title only, except where construction documentation is to be provided.

Contractor shall prepare and submit to OE a construction schedule completely detailing Contractor's proposed methodology and schedule for the completion of the works. This document shall be accompanied and complemented by construction methodology statements describing proposed method of completing various portions of the works, paying due regard to the construction schedules and management of the total project equipment and manpower resources.

The construction schedule shall be prepared by the Contractor as part of the EPC Proposal and shall be updated once a month after starting with the Works. The level of detail of the construction schedule will be augmented as the final design for the works is developed. The intermediate and final substances for completion of the works shall be maintained in accordance with the dates agreed and incorporated into the Contract.

~~The following numbers of copies of the various documents shall be supplied by Contractor:~~

Item	No. of Copies
Design transmittals	4 hard copies & dwg+pdf softcopy
Design calculations	4 hard copies & pdf softcopy
Construction specifications	4 hard copies & pdf softcopy

Operation and Maintenance Manual

Draft	4 hard copies & pdf softcopy
Final	10 hard copies & pdf softcopy

Drawings

Final	4 hard copies & dwg+pdf softcopy
As-built	1 copy on DVD-R or equivalent
	1 hardcopy & dwg+pdf softcopy

Construction Schedule

Preliminary	6 hardcopies & pdf softcopy
Update	6 hardcopies & pdf softcopy
Final	6 hardcopies & pdf softcopy
Test reports	2 hardcopies & pdf softcopy
	All submittals shall be sent in digital format, the Owner will print its own copies.

1.10 System of Units

The SI system of units shall be used consequently throughout the duration of Contract for all technical or contractual purposes.

Following abbreviations are used in these Specifications and related other Contract Documents:

Unit	Abbreviation	
Length :	millimeter centimeter meter kilometer	mm cm m km
Area :	square millimeter square centimeter square meter	mm ² cm ² m ²
Volume :	cubic meter	m ³
Mass :	kilogram ton	kg t
Density :	ton per cubic meter	t/m ³
Spec. weight:	kiloNewton per cubic meter	kN/m ³
Force :	Newton kiloNewton megaNewton	N kN MN
Moment :	Newtonmeter	N.m
Stress :	Newton per square millimeter kiloNewton per square millimeter	N/mm ² kN/mm ²
Pressure :	bar Pascal megaPascal	bar Pa MPa
Time :	second hour	s h
Rate of Flow:	liters per second liter per minute cubic meters per second cubic meters per minute	l/s l/min m ³ /s m ³ /min
Velocity :	meter per second	m/s

The term "day" as used in these Specifications means the calendar day according to the Gregorian Calendar.

If, after making diligent enquiries, the Contractor is unable to obtain an item standardized in SI units, written approval shall be obtained from the Owner to supply non-standard Materials. If reference has to be made to non-standard items, the SI units shall be quoted followed by the non-standard units in brackets.

1.11 Checking of Work

As each part of the works is constructed and erected it shall be made available for inspection by the Owner. Any inspection performed or not performed by Owner shall not derogate in any way from Contractor's liabilities under the Agreement and shall not be construed to impose any liability on part of the Owner. Prior to construction the Contractor shall ascertain from the Owner which parts he wishes to inspect from time to time, but such inspection shall in no way exonerate the Contractor from any of his responsibilities.

The carrying out of all work included in the Contract shall be supervised throughout by a sufficient number of qualified representatives of the Contractor who have had thorough experience in the erection, commissioning and operation of Plant similar to that supplied.

2 THE SITE

Any information herein is made for reference only and should be independently examined by the Contractor.

2.1 Location of the Site

The project area is located in the west rim of Jordan Valley (with approximate GPS coordinate N33.18° E035.55°) northwest of the Sea of Galilee in the vicinity of Kiryat Shmona.

2.2 Climate

Israel has a Mediterranean climate with long, hot, rainless summers and relatively short, cool, rainy winters. The climate conditions are highly variable within the state. On average, January is the coldest month with average temperatures ranging from 6 to 15 °C, and July and August are the hottest months at 22 to 33 °C on average across the country.

2.3 Seismicity

The Manara site is influenced by active Dead Sea Transform system and can be characterised as a high seismicity area with maximal earthquakes of Zone VI by Richter. The zone can be characterized by active main and secondary faults with a movement in all 3 directions with average amount of 1 mm/year. These active faults could have influence on the underground structures.

For both reservoirs, in the “Geotechnical Baseline Report”, the OBE (operational basic earthquake) and MCE (maximal credible earthquake) peak accelerations have been defined and summarised in table below.

Type of Earthquake	PGA	Probability	Return Period
OBE	0.251 g	10%	475 years
MCE	0.387 g	2%	2475 years

2.4 Access Facilities

The Contractor shall be responsible for investigating and determining, as necessary for the execution of the works, the locations, availability, capacity and condition of all access, transport, handling and storage facilities in Israel, including roads, railways, harbors, airports, border crossings, etc.

The highways, roads, bridges and culverts on these access routes have widely varying load limits, and the Contractor shall be responsible for determining the load limits existing at the time and ensuring that his construction equipment and vehicles do not exceed such limits.

The Contractor shall not travel tracked vehicles or equipment on any bituminous sealed road surface. Rubber tyred vehicles conforming to the applicable load restrictions will be permitted to use bituminous sealed roads.

All additional roads required by the Contractor as access and haul roads on the Site shall be provided by the Contractor in accordance with valid relevant department's general road instructions in Israel.

To ensure access at all times to the Site for the purpose of the execution of the works the Contractor shall carry out any roadworks necessary to maintain the access roads in trafficable condition. The Contractor shall make all the necessary arrangements with the appropriate Government authorities or a private owner to permit this roadwork's to be carried out. All costs incurred in obtaining such permission are deemed to be included in the Contractor's rates.

Before moving any heavy construction traffic onto highways, roads, bridges and culverts the Contractor shall make suitable arrangements with the appropriate Government authorities and obtain their approval for the passage for such traffic. The Contractor shall submit to the Owner his proposals for works where authorities require and specify any special protection or strengthening of highways, roads, bridges or culverts after their approval by the authority concerned and shall carry out this work at the direction of the Owner. Separate payment will not be made for any such special protection or strengthening required by Government authorities, the costs of which shall be deemed to be included in the financial proposal of the Contractor.

2.5 Use of the Site

2.5.1 Borrow and Spoil Areas

Areas, shown on the drawings or which shall be notified to the Contractor by the Owner at any time, have been set aside for the excavation of materials for use in the works and for disposal of spoil materials. The Contractor shall confine his operations to within the allocated areas unless otherwise approved in writing by the Owner. The Contractor shall reinstate the allocated borrow and spoil areas to the satisfaction of the Owner before issue of the Taking-Over Certificate.

2.5.2 Ownership of Natural Materials and Structures on Site

Earth, stone, gravel and sand, and all other materials excavated or existing on the site shall not become the property of the Contractor, but will be at his disposal only so far as they are approved for use in the works. Existing structures on the site shall not become the property of the Contractor and, except as and to the extent required elsewhere in the Contract, shall not be interfered with by the Contractor in any way. Existing infrastructure on the site, including buried services which have been located, shall be protected during the execution of the works. Any installation damaged by the Contractor shall be repaired and reinstated by the Contractor without delay and at no cost to the Owner.

2.5.3 Roads

The access roads and all other roads and tracks outside the Contractor's site establishment areas shall be deemed to be public highways for all purposes related to road and traffic law, public and third party liability, insurance and related considerations.

2.5.4 Accommodation

The Contractor shall take all the fees and expenses at his own cost and look for proper places and provide housing for his own ~~staff~~staff In areas allocated to the Contractor residential-~~accommodation will not be permitted~~. In order to allow Aac-

commodation on site the Contractor will take care for all applicable permits.~~will only be permitted for essential housing of security, medical and first aid personnel, and such accommodation shall be subject to the agreement of the Owner.~~

2.5.5 Property outside the Site

The Contractor shall not enter upon private or Government land outside the site without written approval from the Owner and the owner and/or occupier of the land. The Contractor shall take all practicable measures in co-ordination with the appropriate authorities or private owners of the land in the immediate vicinity of the Contractor's working sites or site establishment areas to ensure that no member of his workforce or person or persons connected in any way with or intending to conduct any business with members of his workforce erects or situates any temporary accommodation, shelter, trading stall, or other type of settlement or establishment on this land unless such person or persons have obtained written permission from the appropriate authorities or private owners of the land for the erection or situation of such settlement or establishment.

2.5.6 Existing Rights of Way

Any existing rights of way, tracks or roads running through the site shall be diverted around the site or fenced off in such a way to prevent unauthorized persons from inadvertently entering the site. Such rights of way, tracks or roads shall be kept open at all times except for short periods when construction activities such as surface blasting could require closure for safety reasons.

2.5.7 Protection of Natural Environment

The Contractor's attention is drawn to the special natural environment of the project area and he shall take special care at all times to protect and maintain this natural environment except in so far as is absolutely necessary for the execution of the works and subject to any applicable law and regulations.

3 FACILITIES PROVIDED BY THE OWNER

3.1 General

Certain facilities as detailed below will be provided by the Owner. Such facilities will be provided, maintained and operated by the Owner or shall be provided, maintained and operated by the Contractor, as specified.

Where a facility is provided, maintained and operated by the Owner, or others under the control of the Owner, the use of such facilities is generally free of charge unless rates are stated in the RFP Documents or otherwise stipulated in the Contract.

The Contractor shall be fully responsible for extending, expanding or upgrading any facility provided by the Owner as the Contractor considers necessary, subject to the Owner's prior consent, including any additional maintenance which this may require. This responsibility shall include coordination with the relevant Government authorities and bearing all the respective charges without additional payment by the Owner.

Where a facility is provided, maintained and operated by the Contractor, all costs incurred by the Contractor in maintenance and operation shall be deemed to be included in the Contract rates and prices, unless otherwise provided for in the Contract or approved by the Owner.

In all cases the Contractor shall take all necessary precautions to ensure that the facilities are used in a proper and orderly fashion and that resources supplied are not wasted.

3.2 The Site

The Site comprises the access roads, the Contractor's site installation areas, the site of the permanent works and any other areas that may be handed over to the Contractor.

Site installations areas comprise those areas where the Contractor establishes his offices, workshops, equipment, housing, labor camp and other temporary facilities. All site installation areas are to be made secure and entry is to be controlled by guards ~~and a security pass system~~, all provided and operated by the Contractor.

The Contractor shall provide adequate security at all other areas of the Site, and access to the work sites shall be controlled in order to prevent unauthorized entry.

The cost of security shall be included in the Contract Price.

3.3 Aggregate Supply

The Contractor shall be fully responsible for the provision of the rockfill, coarse and fine aggregates, and granular materials for embankment fill, concrete and road construction and other purposes as specified and required for the works in accordance with the Contract. Preferably rock material at hand from excavation of the upper reservoir shall be used. The concrete works in the construction site area comprise, but are not limited to:

- structures at upper reservoir

- intake at upper reservoir
- high pressure shaft
- high pressure tunnel
- high presser manifold
- underground powerhouse
- low pressure manifold
- low pressure tunnel
- surge tank
- access tunnels
- intake at lower reservoir
- structures at lower reservoir

At the underground powerhouse and power waterways the Contractor shall take samples and lab tests to confirm suitability of the quarry area material for concrete aggregates.

The approval of the Owner for the use of these or other sources of such materials will be dependent on the Contractor demonstrating to the satisfaction of the Owner that the maximum practicable use of materials available from excavations for the permanent works has been made.

4 PROJECT FACILITIES FOR THE OWNER AND THE OWNER'S ENGINEER

4.1 General

The Contractor shall provide and maintain the facilities specified in this Clause for the sole use of the Owner and his OE for the duration of the Contract.

The Owner's compound will contain the office, car parking facilities, footpaths and vehicle maneuvering space. Bushes and trees shall not be cut except where necessary and then only after approval of the Owner has been obtained.

Prior to the provision of the office, the Contractor will allow the Owner to share any temporary facilities the Contractor may establish upon commencement of activities on site. Within 10-30 days after receipt of the Notice to Commence work the Contractor shall submit general drawings, proposals and a time schedule for the establishment of Owner's facilities to the Owner for approval. All facilities shall be completed no later than 90-120 calendar days after the receipt of the Notice to Commence. If the Contractor fails to complete the office facilities within the specified time, in addition to the imposed penalties for this Contract Milestone, the Contractor will continue to provide temporary facilities.

When directed by the Owner, the Contractor shall dismantle and remove from the Site all buildings and related facilities provided under this Clause, which are no longer required by the Owner and reinstate the area to its original condition.

4.2 Building Standards

The buildings for the Owner's site establishment shall be single storey, weather-proof and rodent resistant. They shall be a good quality prefabricated or container system as approved by the Owner. Prefabricated buildings shall have double walls filled with insulating material or other material as approved by the Owner.

Minimum requirements to be met by the Contractor for the design of the buildings are listed below in the Owners Requirements in point chapter 6.5.2. In addition, the Contractor's attention is drawn to existing local building regulations and permit requirements for construction of buildings which shall comply with by the Contractor at no additional cost to the Owner.

The floor shall be damp-proofed concrete raised at least 25 cm above the highest adjacent external ground level. The floors shall generally be covered in vinyl tiles or vinyl sheet. The minimum clear height between floor and ceiling shall be 2.6 meters. The ceiling shall have at least 100 mm thickness of fibreglass insulation above.

External walls shall be of cavity construction. Internal walls shall be plastered and painted. External walls constructed of concrete blocks shall be rendered and painted. All internal partition walls and ceilings shall have a fire rating of at least 30 minutes.

Each building shall have fully glazed windows each at least 30 percent opening for ventilation. Wire anti-mosquito gauze screens shall be provided to opening windows. Total window area for each room shall be at least 20 percent of floor area. Sun filter curtains shall be provided for all windows of offices, drawing office, and

conference room and reception area. Each room shall have at least one door and each door shall be provided with a three-lever lock and three keys. In addition, three master-keys shall be provided.

Each building shall be well ventilated and provided with suitable heating and A/C units and insulation as necessary. Heating and A/C shall be rated such that a temperature of 21°C can be maintained at all times. Lighting shall be of the fluorescent tube type. All rooms shall have one switched electric socket per 5 m² floor area or part thereof, with a minimum of two sockets.

Roofing to all buildings shall be completely weatherproof and at a minimum pitch of 15°, constructed of tiles or sheeting of fibre cement, slate, burnt clay, concrete or metal sheeting. The roof shall have overhangs of at least 900 mm all round and shall be complete with fascias and rainwater goods.

A canopy projecting at least 3.0 meters shall be provided at the main entrance of each building.

The Contractor shall provide running hot and cold treated potable water, electricity, and a sewage disposal system for each building.

4.3 Office Compound

Office buildings, layout and the inside furniture will be subject to in accordance with the Owner's approval Requirements. Contractor will change the office buildings and inside furniture which are not approved by the Owner. The dimensions of the building shall be decided by the Owner. The Contractor shall increase the capacity of the office building in accordance with the requirements of the Owner.

4.4 Office Furniture

Office Building

The Contractor shall provide and maintain in accordance with the manufacturer's instructions and Owner's approval good quality new furniture and appliances necessary for the Owner and his OE.

4.5 Roads, Accesses and Parking Areas

Footpaths with concrete paving or other approved surfacing shall be provided around and between individual buildings and parking areas.

Building and parking area shall be connected to the nearest existing road by a road with running surface not less than 4 m wide. Ample turning spaces for vehicles shall be provided in addition to the parking areas specified above. Roads, turning area and parking area shall be constructed to the requirements of the relevant Specification except that the surface layer shall be gravel or crushed stone aggregate to the approval of the Owner.

All roads, parking areas and footpaths shall be laid to falls and provided with proper drainage facilities to safely dispose of all rainwater and surface water. Adequate lighting shall be provided for all areas within the Office compound.

4.6 **Communication**

The communication systems (Internet connection, telephone etc) to be installed in the Owner's office will be provided by the Contractor.

The Contractor shall supply and install all ~~fiber optic~~ cables or a WLAN system ~~necessary system necessary~~ to provide an ~~underground~~ network for communications.

The Contractor shall be responsible for obtaining all permissions, approvals, licenses etc. from any relevant authorities or entities, and for the payment of all deposits, fees and charges which may be levied by the authorities in this connection.

4.7 **Service vehicles**

The Contractor shall furnish, operate and maintain sufficient service vehicles for use by its own staff.

4.8 **Other Services**

- Sanitation and Cleaning

The Contractor shall arrange ~~for~~ the removal and disposal of all refuse from Owner's establishment ~~at least twice a week as required according Israeli standards.~~

- Security

The Contractor shall incorporate the Owner's establishment area in his security system, ~~according Israeli standards,~~

which may include patrolling, checkpoints and random vehicle searches as agreed by the Owner.

- Fire Control

~~Fire extinguishers for the office and other buildings shall be manufactured and provided according to regulations of Israel. The extinguishers shall each contain not less than 2.5 kg of extinguishing fluid and shall be fitted to the walls at suitable positions by means of quick release brackets. They shall be freshly charged, properly maintained and the seals shall be unbroken. At least two such extinguishers shall be provided per 200 m² of floor area or part thereof in the Owner's Office.~~ The Contractor shall comply with the requirements of any competent authority.

- Medical Services

The Contractor shall make all the medical and health care facilities established on Site in accordance with Clause ~~5.135.13~~ for his own staff continuously available to the Owner's and OE's staff and visitors ~~according Israeli standards, provided that any such use shall conform to the normal controls and regulations which the Contractor applies to his own staff.~~

- Name Boards and Signs

The Contractor shall provide, erect and maintain throughout the Contract a 6 m² sign-board for the Owner at the Owner's compound. In addition, the Contractor shall provide, erect and maintain a sign-board on the office building at

an average size of 0.5 m² per board, mounted at 2 meters above ground level.

5 GENERAL SITE INFRASTRUCTURE

5.1 General

The Contractor shall submit to the Owner for non-objection sufficiently detailed drawings and proposals of all facilities to be established on site, at least 28 days before such facilities are to be established. Buildings, transmission lines and equipment to be provided by the Contractor shall be erected in positions approved by the Owner.

Bushes and trees shall not be cut except where necessary and then only after the approval of the Owner and of any competent authority has been obtained. Surplus spoil and debris shall be disposed of in the designated spoil tip.

~~When directed by the Owner~~ At the end of the works, the Contractor shall dismantle and remove from the Site all buildings and facilities provided under this Clause and which are no longer required by the Owner or the Contractor. After such removal the ground shall be reinstated to a condition similar to adjacent areas, if necessary by means of the spreading of topsoil and replanting grass and/or trees, all to the approval of the Owner.

5.2 Access on Site

- General

The Contractor shall be responsible for the upgrading/construction of the existing and new sections of the main access roads and the Contractor's site construction roads and the maintenance of the same in serviceable condition at all times until the Contract completion date.

- Existing Access Roads

The Contractor shall upgrade and maintain all the existing roads that will be used to access to the site.

- Site Roads

At commencement of the execution of the works, the Contractor shall submit to the Owner for approval the drawings for any roads to be constructed by the Contractor for his own needs, together with the site layout design. Any and all construction, maintenance and repair costs for these roads shall be borne by the Contractor and shall be deemed included in the rates.

- Hand-over of Access Roads to the Owner

At the end of the time for completion of the works, the roads referred to in this section shall be handed over by the Contractor to the Owner in accordance with the Owner's instructions and in fully maintained and repaired condition, and no additional payment shall be made therefore, or shall be dismantled and removed by the Contractor at his own expense from the Site according to Owner's instructions. After such removal the ground shall be reinstated by the Contractor at his own expense to a condition similar to adjacent areas.

5.3 Direction Signs and Boards

The Contractor shall construct, erect, maintain and remove on completion road signs to guide visitors and suppliers to the project to the correct working area or Site Installations. The signs will be of three sizes, 9 m², 6 m² and 3 m². These signs shall be removed at the time of issue of the Taking-Over Certificate or as otherwise agreed between the Contractor and the Owner.

Subcontractors engaged on the works will be prohibited from erecting any signs outside their Site Installations.

The boards and support structure shall be designed by the Contractor. The location, size, distance of the bottom edge above the ground, color, layout and wording of each sign will be instructed by the Owner.

If the Contractor wishes additional signboards to be erected, he shall submit in writing to the Owner a request setting out his requirements.

The Contractor shall erect and maintain one sign-board at the main entrance to his site establishment area. The design of the name board shall be agreed with the Owner and provision shall be made for subcontractors' names to be mounted on panels attached beneath the Contractor's name board. The Contractor shall ensure that these are painted and attached to the board when the subcontractors arrive on Site.

The boards shall be made up from durable materials that will not warp due to weathering. The boards shall be mounted on adequately braced poles and shall be kept neat and legible at all times. The board shall be a maximum of 7 m x 3.5 m in size and be mounted at a height of 2 m.

The Contractor shall keep the name board in good repair and order for the duration of the Contract and shall remove it on completion of the Contract.

Contractor's and subcontractor's company boards shall only be displayed at the entrance to their respective office areas/buildings. The Owner will order the removal of any board that falls into a state of disrepair or illegibility.

5.4 Electricity Supply and Power Distribution

Contractor shall provide all the necessary facilities required to supply electricity to the construction site, offices and guest houses during construction. This power transmission line shall be maintained, repaired and upgraded by the Contractor during the project construction. All pertinent necessary procedures and contacts with power administration of Israel shall be carried out by the Contractor. In order to provide electric supply in supplemented to the above for the construction site from this power transmission line, the Contractor shall provide and install a substation of the necessary capacity as per his own requirements and, within the construction site, a power distribution center. No cost shall be payable to the Contractor for such work and the costs incurred therefore shall be deemed included in the Price Proposal.

All transformers, electric equipment, steel construction and transmission line materials required for the construction of the main substation and the power distribution system within the construction site, including all other equipment and materials required for operating the system in a reliable manner shall be provided and installed by the Contractor, who shall also assume the maintenance and repair thereof dur-

ing construction and take necessary safety precautions thereon. For any excess amount of power supply requirements, the Contractor may install additional groups of generators on the site at his own cost, and subject to any applicable law and regulation. For any such facilities installed for power supply and the maintenance and repair thereof, and for power distribution and any necessary measures taken for safety purposes, the Contractor shall not be entitled to any claims against the Owner. The costs for these items of work shall be deemed included in the Price Proposal and Proposals shall be deemed submitted on this condition.

The Contractor shall not operate any electricity generating equipment without the written approval of the Owner of the type, performance, safety and environmental suitability of the equipment, its location and installation, and the mode of operation.

The Contractor shall be responsible for all obligations of power authorities of Israel including initial deposits. Payment for the Contractor's electric power supply in accordance with his contractual obligations shall be deemed to be included in the Price Proposals.

5.5 Power, Lighting, Communications and Access

~~The Contractor shall provide and operate sufficient standby diesel generator sets to supply power to meet his requirement together with his emergency requirements in the event of breakdown of the main supply. The location of such diesel generator sets shall be subject to the approval of the Owner, but in any case shall not be within 500 meters of any public or domestic buildings unless the Contractor installs special sound insulation to reduce the noise to a level in any such area to the satisfaction of the Owner, and as required by any applicable law and regulation.~~

Whenever the Contractor is engaged in night or underground work, the Contractor shall provide and maintain in good condition adequate lighting for all portions of the work in progress and the accesses thereto. This shall include the stockpile and spoil areas if machinery is operating in any of these areas. If, in the opinion of the Owner, the resulting illumination is not adequate for the safe and efficient execution of the work, additional lighting shall be provided by the Contractor without additional payment.

The Contractor shall provide and maintain all temporary gangways, ladders, stagings and covers for protection against falling objects and debris on and about the Site necessary for the purposes of the Contract and shall remove such gangways, ladders, stagings and protective covers when no longer required.

5.6 Compressed Air and Water Supplies for the Works

The Contractor shall provide at suitable locations adequate supplies of compressed air and water of proper quality and pressure for all operations to be undertaken to complete the Contract.

5.7 Telecommunication

The Contractor shall install a telephone line for his own and the Owner's needs. The Contractor shall install a high speed internet system, which will be accessible to the Contractor as well as to Owners personnel. Internet shall have enough traffic capacity to allow uninterrupted high speed performance without restriction to

the pre-defined number of users from the Contractor's and Owner's personnel. No cost shall be payable to the Contractor for such work and the costs incurred therefore shall be deemed included in the Price Proposal.

In addition to the normal telephone connections to be installed by the Contractor for the effective organization and administration of the execution of the works, the Contractor shall provide adequate telephone or radio communications between all his work sites and his main administration offices. The Owner shall have access to this radio communication system.

5.8 Water Supply

The Contractor shall ensure that there is an adequate supply of drinking water at various locations throughout the site for the use of his employees. The Contractor shall be permitted to extract water from the nearby public water network. All extractions of water from public water network require a license from relevant Israeli authorities, and the approval of the Owner will only be given after the Contractor has obtained such licenses and permissions as may be required.

The Contractor shall be entirely responsible for the provision and distribution of all settled raw water requirements for his own use and for other authorized persons or organizations engaged in the Project.

The Contractor shall satisfy himself that the points of sources of water supplies it selects and which are approved by the Owner will provide sufficient water to meet the anticipated demand particularly during periods of drought and low flow. The Contractor shall design and construct appropriate storage facilities to overcome drought periods without interruptions to the Works.

The Contractor shall submit detailed drawings and calculations of his proposed storage and reticulation systems to the Owner within 28 days of receipt of the Notice to Commence.

In addition to his own requirements the Contractor shall also provide, operate and maintain a water distribution system to supply potable water to the Owner's Main Office compound. The quantity of potable water that shall be available at the Owner's Main Office compound shall be 3.0 m³/day.

5.9 Sewerage and Sewage Treatment

The Contractor shall provide adequate sewage treatment plants at the work sites, as necessary for his own needs and those of the Owner. The Contractor shall collect sewage from site installations, either by sewer or tanker in accordance with applicable law and regulation. If a tanker service is adopted, the Contractor shall provide adequate storage at each establishment area.

Adequate mobile or other toilets shall be provided at the work sites controlled by the Contractor, including underground, and such toilets shall be connected to or emptied into the sewerage system. The Contractor shall ensure that such toilets are always kept in a hygienic condition and supplied with toilet paper, soap and towels by regular attendance and are kept disinfected.

The quality of the Contractor's sewerage and sewage treatment facilities shall comply with the requirements of the laws of Israel.

The Contractor shall submit detailed drawings of his treatment and reticulation systems to the Owner within 28 days of the receipt of the Notice to Commence. Once obtained, the Contractor shall submit to the Owner a copy of all the licenses and permissions required in respect of the Contractor's proposed discharge points and details to demonstrate compliance with these requirements.

5.10 Site Sanitation

The Contractor shall ensure that the Site is maintained in a clean and sanitary condition at all times. The sanitary services shall comply with applicable Israeli law and regulations and shall be located conveniently to all points where work is in progress. The services shall include but not be limited to the following.

- Refuse Collection and Disposal Including the Cleaning of Drainage Channels
- Metal dustbins or equivalent plastic dustbins with lids shall be provided by the Contractor for all buildings and refuse shall be collected and removed from all buildings including the Owner's office at least twice per week. Refuse from food preparation areas shall be collected and removed daily. Refuse shall be transported to the refuse dumps in covered containers.
- The cleaning of drains shall be carried out sufficiently frequently to maintain the Site in a neat and tidy condition.
- A refuse dump with an incinerator shall be established on Site and operated by the Contractor at a location designated by the Owner and to a standard and with a mode of operation approved by the local government authority. Where practicable, refuse shall be burned and the ashes and all unburnt material deposited and compacted by the Contractor in layers not more than 2 meters thick in trenches and covered with layers of soil not less than 0.25 m thick. The refuse shall not be left uncovered for more than 24 hours and shall eventually be covered with a further 0.5 m thickness of soil. The refuse area shall be fenced for security and so that windblown refuse is contained within the refuse area. Windblown refuse escaping the disposal area shall be collected and re-deposited regularly. The Contractor shall maintain the incinerator in a workable condition at all times.
- Disposal of Waste Sewage screening, grit and sludge shall be disposed of by burial at the refuse disposal area.
- Cutting of Grass and Vegetation Grass and other vegetation in the vicinity of all buildings shall be cut at regular intervals to reduce fire hazards. Adequate fire breaks shall be maintained around the Site Establishment Areas and wherever designated by the Owner. Cut grass and vegetation shall be disposed of at designated areas.

5.11 Spoil Tip and Stockpile Sites

Before dumping and/or excavating any material, the Contractor shall strip and stockpile all topsoil for later use. The nature of topsoil varies from place to place and the Contractor will be required to stockpile separately topsoil from different areas. Excavated material and topsoil required for subsequent use in the works shall be stockpiled separately in designated areas. Random stockpiling adjacent to the point of excavation shall not be permitted.

Excavated material not required elsewhere in the works shall be disposed of only in the designated spoil tips shown on the drawings or selected by the Owner. Nat-

ural topsoil in the designated spoil tip area shall be stripped, stockpiled and replaced over the final surface of the spoil tip. The surface shall then be grassed and/or planted with bushes or trees in accordance with the specifications and standards as directed by the Owner e.g. avocado trees at the Main Access tunnel area.

The designated spoil tips shall be systematically constructed of mineral spoil and rock materials and vegetative materials derived from excavations. Stable refuse may also be incorporated as spoil, subject to the agreement of the Owner. The spoil tip shall be shaped to blend with the local topography.

Spoil material shall be randomly compacted to the maximum extent practicable by routing the haulage traffic over the area, and shall be graded to prevent the ponding of water. Side slopes shall be formed and protected such that they remain stable under all foreseeable conditions and shall be compacted over 4 meters width appropriate to the particular type of material being spoiled. The toes of the slopes shall be formed of rock material to prevent the sloughing or scour of the slopes or else blended into a gentle transition with the ground.

Where spoil tips will be exposed to varying water levels, rock toes and/or rip-rap protection to exposed slopes shall be incorporated in the construction of the tip.

Surface water runoff shall be conducted through, or over, or around the spoil tip where directed by the Owner to prevent erosion damage from storm runoff.

During construction the Contractor shall ensure that fine materials are prevented from migrating from the spoil tip into water courses. Where necessary an earth mound shall be constructed along the contour immediately below the spoil tip to collect fine material washed off the spoil tip. The drains and banks shall be regularly maintained until sufficient vegetation has been established on the spoil tips to prevent the washing out of fine material.

The areas designated as "Temporary Stockpile Areas" on the drawings or agreed with the Owner may be used by the Contractor for temporary stockpiling of material which is to be subsequently included in the permanent works or disposed of as spoil.

5.12 Ventilating Systems

The ventilating system shall be of sufficient capacity to maintain an adequate supply of uncontaminated air in underground excavations throughout the construction period.

The design of the ventilation system shall provide for all categories of construction equipment to be used underground. For each person working underground, a minimum amount of 3 m³/minute of fresh air shall be provided.

If diesel powered equipment is used, then the minimum quantity of fresh air to be supplied shall be 6 m³/minute for each kW of power employed underground, in addition to the requirements for personnel.

The supply and distribution of fresh air shall be such as to ensure that the minimum requirements are met at any working area.

Maximum Quartz content "Q" (concentration of total respirable particles of dust, size from 5.0 to 0.2 micron) is shown in the following table:

Max. Quartz Content in Dust (by weight)	Max. Concentration of Dust in Air (mg/m ³)
Q < 1%	8
1% ≤ Q ≤ 4%	4
Q > 4%	0.15

The values shall relate to average concentrations over an 8 hour period. When dust concentrations exceed the above, all persons in the affected area shall be notified and instructed to wear appropriate respirators.

Limits of concentration of noxious gases shall comply with an approved relevant international regulation.

The average air velocity in all excavation areas shall not be less than 0.3 m/second. The ventilation and, where necessary, cooling arrangements shall be designed to ensure a working environment such that

- a) at any time the weighted mean wet bulb temperature at all workplaces in any one tunnel drive or underground excavation shall not exceed 30°C (the average being calculated on the basis of the number of persons and the wet bulb temperature at the work place of each person)
- b) the wet bulb temperature at any one workplace does not exceed 32.5°C.

To ensure compliance with the foregoing, the Contractor shall provide all necessary equipment to measure the wet bulb temperatures at regular intervals during each working shift or such other interval as agreed with the Owner.

Additionally, if the wet bulb temperature at any one workplace exceeds 30°C, the Contractor shall inform the Owner of the additional corrective measures he plans to adopt to counter the risks to health in general, and of heat stroke in particular.

With a view to ensuring healthy working conditions, the Contractor shall submit proposals to the Owner in respect of acclimatization procedures and the monitoring of the health and physical performance of workers. These procedures shall be subject to the written approval of the Owner.

For the purpose of ventilation, the Contractor may use temporary and permanent access tunnels, adits, auxiliary tunnels and shafts.

Full particulars of the proposed ventilation system shall be submitted to the Owner for approval prior to acquisition and installation of the ventilation and exhaust system.

5.13 Medical Facilities

The medical service utilizing the facilities specified in this Clause shall be effective within 90 days of the receipt of the Notice to Commence according to Israeli law.

Field First Aid Stations

For the purposes of first aid and treatment, the Contractor shall install a first-aid station equipped with first-aid supplies to handle events on site, including medical materials, drugs and equipment pursuant to the relevant regulations of the health ministry of Israel. The personnel of the Owner and the OE shall be availed of the Contractor's first-aid services free of charge.

5.14 Fire Control

The Contractor shall take all reasonable precautions and as required by any law, regulation and competent authority, against outbreaks of fire and ensure that a nucleus of persons trained in the use of firefighting equipment is available in each section of work on each shift.

Without derogating from the above, the Contractor shall provide and maintain in full working order a water tanker with at least 10,000.00 l or as required by the local fire brigade with mounted pump, suction and delivery hoses with suitable couplings together with other equipment, appliances, tools etc. and shall staff and administer this service to the approval of the Owner. Such firefighting services shall be available within 90 days of the receipt of the Notice to Commence. Such firefighting service shall be available on a 24 hour basis for all site establishment and work areas and the Contractor shall install and maintain a proper communication to ensure that the firefighting equipment can be concentrated on any fire in the shortest possible time.

This water tanker can be used for dust control on site roads in summer time as long as it can be alarmed by radio.

The firefighting service shall be supervised by a competent person and shall have at least 8 members on a voluntary or part-time basis. The number of members will be defined in a fire fighting plan which has to be approved by the authorities.

The Contractor, in consultation with the Owner, shall publish rules and regulations governing the call out and use of the firefighting service and notice shall be prominently displayed giving instructions as to how the firefighting service can be summoned.

All equipment, appliances and personnel shall be in a state of readiness and available at short notice for the firefighting service which shall be tested at least once every two months.

In the event of a fire, the Contractor shall mobilize all nearby personnel, and shall do everything possible to extinguish the outbreak.

No open fires will be permitted in working areas or elsewhere.

5.15 Temp. Works, Safety Works and Fall Protection

The contractor has to provide all temporary scaffolding, ladders, platforms with the boards and handrails essential for safe and convenient access to the working areas by workmen, inspectors and other authorized persons employed for the Works. All dangerous openings or holes in floors shall be provided with handrails or covers. Preventive measures shall be taken to protect workmen from falling material.

5.16 Escape Way

The contractor has to provide an escape way marking according local standards involving the authorities and the fire brigade.

5.17 Security

The Contractor shall institute and operate a security system on a 24-hour basis at his and the Owner's site installations, and at all work sites including all points of access. It shall co-operate with the local Police and comply with the Owner's requirements on all matters relating to security of the works and the Site.

The Contractor shall institute emergency evacuation procedures at the work sites and site establishment area. These procedures shall be tested by the Contractor at least four times per year on a random basis.

The Contractor shall ensure that no unauthorized firearms are brought to the Site. No consumption of alcoholic beverages or illegal drugs will be permitted at the Site. Contravention of these requirements will be cause for dismissal.

6 OTHER FACILITIES PROVIDED BY THE CONTRACTOR

6.1 General

The Contractor shall submit to the Owner for consent sufficiently detailed drawings and proposals of all facilities to be established at least 6 months before such facilities are to be established.

The Contractor shall dismantle and remove from the Site all buildings and related facilities provided under this Clause and which are no longer required by the Owner or the Contractor. Prior to removal, the Contractor shall obtain the Owner's consent for removal. After such removal the ground shall be reinstated to a condition similar to adjacent natural areas, if necessary by means of the spreading of topsoil and replanting grass and/or trees, all to the satisfaction of the Owner. Surplus spoil and debris shall be disposed of in the designated spoil tip.

The Contractor shall be responsible for keeping his site establishment areas and temporary buildings in a clean, sanitary and orderly condition and to the satisfaction of the Owner.

The Contractor shall fence off all his designated site establishment areas and shall be responsible for the security of all buildings, equipment and materials within these areas.

The facilities shall be subject to the approval of the Owner, who shall have full access to them at all reasonable times. Site buildings shall be maintained in good condition and appearance for the duration of the Contract. Fuel shall be stored in properly constructed tanks that shall be coded and certified as such. Fuel installations shall be secure against unauthorized persons.

The Contractor shall take all precautions necessary to ensure that natural water courses, groundwater and the natural ground soils are not contaminated by fuel, oil or other substances being handled or stored in any of his site establishment areas. The Contractor shall submit details of the measures he will institute for the prevention and control of spillages in these areas to the Owner for approval.

6.2 Progress Photographs

Digital photographs in .jpg format showing the progress of the works shall be taken every month from suitable positions previously agreed with the Owner. Pictures shall incorporate the date when taken and an identification number. The pictures have to be provided for the Owner every month on a CD or DVD.

The pictures shall become the property of the Owner. The Contractor shall not use these or any other photographs of the works for publicity purposes without the prior written approval of the Owner.—Approvals shall not be unreasonably denied, withheld or delayed.

6.3 Packing and Marking

All items transported to Site for incorporation in the works shall be robustly packed and protected from damage during transit.

Where appropriate, careful attention shall be paid to the provision of lifting and securing features to facilitate handling and transportation to Site.

All stencil marks on the outside of cases are to be such that they cannot be obliterated in transit. Each crate or package shall contain a packing list in a waterproof envelope. Component parts shall be clearly marked with the symbols stamped on the metal as well as painted thereon.

All cases and packages shall be clearly marked on the outside to indicate the total weight and shall bear an identification mark relating them to the appropriate shipping documents, and the Manara PSPP Project.

6.4 Testing by the Contractor

The Contractor shall provide, use and maintain adequate equipment operated by competent staff for carrying out tests required for the control of the quality of materials and workmanship in accordance with the Specification and other RFP Documents.

The Contractor shall arrange for testing to be undertaken at an independent laboratory approved by the Owner for special tests like direct shear or triaxial testing etc.

The Contractor shall carry out all necessary tests and shall report to the Owner the results of such tests before submitting materials and finished work to the Owner for approval.

The Contractor may have the necessary aggregate and concrete tests done in a laboratory in the project area with the approval of the Owner. In case it is not possible the Contractor has to establish a laboratory with the below specified characteristics.

6.5 Laboratory Building

The Contractor shall construct, furnish, operate and maintain for the duration of the Contract a laboratory for the joint use of the Contractor and Owner. Tests by the Owner shall be paid to Contractor according to an pre-agreed tariff. The location of the laboratory shall be selected by the Owner on receipt of the Contractor's proposals for the locations of his other buildings and site establishment facilities.

The Contractor is fully responsible for all testing of materials and design of mixes identified in the Contract. The Owner will supervise this testing and may require additional testing as deemed necessary. The Contractor shall establish a comprehensive computerized record keeping system in a form approved by the Owner. The Owner shall at all times have access to test records and the Contractor shall formally submit copies of those records requested by the Owner.

The equipment to be supplied and installed is specified below and shall be new. The Contractor shall carefully review the specified equipment and amend it as he deems required for carrying out the specified tests. Payment for the equipment will be effected according to a respective item included in this clause; however, the Contractor shall supplement equipment and installations which become unusable due to normal wear and tear without additional cost to the Owner.

All personnel and labor for testing, operation and maintenance shall be provided by the Contractor. The Contractor shall provide and employ for performance of the testing and sampling:

- a) only such technical assistants or personnel as are skilled and experienced in their respective fields and such sub-agents and foremen as are competent to give proper supervision to the work they are required to supervise and to carry out, and
- b) such skilled, semi-skilled and unskilled labor as is necessary for proper and timely execution of the sampling and testing works and associated services.

The laboratory will be used and shall be equipped for the following tests and analyses:

Concrete and Asphalt aggregates: Particle size analysis, strength, soundness, sand equivalent test, abrasion loss.

Cement: Measurement of Blaine fineness, setting time, compressive and tensile strength.

Concrete: Mix design, measurement of workability, curing and crushing concrete cubes, measurement of tensile strength, permeability.

Grout: Design and performance testing of grout materials and grout mixtures.

Asphalt: Bitumen tests (Viscosity, stiffness, hardening of the bitumen vs. time, affinity aggregate / bitumen).

Admixtures: Performance tests.

Water: Chemical analysis, pH, dissolved oxygen, faecal count, COD.

Storage of rock cores: Adequate open shelving for all rock cores recovered permitting individual core boxes to be identified and fully opened for inspection without disturbing other core boxes.

The laboratory building shall have the dimensions approved by the Owner. Concrete works should be arranged according to the laboratory equipment and concrete faces should be smooth.

The laboratory buildings, arrangement of this buildings and inside furniture is to be approved by the Owner. The buildings and inside furniture that is not approved by the Owner should be changed.

The building shall be well ventilated and provided with suitable heating and A/C units and insulation as necessary. Heating and A/C shall be rated such that a temperature of 21°C can be maintained at all times. Lighting shall be of the fluorescent tube type, providing adequate illumination for all laboratory activities.

The Contractor shall also provide hot and cold treated water, electricity, telephone, sinks and sewage system.

Contractor may have some of the above mentioned test done in a nearby laboratory with the approval of the Owner. In this situation site laboratory

should be capable of performing at least concrete, aggregate, cement and grout tests.

6.6 Laboratory Furniture

~~Furniture and appliances shall be new and of good quality and to the approval of the Owner. Adequate furniture should be supplied in the laboratory according to the Owner needs. Removed~~

6.76.6 Laboratory Equipment

The Contractor shall provide the following test equipment for the laboratory:

- Aggregate Testing Equipment
 - 1 sets of 250 mm diameter sieves (from 0.075 to 75 mm)
 - 2 sets for sand equivalent test
 - 2 No. speedy sand moisture testers
 - 1 set of rifle boxes
- Concrete Testing Equipment
 - 1 No. 125 liter concrete mixer (vertical axis)
 - 1 No. concrete aerometer
 - 3 No. concrete thermometers
 - 10 No. cube moulds 100 mm square and 5 No. of 150 mm
 - Spanners, rammers, cleaning equipment for moulds
- Cube crushing machine
 - 1 capping set for 200 mm concrete cylinders/cores
 - 1 capping set for 150 mm concrete cylinders/cores
 - 2 No. Schmidt concrete hammers
 - 3 No. slump cones with rammers, trowels and metal trays and related manual equipment
- Grout Testing Equipment
 - 1 No. vibrating hammer
 - 2 No. Marsh Standard cones
- Miscellaneous
 - 1 No. 25 mm diameter vibrators (immersion type)
 - 1 No. 600 liter electric oven with thermostat
 - 1 No. 120 g balance, 0.005 g precision
 - 1 No. 2000 g balance, 0.1g precision
 - 1 No. 15 kg automatic balance, 5 g precision
 - 1 No. 100 kg automatic scale, 10 g precision
 - 1 No. caliper square
 - 2 No. hygrothermographs with recorder
 - 1 No. spare gauge for concrete tester
 - 1 No. press calibrating dynamometer
 - 1 No. core drilling machine (up to 200 mm core diameter)
 - 1 No. circular saw for rock materials
 - 1 No. Los Angeles test set

- 2 No. Meteorological measuring equipment

Small tools and equipment as required for testing and sampling. Equipment for rockfill density tests with an adequate ring Ø 1.20 m, water measurement device, plastic sheets etc.

The laboratory building shall be removed and the area reinstated in accordance with the relevant specifications at the completion of construction works on the approval of the Owner. Furniture shall be handed over to the Owner in its actual condition at that time. The equipment will remain the property of the Contractor and shall be re-exported if no longer required, except that the meteorological measuring equipment shall be handed over to the Owner in full working order as established within the fenced area.

If the Contractor chooses outsourcing or subcontracting the site laboratory works to others the requirements related to the laboratory and equipment shall be according Chapter 6.56.5 and 6.66.6.

7 PLANNING REQUIREMENTS

7.1 General

The Contractor shall employ at least one experienced programmer who will be responsible for the preparation and updating of time schedule and progress reports. Time schedules shall be realistic and adequately detailed and shall be used by the Owner as a base for the schedule of issuing working drawings to the Contractor and for monitoring progress.

Where access must be given to subcontractors or other contractors for the erection of plant and equipment while his own operations are still in progress, the Contractor shall schedule the work in such a manner that the erection operations can be carried out in safety and without undue obstruction or hindrance.

7.2 Construction Schedule

The detailed Construction Schedule to be submitted to the Owner by the Contractor.

This schedule shall be computerized using "Primavera" or "MS Project" software suitable for use on a computer.

The program shall include as a minimum a network diagram, manually or computer produced indicating critical path activities:

a) A tabular listing of:

- early starts and finishes
- late starts and finishes
- free and total floats;

b) Computer generated bar charts:

- Periods required for work to be carried out by other contractors and subcontractors;
- Information on assumed shutdown periods, vacation days and other non-working time.

The detailed Construction Program to be submitted in accordance with the EPC Contract shall be in the form of a bar chart in sufficient detail to show when the main components of each section of the works will be constructed and commissioned. Periods when construction will not take place shall be clearly shown. The time schedule shall incorporate the Sectional Completion Dates set out in the Construction Schedule, or such variations as may be agreed with the Owner, and any other key dates as specified by the Owner for the proper monitoring of progress.

In addition, a statement of the planned type, number and output of resources shall be submitted to substantiate each activity duration.

The Contractor shall also submit with the Construction Schedule proposed excavation, embankment fill and concrete summation graphs for each section of the

works and each type of embankment fill material against which progress will be monitored.

7.3 **Meetings**

The Contractor shall be required to attend regular Management Meetings with the Owner where the contract matters and progress of construction will be reviewed. Such meetings shall normally be held monthly and may be attended by representatives of the Owner. The Contractor shall present a report on progress to the Owner before the meeting at a time to be agreed for circulation to participants by the Owner.

The progress meeting agenda will include approval of the minutes of previous meetings, a report on progress of construction in relation to the construction program and matters arising from any difficulties encountered in the construction of the works. The progress meeting may be extended to cover also technical and environmental etc. issues.

When the minutes of the meetings prepared by the Owner have been accepted by the other participants, the minutes will be deemed to be a true record of the declarations, instructions and decisions taken during the meeting.

When requested by the Owner the Contractor shall also attend a weekly meeting with the Owner and provide, four working hours before each meeting, detailed programs showing separately the excavation, support (if any), grouting, instrumentation, reinforcement, formwork, concreting and other work anticipated over the forthcoming two week period as well as the progress achieved over the preceding week.

The Contractor will be required to attend other meetings from time to time on special subjects.

7.4 **Construction Methods**

7.4.1 **General**

Unless otherwise confirmed in writing, acceptance of the Proposal will not signify acceptance of the Contractor's proposed methods of construction or materials, nor will it in any way relieve the Contractor of any of his responsibilities for the Works. Further it will not be accepted as a basis for claiming additional compensation where the proposed methods of construction, its end results, or the proposed materials do not comply with the Specification and other RFP Documents

Unless otherwise directed, the Contractor shall submit to the Owner for consent full details concerning the methods, equipment and quality assurance procedures proposed for each section of the work, including temporary offices, buildings, access roads, Contractor's Equipment, power arrangements, aggregate storage, cement handling, concrete mixing and handling plant, laboratory, quarry operations, method of excavation, embankment fill construction, dealing with water, diversion and environmental mitigation. These shall be referred to as Method Statements and details shall be submitted sufficiently in advance before the programmed commencement of work in the area concerned.

The Owner will give his consent or comment on the proposals within approximately two weeks of receipt.

The Owner's consent will not be unreasonably withheld, provided the methods and equipment proposed may be expected to produce an acceptable end result, but such consent shall not relieve the Contractor of any its responsibilities, including for safety, adherence to the time schedule, compliance with the technical specifications and drawings or any other requirements of the Contract.

After operations have commenced, it is possible that modifications to the construction methods originally agreed upon will be found desirable and such modifications will be made from time to time by agreement in writing between the Owner and the Contractor. If any equipment, appliances, types or quality of scaffolding, forms, and the like are, in the opinion of the Owner, either unsafe or unsuitable for accurate and efficient construction, the Owner may instruct the Contractor to replace or modify the item or items concerned, whether or not the Contractor is in agreement with such opinion, and the Contractor shall forthwith make the required alterations without any additional payment.

7.4.2 Approval, Consent, Agreement etc.

Any approval, consent, acceptance or agreement or non-objection, by the Owner, including in connection with Contractor's Equipment or its operations, or of any construction procedure, or of any materials to be used in construction, or of any temporary work will not imply any relaxation of the clauses of the technical specifications governing the quality of the materials or of any requirement of the Contract or release the Contractor of any of his obligations or responsibilities under the Contract.

There will be generally 3 different kinds of "Requests for Approval" applied for civil work which shall be submitted 72 hours in advance:

- Request to commence a new work portion, this will normally be only after prior approval of a method statement for the new work portion;
- Request to approve a foundation area;
- Request to place concrete with a formwork, reinforcement and cleanliness check.

7.4.3 Contractor's Design Alternatives

Where an alternative design is initiated by the Contractor he shall be responsible for timely obtaining any necessary approval of the design criteria from the Owner.

7.4.4 Special Conditions

Dam bodies, power tunnel, surge tank, penstock and underground powerhouse are deemed a particularly important part of the Works. Contractor will work with the EM Sub-Contractor in the powerhouse and for the concurrent works Owner's instructions will be exactly followed. If necessary responsibilities defined in the specifications and design will be fulfilled.

The methods that will be used for shaft, tunnel and cavern excavations ("use of raise boring method and conventional drill & blast method) will be in the Contractors' Proposal with the detailed explanation of the reasons of the method details.

The Contractor shall operate the overhead crane for the EM Sub-Contractor in subject to his agreement with the EM Sub-Contractor.

7.5 **Contractor's Reports**

Before commencement of Works the EPC has to provide a template for the records mentioned below. This templated will be checked, commented and approved by the Owner. Owners Engineer and EPC Contractor will agree on a standard form for the records mentioned below.

7.5.1 **Daily Records of Work Performed**

The Contractor shall submit to the Owner by midday of the following day accurate records detailing work carried out the previous day on permanent and temporary works. This record shall include the following for each portion of the works, separately and in sufficient detail to establish the man-hours and equipment hours expended:

- Extent of work done and equipment in operation;
- The time and duration of any significant delays or breakdowns of any Contractor's equipment;
- Any other events relevant to the progress of the works.
- The reports shall be in a format acceptable to the Owner.

Notwithstanding the foregoing, the Owner may employ members of his own staff to record some or all of the above data in addition to the Contractor's records. The Contractor shall also provide such further information as may be requested by the Owner.

7.5.2 **Reports of Labor and Equipment**

- Weekly

The Contractor shall maintain a weekly record detailing for each portion of the works separately the numbers of the various classes of workmen employed by him on the Site, the Contractor's Equipment on Site and any other information that may reasonably be required.

The number of days Contractor's Equipment is out of order shall be noted. When requested by the Owner in writing, these weekly records shall be submitted to the Owner.

- Monthly

The Contractor shall submit to the Owner for statistical purposes a monthly return of the number of the various classes and nationalities of workmen employed by him on the Site.

The Contractor shall maintain a monthly, or at shorter intervals as required, record of principal materials ordered and stocks on Site and further Contractor's Equipment to be delivered to the Site. The returns shall be in a format agreed with the Owner.

When requested by the Owner in writing, these monthly records shall be submitted to the Owner.

- Day-work and Similar Records

In accordance with the related sub-clause of EPC Contract records shall be kept of labor, materials and Contractor's equipment where there is an agreement to pay by day-works. Such records shall be valid only when signed by both the Contractor and the Owner.

7.6 Drawings and Correspondence

7.6.1 Detail Design Drawings

The Drawings referred to in the EPC Contract and further drawings are supplied under the Contract.

The Basic Design Drawings issued with the RFP Documents are drawings prepared according to map and contour lines with properties Projection ITM (Israeli Transverse Mercator) and they are considered to be sufficient for the purpose preparing and submitting a Proposal. After the preparation and approval of the large scale map mentioned in the Section Surveying, compliance of tender drawings with the large scale map shall be checked and approved by the OE. If inconveniences exist due to mapping, the basic design drawings shall be used after making necessary revision of the basic design for preparation of the construction drawings by the Contractor's Engineer.

The Contractor shall agree with the Owner a schedule showing dates of submission of construction drawings by the Contractor to the Owner for review and non-objection to suit the construction schedule. The Contractor shall be entirely responsible for the completeness, correctness and accuracy of any calculations and drawings prepared by him, and the Owner's approval or non-objection of such calculations and drawings shall in no way relieve the Contractor of this responsibility.

7.6.2 'As Built' Drawings

In the case of those parts of the permanent works designed or detailed by the Contractor are finished, a set of 'as-built' drawings shall be prepared by him to show the permanent works as finally built or installed. The 'as-built' drawings shall be prepared from reproducible of drawings submitted by the Contractor and approved by the Owner. An 'as-built' drawing shall be prepared and submitted corresponding to every drawing submitted by the Contractor and approved by the Owner. In the case of permanent works designed by the Owner, 'as-built' drawings shall be prepared by the Contractor from reproducible of the drawings provided by the Owner. All the reproducible's shall be altered by the Contractor in an indelible medium to show all variations and modifications made during the execution of the works. An 'as-built' drawing shall be prepared and submitted corresponding to every drawing provided by the Owner.

Altered drawings shall be to a standard of draughtsmanship equal to that of the drawings provided by the Owner and to the satisfaction of the Owner. Six copies and one reproducible of each 'as-built' drawings shall be submitted by the Contractor within one month of the date of completion of the relevant part of the works shown on the drawing and in any case not later than one month after the date of completion of the whole of the works. The Files should be submitted in pdf-Format

as well as dwg-Format. All costs of the preparation, reproduction, review, corrections and obtaining of the Owner's approval for the 'as-built' drawings are deemed to be included in the Contractor's rates.

7.6.3 Submissions to the Owner

Wherever the specification requires that the Contractor shall make a submission to the Owner the Owner will consider such submission and reply to the Contractor in accordance with the relevant provision of the EPC Contract. Unless a defined period of time is stated in the specification, each submission shall be made by dates to be agreed with the Owner. The Owner will either approve or comment on submissions from the Contractor expeditiously but no later than 28-21 days after receipt except where otherwise stated in the Contract. Where, in the opinion of the Owner, substantial checking or calculation work would be required before the Owner would be able to approve or comment on the Contractor's submission, the Contractor shall not unreasonably withhold his agreement to a longer period of time as requested by the Owner.

Documents submitted, other than drawings and manufacturer's literature, shall be A4 in size. All documents shall be in English and any abbreviations shall be explained. All calculations and technical information shall be in units conforming to the System International d'Unites (SI).

All drawings shall be A1 paper size. Notes shall be in English. All drawings shall have the appropriate scales drawn on them. All dimensions shall be in meters or centimeters and all weights in metric tons or kilograms.

All drawings shall include the title of the Contract at the bottom of the drawing followed by the title of the drawings concerned.

Four copies of commissioning manuals and of draft operation and maintenance manuals shall be submitted to the Owner 60 days in advance of the programmed start of commissioning of the corresponding item. The manuals shall be in English.

Five copies and a reproducible pdf-file of all approved operation and maintenance manuals shall be submitted. The manuals shall be suitably bound in A4 size volumes, complete with tables of contents and an overall index.

7.6.4 Correspondence with the Owner

All correspondence shall be numbered and distributed in accordance with an agreed procedure.

8 SURVEYING

8.1 General

The Contractor shall prepare a big scale map (1/1000 and/or any scale asked by local administrations and Owner) according to applicable laws, regulations, special technical specification and standards by Israeli governmental local authority and approved by relevant local authority and Owner.

Subjects discussed in this section, about surveying will cover the surveying work after the big scale map's all approvals.

The Contractor shall render all services for geodetic survey, setting out and measurements as required for the performance of the works.

Based on the drawings and directions given by the Owner these services shall cover the establishment of basic datum points, benchmarks and permanent survey monuments; the establishment of axes, center lines, alignments of structures and features; the setting out for construction purposes including all monitoring and checking surveys for correct location, dimensions and elevations; and all surveys required for measurements to permit quantity calculations.

Such surveys shall be based on and referred to the existing National Survey Grid of triangulation points established in the vicinity of the project area. This grid shall be the sole basis of reference for all survey works and measurements.

For the execution of the survey works the Contractor shall employ and provide experienced professionals and auxiliary staff familiar with modern survey techniques and instruments. All survey and measurement works shall be recorded in a professional way.

The Contractor shall provide, maintain, adjust where required and operate the required survey and auxiliary equipment for the performance of the works. The Contractor shall submit to the Owner for approval prior to the commencement of the survey works a programmatic report on the required survey works, giving the following detailed information:

- information on and professional records of his responsible survey staff;
- the survey methodologies intended to be applied, including the locations of all main reference survey points/benchmarks to be established throughout the Site based on the triangulation point grid;
- details and technical data on the surveying instruments, equipment and auxiliaries;
- details on the accuracies obtainable/guaranteed for all types of survey work to be performed considering the methodologies to be applied and the instruments which will be used.

The Contractor's attention is drawn to the fact that an important part of the survey works refers to the survey of underground structures. Methodologies, equipment and auxiliaries to be used shall be suitable for and meet the requirements of the survey work to be done including the particular requirements of the underground survey.

All survey and measurement activities shall be recorded in maps and field books. Where required, the production of drawings and maps shall be deemed to be part of the works.

All survey works performed by the Contractor shall be subject to approval by the Owner.

8.2 Handing over of Survey Data

Prior to the commencement of the works the Owner will hand over to the Contractor all information and data of the basic National Survey Grid triangulation points.

Upon handing-over the Contractor shall review this information and all relevant data and shall verify the existence of the triangulation points and other monuments by field checks.

Should field checks reveal that points have been damaged or displaced, the Contractor shall forthwith inform the Owner of this fact, and the Owner shall confirm other reference points to be used if necessary. If no objections have been raised against the basic grid and related data within three months after handing-over of the data, the reference points and the data are considered accepted by the Contractor.

8.3 Additional Datum Points and Benchmarks

8.3.1 General

Additional basic datum points and benchmarks established by the Contractor for the convenience of his works and required as part of the works shall have at least the same quality and durability as those of the existing points and shall meet the accuracy required.

The accuracy and reliability of additional datum points and benchmarks shall be established upon performance of at least five series measurements and two closed level loops respectively, with the required analyses and mean value calculations.

8.3.2 Permanent Survey Monuments

The Contractor shall survey in using precision survey methods and establish Permanent Survey Monuments at locations selected by the Owner, and the Contractor shall then derive the coordinates and elevations of the Monuments. The Permanent Survey Monuments shall be constructed in accordance with the details given by the Owner, surmounted by wild pattern theodolite pillar stands protected by lockable, galvanized steel covers.

The Contractor may elect to establish the Permanent Survey Monuments at the start of the works for use during construction. The Contractor shall be entirely responsible for the maintenance and protection of these monuments during construction, and shall regularly perform full check surveys to confirm that they have not been affected by construction activities or in any other way disturbed or damaged.

On completion of the works the Contractor shall carry out a complete check survey to confirm that the locations and elevations of the Permanent Survey Monuments

have remained unaltered since their establishment. The Contractor shall be entirely responsible for the correctness of the Permanent Survey Monuments and for any direct or indirect effects of any error or change in their locations or elevations.

Payment for all works required for the establishment, construction, checking and, where necessary, repair or replacement of the Permanent Survey Monuments shall be deemed to be included in the Contractor's financial proposal.

8.3.3 Contractor's Basic Datum Points, Benchmarks and Reference Monuments

The programmatic report to be submitted by the Contractor prior to the commencement of the survey works shall include details and maps showing the locations of all datum points and benchmarks to be established by the Contractor throughout the Site as the basis for the subsequent survey work required for the performance of the works. The datum points and benchmarks shall be of a permanent nature and shall be constructed in a manner to be agreed by the Owner.

The Contractor shall also establish reference monuments for center lines and line control of structures which need frequent and extended control surveys (e.g. dam axis, spillway axis, tunnel alignment, etc.).

If, in the opinion of the Owner, additional datum points, benchmarks or reference monuments are required in order to ensure an accurate and satisfactory coverage of the Site for the performance of the works, he may instruct the Contractor to amend the locations of some points or establish additional points and the Contractor shall comply with such instruction at no additional cost.

The Contractor shall survey in using precision survey methods and establish his datum points, benchmarks and reference monuments at the locations agreed by the Owner. The Contractor shall be entirely responsible for the correctness of his datum points and benchmarks and for any direct or indirect effects of any error or change in their locations or elevations.

The Contractor shall submit to the Owner all data for each of the Contractor's basic datum points, benchmarks and reference monuments, including a description of the point and its physical situation together with a sketch, its coordinates and elevation, within three days of having established the point ready for use. The Owner may use such points established by the Contractor for his own survey work at any time thereafter.

The Contractor shall be responsible for the maintenance and protection of these datum points, benchmarks and reference monuments during construction, and shall regularly perform full check surveys to confirm that they have not been affected by construction activities or in any other way disturbed or damaged.

8.4 Approval of Contractor's Surveys

At least three days prior to any major survey work the Contractor shall inform the Owner of his intention to commence these works. The Contractor shall indicate the purpose of the survey, the area where the survey work will take place, the structure or facilities involved, the methods to be applied, and the time requirements. This information is required to permit the Owner to coordinate survey works with other ongoing works, including those of third parties. Following the receipt of all such required information the Owner will within two days give his approval to proceed if there are no particular constraints. However, should constraints exist the

Owner will advise the Contractor accordingly and determine the commencement date of the related field works.

Prior to completion of a partial survey task or upon completion of setting out the Contractor shall inform the Owner accordingly so that the Owner has the opportunity to carry out the necessary checks and inspections. This shall be particularly applicable for structures which will be covered up and/or are of a permanent nature.

Notwithstanding the above the Owner shall have the right to check at his discretion performance, accuracy, stations, etc., and all survey results, measurements and calculations as well as conformity with plans and drawings related to the survey work.

The Contractor shall without delay provide to the Owner any assistance and auxiliary services required to permit him to carry out control surveys and measurements.

The Contractor shall keep and maintain professional records of all field surveys and measurements, the related computations and calculations, manuscripts, plans, drawings and maps and shall make them available to the Owner whenever requested.

If, in the opinion of the Owner, deficiencies and/or inaccuracies in field or office work have been found, such work shall be repeated and made good to the satisfaction of the Owner without entitling the Contractor to extra payment.

Any control of the Contractor's surveying works by the Owner shall not relieve the Contractor from his responsibility for the accuracy of location, position, dimension, measurements, etc., of any type of structure or facility or part thereof.

8.5 Survey Instruments and Equipment

The Contractor shall provide, maintain and operate suitable and appropriate instruments and auxiliary equipment and materials commensurate with the various tasks and precision requirements of the survey works.

The type and accuracy of the survey equipment intended to be used by the Contractor for the performance of his work shall correspond to the nature of the construction/erection works and the construction technique.

All equipment, instruments, materials and auxiliary equipment shall be in perfect operational condition. Prior to the start of survey activities, in particular precision surveys, equipment, instruments, etc., shall be checked as to their proper function and accuracy. During the construction period the survey instruments shall be checked and if necessary adjusted at regular intervals.

Instruments and equipment which have suffered from use, damage or accidents to a degree making them unfit for further use at the Site shall be removed from the Site and replaced immediately. The Owner shall be informed accordingly. Any delay in the progress of survey or construction works resulting from the non-availability of suitable instruments, equipment, etc. shall be at the Contractor's expense and shall not be cause for any extension of time.

8.6 Survey of Ground Profiles

8.6.1 Original Ground Profiles

The Contractor shall inform the Owner, at least 7 days prior to commencing such work, of his intention to perform any work which will result in a change to the existing topography of the site whether such work be for the permanent works to be constructed on the site or for temporary works which the Contractor intends to execute for his own convenience. Thereupon, before commencing any work, the Contractor shall survey the original topography to the approval of the Owner over the entire area to be occupied or disturbed. The information so obtained shall be recorded by the Contractor on a drawing or drawings which shall each be signed by both the Contractor and the Owner. The Contractor shall then provide the Owner with a reproducible copy of each drawing to serve as a permanent record for the purpose of determining both the quantities of excavation and earthworks carried out in the construction of the permanent works and the extent to which temporary works shall be removed or temporary excavations shall be refilled upon completion of the works.

8.6.2 Excavated and Final Ground Profiles

The Contractor shall survey all excavated and final surfaces as required by the Owner for the purpose of recording as-constructed details and for the measurement of quantities

- on completion of excavation and prior to commencement of placing backfill, concrete or other work
- on completion of placing backfill, concrete or other work.

8.7 Setting out

8.7.1 Setting Out of Works

The Contractor shall perform all setting out and check surveying of the works in accordance with methods approved by the Owner before work commences. The methods and schedule of checking shall be such as to ensure the construction of every part of the works to the correct line and level. The Owner may at any time request the Contractor to submit proof that his own setting out has been satisfactorily checked, and the Contractor shall comply immediately with any such request.

The number of points required for setting out as well as the spacing between these points shall be determined by the Contractor together with the Owner in accordance with the type of the work. In addition to any coordinated points and datum levels the Contractor establishes for his own use, the Owner may require that certain or all of the given points and datum levels be clearly marked during construction in such a way that the marks can be retained after completion of the construction. Where this is not possible for any reason, the Contractor shall inform the Owner in writing and an alternative position shall be agreed with the Owner and confirmed in writing.

The Contractor shall not amend the approved methods of survey control without the approval of the Owner.

8.7.2 Setting Out of Checks

The Owner will carry out regular check surveys during the course of construction and the Contractor shall cooperate with and provide assistance as required by the Owner.

The Contractor is expected to liaise with the Owner to schedule the check survey to be carried out during periods or in parallel such that the minimum delay or inconvenience is caused to construction work, wherever and whenever possible. The Contractor shall afford the Owner every cooperation and assistance in this regard including, but not being limited to, the provision of survey equipment, drainage, lighting and ventilation, and personnel and the removal or placing of Contractor's equipment and other obstructions such that they do not interfere with the setting out checks and, where required, facilitate such checks.

8.7.3 Tunnel Alignment and Gradients

The Contractor shall establish and maintain at suitable distances of any tunnel portal at least two reference monuments and benchmarks on the extended tunnel axis/alignment, to warrant that control surveys during tunnel construction can always be referred to such reference monuments. Because of the importance of such reference monuments they shall be secured by auxiliary fixed points permitting the location control of the reference monuments should these have suffered during extended tunnel construction periods.

Establishment and control surveys of the tunnel alignment and the gradient shall always be referred to such reference monuments.

Underground alignment and level survey and control thereof shall be performed by the use of suitable precision instruments preferably of the pulsed laser type or equivalent instruments, and auxiliary equipment.

Underground survey equipment and methodology shall be subject to the approval of the Owner.

8.7.4 Survey Records and Documentation

The Contractor shall keep records of all survey activities such as sketches, field books, calculations, etc., for the duration of the entire construction period. The Contractor shall upon request of the Owner put at the Owner's disposal all records and documentation or provide copies thereof.

9 QUALITY OF MATERIALS

9.1 General

The quality of all material shall not in any way be inferior to the requirements of the most recent local and internationally recognized standards and applicable to the same.

Electrical equipment shall be of the class most suitable for working in the local conditions.

9.2 Proscribed materials

The Contractor warrants:

- that he, or any Subcontractors, has not used or specified and will not use or specify proscribed material for use
- that he has exercised and will continue to exercise, reasonable skill, care and diligence to see that such materials are not used
- that he is not aware and has no reason to suspect or believe that such materials have been or will be used; and
- that he will promptly notify the Owner in writing if he becomes aware or has reason to suspect or believe that such materials have been, or will be used

in, or in connection with the works, any of the materials or substances identified as follows:

- high alumina cement in structural elements
- wood wool slabs in permanent formwork to concrete
- calcium chloride in admixtures for use in reinforced concrete
- asbestos products except (with the Owner's consent in writing) in mechanical or electrical equipment where their use cannot reasonably be avoided
- naturally occurring aggregates for use in reinforced concrete which do not comply with the required standards
- polychlorinated biphenyls, PCBs and materials containing PCBs
- cast iron for any oil service
- carcinogenic materials; and
- any others generally known material in the construction industry at the time of use to be deleterious if used or incorporated in the works.

10 DESIGN

All detail design works for construction have to be prepared / signed by an authorized certified Israeli Engineer!

The works (more detailed requirements for the design are given in the Owner Requirements; Volume 2 – Section I) shall be designed to ensure satisfactory operation in which continuity of service is the first consideration and to facilitate easy inspection, cleaning and repair. All structures and equipment supplied shall also be designed to ensure satisfactory operation under the seismic and atmospheric conditions prevailing for the works and fit for the required purpose, and under such variations of load and voltage as may be met with under working conditions on the system, including those due to faulty synchronization and short circuit.

The Contractor shall be responsible for submitting all statutory calculations for third party verification, and obtaining such approvals as are required.

All apparatus shall function without undue vibration and with the least practicable amount of noise.

The Contractor shall provide sufficient access around all equipment, in accordance with good utility design practice, to allow effective maintenance and removal.

Platforms shall be provided around equipment as required for maintenance work.

The design of all apparatus, including supporting structures and bases, shall incorporate features to preclude the ingress or nesting of animals, birds, rodents and insects. Such features shall not restrict any natural ventilation of the apparatus, structure or base.

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of fire. When cabling is carried out as part of this Contract, the Contractor shall be responsible for sealing all holes in floors, walls, roofs, etc. through which the cabling may pass.

11 OPERATING AND MAINTENANCE INSTRUCTIONS

In addition to the specifications below, the Contractor has to coordinate with the O&M Contractor to be able to fulfil the Operation and Maintenance Specifications given in Volume 2 - Section X.

11.1 General

The Contractor shall supply operation and maintenance manuals as required by the Contract.

The procedures adopted within the operation and maintenance manuals shall be structured to ensure efficient operation of the construction components, and the equipment to minimize downtime for repairs and replacement of items of equipment critical to operations.

The text of the operation and maintenance manuals, together with all drawings, illustrations, and diagrams therein shall refer specifically to the civil works provided under the Contract. The text shall be concise and unambiguous with drawings and sketches provided where necessary to aid readability.

The indexed operating instructions shall be in sufficient detail to enable the Owner or his Personnel to maintain, dismantle, reassemble and adjust all parts of the works.

Maintenance instructions shall include a schedule of spare parts, reference numbers and procedures to facilitate identification and ordering of spare parts.

Environmental consequences of maintaining and operating the works shall be considered when preparing the operation and maintenance manuals. For example, the procedures shall ensure that waste materials are disposed of in an environmentally acceptable manner, typically to avoid contamination of water resources.

The operation and maintenance instructions shall comply with regulations of the grid operator and applicable law. Due consideration shall be taken of statutory requirements relating to occupational health and safety.

11.2 Civil Works

The manuals shall consist of two separate volumes which shall cover the surveillance, operation and maintenance of the works as follows:

Volume 1: Description and Maintenance

Volume 2: Surveillance and Operation

11.2.1 Volume 1 - Description and maintenance

Volume 1 shall describe the project components and maintenance thereof as follows:

11.2.1.1 *Description of project components*

A detailed description of each component of civil works shall be provided. Typically, as part of the description, the following details shall be provided within Volume 1:

- location of component and its function
- means of access
- emergency exit procedures
- security provisions
- design function
- permissible applied loading to all components
- details of possible work in secured and dangerous work areas
- details of specialist operation and maintenance data; and
- any other detail that is relevant to the operation and maintenance of the works.

11.2.1.2 Maintenance

The maintenance procedures for each component shall incorporate routine planned maintenance work or other work of a less routine nature that may or may not require outage of the generating units. Clear and comprehensive instructions shall be provided describing the execution of the maintenance procedures.

Maintenance procedures shall be established for each component of the civil engineering works and all Plant and equipment. The procedures shall define the nature and type of routine maintenance work that is envisaged for the component. Typically for the civil works these would include such items as clearing drainage structures of trash, vegetation and sediment; lubrication of hinges and bearings; tending to overgrown grass; repairing damaged or flaking paintwork; repair of road surfacing; etc. Maintenance procedures for all Plant and equipment would be based on the recommendations of the manufacturers and would typically include procedures for the repair or replacement of seals, bearings, linkages and similar serviceable parts.

Separate maintenance procedures shall be established for maintenance work which is not of a routine nature, such as components which have been damaged during operation.

The maintenance procedures for all proprietary products shall be provided within the operation and maintenance manuals and clearly referenced.

A detailed list shall be provided of suppliers and manufacturers for all proprietary components including those supplying instruments for monitoring the behavior of structures, foundations and waterways. The list shall include the make/model number/catalogue number; parts list and spares ordering instructions. A detailed list shall also be provided of contact addresses, telephone numbers, fax numbers and e-mail addresses for suppliers and manufacturers for all proprietary components.

Text shall be provided describing the method of execution of the maintenance procedures and the method of recording maintenance works undertaken.

Provision shall be made for the recording of the location of defects, the identification source and the nature of work completed. Typically this could be recorded on a pro-forma ‘Maintenance Record’ sheet.

Provision shall be made for recording separately maintenance work carried out as a result of an inspector’s recommendation. Typically this work could be recorded

on a pro-forma ‘Maintenance Record’ sheet and an ‘Inspection Report’ sheet completed as part of the operating procedures.

11.2.2 Volume 2 - Surveillance and Operation

Volume 2 shall typically include but shall not be limited to operating, inspection and monitoring procedures as follows:

11.2.2.1 *Operating instructions*

Operating instructions shall detail all normal starting up, running, switching and shutting down procedures, emergency operating procedures and any precautions recommended preventing deterioration of the works during periods of non-operation.

Instructions shall cover the filling and draining procedures for civil works such as the reservoirs, power waterways, water supply systems, drainage and dewatering systems and sewage systems.

The operating instructions shall include a comprehensive commissioning schedule for each component or structure, and check lists to record the completion of these activities. Copies of all settings and calibrations of instruments shall be included in the operating instructions.

11.2.2.2 *Inspection and monitoring procedures*

The text for the inspection and monitoring procedures shall include but shall not be limited to the following:

- An ‘Inspection and Monitoring Timetable’ for the major elements of the works. The timetable is expected to include regular daily, weekly, monthly, quarterly, biannually, annually and five yearly inspections.
- A method of requesting maintenance work. Typically a pro-forma ‘Maintenance Request’ sheet could be used.
- A method of controlling access to typically unsafe or confined work areas shall be provided. Typically a ‘permit to work’ pro-forma sheet for signature by the station superintendent or his deputy could be used.
- A check list of inspection work to be carried out and a method of recording the completed inspection work. Typically an ‘Inspection Report’ form could be used.
- A record of completed maintenance work. Typically a ‘Maintenance Record’ sheet could be used.
- Any other information deemed necessary to ensure satisfactory operation of the works.

11.2.2.3 *Detailed inspection of each component*

The text for the detailed inspection of each component shall typically include but shall not be limited to the following:

- A detailed description of the inspection work to be carried out on the component. It is anticipated that the inspection work will vary in scope and thoroughness depending on the relative importance of the component and the frequency of inspection.

- Procedures for reading instruments installed for monitoring the behavior and performance of the component.
- Service limits applicable to instruments monitoring the component. Details shall be provided of when further specialist advice should be sought in the case of emergency situations.
- Method statements, information and data regarding specialist repairs and specialist techniques required for maintenance work.

Any other information deemed necessary to ensure satisfactory operation of the works.

11.3 Testing and Technical Particulars

The Contractor shall carry out the specified tests in accordance with the conditions thereof and such additional tests as in the opinion of the Owner are necessary to determine that the works comply with these Specifications.

All tests shall be carried out to the satisfaction of the Owner either in his presence or, if agreed by the Owner, as confirmed by certifications to the satisfaction of the Owner. The Contractor shall supply suitable test pieces of all Materials required by the Owner.

All labour, materials laboratories, stores, apparatus, instruments and connections required for the above tests shall be provided by the Contractor.

The Contractor shall be responsible for any discrepancies, errors or omissions in the technical particulars, whether such technical particulars have been approved by the Owner or not.

11.4 Spare Parts

Spare parts must be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the works. They shall comply with the Specifications and must be suitably marked and numbered for identification and packed for storage under the climatic conditions prevailing at the Site.

All spare parts or material containing electrical insulation shall be delivered in cases suitable for storing the insulation over a period of years without deterioration. The cases shall remain the property of the Owner.

12 PROJECT QUALITY REQUIREMENTS

12.1 General

The Contractor and his Subcontractors shall work to defined quality assurance program accredited to ISO 9001. The Contractor shall define the items which he proposes to subcontract, together with all items for which quality plans (inspection and test plans) will be submitted and shall define the quality level(s) proposed for his own and his Subcontractors' scope of supply.

The Contractor and his Subcontractors may be subject to quality audits by the Owner or his Representative. The Contractor shall establish and maintain a documented inspection system capable of producing objective evidence that all Materials, manufactured parts and assemblies comply with the quality requirements of the Contract.

The Contractor's inspection system shall, as a minimum, include procedures used for controlling the following functions:

- Availability at inspection points of applicable drawings, instructions, etc., and prompts removal of superseded documents.
- Maintenance and calibration of suitable inspection and test equipment.
- Inclusion (or referencing) on purchase orders of the necessary technical inspection and test details to meet the specified requirements and of the Owner's right of involvement at a Subcontractor's works.
- Incoming, in process, and final inspection; and inspection of packing and marking.
- Means of identifying inspection status throughout manufacture.
- Provision of complete inspection and test records.

The Contractor shall submit for approval, within 30 days of the date on which the Contract comes into full force and effect, a Project Quality Plan, to include the Site Quality Plan, defining the time schedule of quality control and inspection activities which he will perform in order to ensure that the design of the works and the manufacture and completion of the works comply with the specified requirements. The Project Quality Plan may be of any form to suit the Contractor's system, but it shall as a minimum:

- Define the management responsibilities for:
 - Quality
 - Organization
 - specific responsibilities, and
 - system reviews.
- Provide for a Contract review on commencement of the Contract and thereafter on a defined regular basis.
- Define design review and document control.
- Define purchasing controls.
- Define process controls.
- Define inspection and testing requirements.
- Define the handling of deviations and non-conformances.
- Define handling, storage, packing, preservation and delivery.

- Define records.
- Define an audit programs for the project.

The Contractor shall submit for approval, within 30 days (this time may be extended for special items) of Purchase Order award for various items of plant a project inspection and test plan defining the programs of quality control and inspection activities which he will perform in order to ensure that the manufacture and completion of the Plant complies with the specified requirements. The works inspection and test plan may be of any form to suit the Contractor's system, but it shall, as a minimum:

- Indicate each inspection and test point and its relative location in the production cycle including incoming, packing and site inspections.
- Indicate where Subcontractors' services will be employed (e.g. Subcontractor non-destructive testing or heat treatment).
- Identify the characteristics to be inspected, examined, and tested at each point and specify test pieces and procedures and acceptance criteria to be used.
- Indicate mandatory hold points (to be established by the Owner) which require his verification of selected characteristics of an item, or a process, before work can proceed.
- Define or refer to sampling plans if proposed and where they will be used.
- Where applicable, specify where lots or batches will be used.

The Contractor shall include in all his orders to Subcontractors a note advising that all Materials and equipment may be subject to inspection by the Owner as determined by the Project Quality Plan. Two copies of such purchase orders (unpriced) shall be forwarded simultaneously to the Owner.

In order to verify compliance with engineering procurement, manufacturing requirements and programs, the Owner shall have access at all times, to all places where Materials or equipment are being prepared or manufactured, including the works of the Contractor's Subcontractors or suppliers of raw materials.

The Contractor shall advise the Owner or his nominated representative of the readiness of inspection at least 44-10 working days prior to a nominated witness or hold point. Work shall not proceed beyond a hold point without the written agreement of the Owner or his nominated representative.

Inspection of the Plant may be made by the Owner and may include the following activities:

- Evaluation of the Contractor's system and approval of the quality plan.
- Periodic monitoring to confirm the effectiveness of, and the Contractor's compliance with, the established system procedures, quality plan and inspection of test instructions.
- Witnessing of inspections and tests and/or verification of inspection records to be carried out at the Owner's discretion covering:
 - Compliance of raw material with specified requirements.
 - Compliance of manufactured parts, assemblies and final items with the Specifications, drawings, standards and good engineering practice.
 - Periodic inspection of the Contractor's design, manufacturing, installation work and the production of progress reports.
 - Witnessing of inspections and tests.

- Packing for shipment including check for completeness of shipment, handling requirements, and case markings and identification.

The Contractor's compliance with equipment documentation, drawing, delivery and commissioning schedules shall be monitored by the Owner. Raw materials, components, shop assemblies and the installation thereof, shall be subject to inspection and test by the Owner as required by the Specifications and to the extent practicable at all times and places during the period of manufacture.

The Contractor shall keep the Owner informed in advance of the time of starting and of the progress of the work in its various stages so that arrangements can be made for inspection and for testing. He shall also provide without additional charge all reasonable facilities and assistance for the safety and convenience of the Owner in the performance of his duties. All of the required tests shall be made at the Contractor's expense, including the cost of all samples used.

The Owner will endeavor to schedule his presence at the performance of inspection and tests so as to avoid undue risk of delaying the work. In the event of postponement, by the Contractor, of tests previously scheduled or of the necessity to repeat tests due to unsatisfactory results of the original tests, or other reasons attributable to the Contractor, the Contractor will bear all costs for new tests and the costs incurred by the Owner or his nominated representative in re-inspecting the non-conforming item or its replacement.

The Contractor's and his Subcontractors' quality assurance programs shall identify and isolate items not conforming to the Specifications. All such items shall be reported to the Owner via a non-conformance report.

The Owner shall have complete authority to accept or reject any equipment or part thereof considered unsatisfactory and/or not in accordance with the specified requirements.

The Contractor shall not offer, unless otherwise agreed, any item of equipment for inspection to the Owner until all planned inspections and tests to date have been completed to the satisfaction of the Contractor.

Any non-conformances identified by the Owner shall be notified by issue of the Owner's non-conformance report to the Contractor. Re-inspection shall not be notified until the completed non-conformance report, together with any applicable concession applications, has been accepted by the Owner.

Acceptance or rejection of Plant, equipment and/or components will be made as promptly as reasonably practicable following any inspection or test involvement by the Owner. However, failure to inspect and accept or reject equipment and/or components shall neither relieve the Contractor from responsibility for such items which may not be in accordance with the specified requirements, nor impose liability for them on the Owner.

Approval of a concession application is the prerogative of the Owner and approval of a particular case shall not set precedent.

The inspection and tests by the Owner of any components or lots thereof does not relieve the Contractor of any responsibility whatever regarding defects or other failures which may be found before the end of the Defects Notification Period.

The Contractor shall provide a quality release certificate confirming compliance with the Contract requirements and a data book. The Contractor shall furnish the Owner with two copies of the data book.

No materials shall be shipped to the Site or put to work until all tests, analysis and inspections have been made and certified copies of reports of test and analysis or Contractor's certificates have been accepted and released by the Owner or by a waiver in writing.

12.2 Inspection and test plans

The Contractor shall agree on a relevant inspection and test plan ("ITP") with the Owner prior to commencing work on each activity. The ITPs shall include, where applicable, measurements or tests at the Contractor's or Subcontractor's facilities and shall also incorporate the Owner's hold points for inspection and testing requirements. They shall also include details of the testing establishments the Contractor proposes to use.

12.3 Quality tests

The Contractor shall be responsible for the quality of all products, processes and services supplied under the Contract, and shall provide all test facilities and perform demonstrative conformance of all products, processes and services to the requirements of the Contract.

12.4 External quality audits

External quality audits shall be carried out in accordance with the Contractor's Quality Plan, but shall be conducted no later than twelve (12) months apart. Upon request, the Owner shall be given access in conjunction with or through the Contractor to carry out quality audits, reviews or surveillance or ascertain the effectiveness of the quality system put in place by the Contractor.

The Owner shall be entitled to carry out audits of the Contractor's quality system by:

- review of the Contractor's conformance with the Quality Plan; and
- review and verification of the Contractor's quality procedures and work instructions and documentary evidence of compliance with the technical requirements of the Contract.

The Owner may require compliance audits of the Contractor's quality system. Not less than three (3) weeks' notice will be given by the Owner. During audit by the Owner, the Contractor shall provide staff trained and registered as ISO auditors to accompany the Owner. The Contractor shall make available on request any document which relates to internal audits.

Internal and external audits shall be carried out at six (6) monthly and yearly intervals respectively. A copy of all quality audit results, reports and corrective actions shall be submitted to the Owner.

12.5 Traceability

The Contractor shall maintain records clearly identifying the source and condition of all Plant, Materials and equipment used for construction of the works, along with any relevant test results, design drawings, and the place and time of delivery to store or to Site. The Contractor shall be able to demonstrate ease of traceability of non-conforming items for rectification.

13 HEALTH AND SAFETY REQUIREMENTS

13.1 General

The Contractor shall comply at all times with the requirements of any applicable law and competent authority regarding environment, health and safety. The Contractor shall take full responsibility for the prevention of unhealthy or unsafe conditions and practices and for the promotion of healthy and safe working practices at the Site. Nothing specified herein shall relieve the Contractor of any obligation or responsibility in this regard.

Approved safety equipment shall be worn by all persons at all times whilst on the works. Suitable clothing, footwear, helmets, cap lamps, waterproofs, safety glasses, ear protectors, dust masks, gloves, goggles, harnesses, "self-rescuer" apparatus, breathing apparatus, etc., appropriate to the work being undertaken, shall be issued free of charge to and worn by all workmen on and from the day of commencement of work. The workmen shall be trained in the use of all such equipment before entering working areas.

The Contractor shall erect and maintain all necessary temporary fencing, barricades, barriers, signs and lights for the prevention of accidents or unsafe practices to the satisfaction of the Owner. Signs shall include but not be limited to standard road signs, warning signs, danger signs, control signs and direction signs in addition to the safety notices specified elsewhere in this clause. All such signs shall be clearly legible in English and Hebrew, to the approval of the Owner, and the Contractor shall maintain them in a clean and legible condition for the duration of the works.

The Contractor shall conduct safety awareness programs and campaigns throughout the duration of the Contract, including the use of prominent and strategically placed posters, audio-visual methods, etc.

The Owner may at any time order that the Health and Safety Policy may be altered completely or in part or may be added to. The Owner may also serve on the Contractor a Notice of Contravention of the Health and Safety Policy. Such a notice will specify the nature of the contravention, and the time limit for rectification. In the event of failure to comply with a Notice of Contravention the Owner may arrange for work to be done to rectify the cause or order removal or suspension of the offending persons from site or close down the work area, as appropriate, at the Contractor's expense.

Contractor may appeal to the Owner for modification of the terms of any "Notice of Contravention" before the expiry of the notice. Upon such appeal the Owner in his sole discretion may modify, withdraw or confirm the Notice.

13.2 Transport of Labor

The Contractor shall be responsible for, and make provision for, the safe vehicular transport of all laborers between their accommodation sites and their work areas, and vice versa. Under no circumstances shall labor be transported on flatbed trucks, or similar vehicles without acceptable form of side restraints and adequate seating. Weather proof covers shall be available for use at all times. The Contractor shall prevent overloading of vehicles

13.3 Safety of Public

Where the Public could be exposed to danger by any of the Site activities the Contractor shall as appropriate provide suitable flagmen, barriers and/or warning signs in Hebrew and English and close off access all to the approval of the Owner.

Where shown on the drawings or instructed by the Owner the Contractor shall provide alternative safe access routes.

13.4 Explosives and Blasting

The handling, storage and use of explosives shall be in accordance with the requirements of the Israeli authorities. The Contractor shall install and operate a siren of sufficient volume to be easily heard above the general site noise from all points within a radius of 1.0 km of surface blasts, including by those persons operating construction vehicles and machinery.

Hand operated sirens will only be accepted in areas of restricted access such as tunnel headings where access is fully controlled.

The Contractor shall submit details of his blasting procedures to the Owner for consent and shall ensure that such procedures are adhered to at all times. Relevant aspects of the procedures shall be agreed with the local authorities and disseminated as widely as possible amongst the local population.

The Contractor shall in particular adopt precautions when using explosives which will prevent scattering of rocks, stumps or other objects or debris outside the work area.

All blasters employed by the Contractor must be tested and certified by the relevant Government Authorities

13.5 Lightning

The Contractor shall take precautions against lightning with regard to earthing of metal work and conductors on site.

13.6 Information Notice Boards

The Contractor shall erect and maintain notice boards for the dissemination of relevant safety information and safe work procedures.

The boards shall be made up from durable materials to the satisfaction of the Owner that will not warp from variations in temperature or weathering, protected from rainfall if erected in outside locations, and well illuminated if erected underground. The board shall be a minimum of 2 m x 1.5 m in size and be mounted at a height of 1.5 m.

The Contractor shall keep the notice boards in good repair and order with legible notices for the duration of working in any given contract area.

At least one notice board shall be erected in each of five locations to be nominated by the Owner.

The relevant statutory regulations with respect to blasting shall be displayed at each entrance to underground works and in the vicinity of the quarry workings.

13.7 Hazardous Substances

The Contractor shall identify and keep records of all hazardous equipment, materials, or other substances and any other health hazards in his undertaking of the Contract. Newly created hazards or new hazardous equipment, materials or other substances brought on to Site shall be added to the record. The Contractor shall draft codes of practice appropriate to the said hazards. The Owner shall be granted access to such records at all times.

The Contractor shall regularly check the site establishment and storage areas for Contractor's Equipment, transport vehicles and hazardous materials, for spillages and leaks. The Contractor shall make adequate provisions, to the satisfaction of the Owner, to ensure that such spillages of toxic materials are prevented from entering the groundwater, natural streams, the natural ground soils or areas outside the site.

13.8 Fire precautions

The Contractor shall take all necessary precaution to prevent fire. In established operational areas, firefighting appliances suitable for existing risks will be available. Where new risks are introduced in or by the works during the construction period, the Contractor shall provide appliances suitable for such risks.

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of fire. All holes in floors, walls and roofs, through which the cabling may pass and for protecting cable shall be sealed in an approved manner against mechanical damage or damage by fire by certificated fireproof bulkheads. All this work has to be co-ordinated with the E&M Subcontractor.

When working in potentially explosive atmospheres the Contractor shall employ safe non-electric tools and apparatus suitable for use in such areas.

13.9 Compressed gases

The Contractor shall make adequate arrangements for the safe storage (including appropriate warning notices) and handling of all compressed industrial gases.

13.10 Access, fencing and safety barriers

The Contractor shall give notice to the Owner's Personnel whenever he proposes to start any work which may impede the safe passage of persons and vehicles in an emergency.

The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress. Permanent or approved temporary covers to openings shall be replaced at all other times.

Where the Contractor is required under the Contract to provide a temporary cover over any shaft or similar structure, he shall comply with the following requirements:

- The cover shall be secure, weatherproof, provide adequate ventilation (which may be natural or forced as the case may require) and shall not detract from the visual amenity of the surrounding area.

- The cover shall be able to support an imposed load equivalent to a uniformly distributed load of at least 1.4 kN/m².

13.11 Site rules

The Contractor shall comply at all times with the Owner's site rules, which may include, but not be limited to, safety and operational rules. The Contractor shall provide all safety equipment for use on the works. Where such equipment is subject to statutory inspections, the Owner shall be provided with copies of the inspection reports.

13.12 Protection of hearing

Where sound levels cannot be reduced at source, the provision of suitable hearing protection is required when noise levels indicate a L_{eq} (equivalent continuous sound level) of more than 90 dB(A). When hearing protection is used arrangements should be made to ensure the wearers can be warned of other hazards.

13.13 Respiratory protective equipment

Where there is a risk to persons at work from a dangerous atmosphere, appropriate breathing apparatus must always be readily available for use and all persons concerned must have received adequate training in the working principles and use of this equipment.

Breathing apparatus may need to be used in both routine operations and emergency situations. It is important that the correct equipment is selected for the particular environment for which the user requires protection and that approved procedures are followed in the general care, use and maintenance of such equipment.

All breathing apparatus, safety harnesses, life-lines, reviving apparatus and any other equipment provided for use in, or in connection with, entry into confined spaces, and for use in emergencies, must be properly maintained and thoroughly examined at least once a month, and as soon as possible after every occasion on which it has been used. The manufacturer's advice should be followed regarding regular maintenance and servicing requirements, when, and where appropriate, spare cylinders of air, and/or oxygen should be kept.

At least monthly, a thorough examination of the equipment must be made by a competent person, who should sign a report containing at least the following particulars:

- the name of the occupier of premises where the equipment is stored
- the address of the premises
- in the case of breathing apparatus or reviving apparatus, the particulars of the type of apparatus and of the distinguishing number or mark, together with a description sufficient to identify the apparatus, and the name of the maker
- in the case of a safety harness, belt or rope, the distinguishing mark and a description sufficient to identify the safety harness, belt or rope
- the date of the examination and by whom it was carried out
- the condition of the apparatus, safety harness, belt or rope, and particulars of any defect found at the time of examination

- in the case of a compressed-oxygen apparatus, a compressed-air apparatus or a reviving apparatus, the pressure of oxygen or air, as the case may be, in the supply cylinder.

Such reports must be kept available for reference and inspection purposes and may be kept in the form of a register.

13.14 Buoyancy equipment

When there is a risk of drowning the Contractor shall provide lifebelts and ensure that personnel wear adequate buoyancy equipment or harness and safety lines, and ensure that rescue personnel are present when work is proceeding.

13.15 Atmospheric hazards

13.15.1 Dangerous atmospheres

Entry should not be made or permitted into a confined space unless the atmosphere has been tested by an authorized competent person. A safe result must be obtained before entry is attempted and arrangements made thereafter for the continuous monitoring whilst persons are in the confined space. Alternatively suitable breathing apparatus must be provided and used.

Vehicles or plant driven by internal combustion engines must be located so that exhaust fumes cannot be taken into a confined space.

The physiological effects of gases and vapors vary widely and symptoms including giddiness, headache, pulsing at the temples, nausea, breathlessness and irritation of the eyes should always be taken to indicate potentially dangerous conditions. Workmen should be instructed that if they experience any of these symptoms they should leave the area immediately and warn all others present, and with the least possible exertion, avoiding violent effort which increases the rate of breathing and hence the intake of poisonous substances. The symptoms listed above provide a warning, but they do no more than indicate that dangerous gases may be present and give no indication of the potential severity of the conditions.

13.15.2 Ventilation

Work can only take place in a confined space without breathing apparatus being used if the space has been adequately ventilated, tested for dangerous fumes and has a supply of air adequate for respiration.

If, for example, a vessel has sufficient top and bottom openings, then natural ventilation may be adequate, but in most cases a form of mechanical ventilation may be required. Ventilation is to be supplied by:

- Introducing compressed air
 - by compressed air cylinders - a suitable reducing valve must be used and the cylinder kept at the top of the opening (i.e. the cylinder must not be taken down the confined space);
 - by the use of a compressor and/or compressor and air mover - the compressor should be sited so that its air intake cannot take in contaminated air, e.g. diesel and petrol exhaust gases from passing vehicles.

The discharge from the compressor air reservoir should be fitted with an oil mist filter to clean the air being introduced into the confined space.

- Using a blower fan and trunking - the fan intake should be sited so that it cannot take in contaminated air.
- Using an exhaust fan or ejector and trunking (provided there is an adequate supply of fresh air to replace the air exhausted).
- In all cases the air-line or trunking should be introduced at, or extend to, the bottom of the confined space, to ensure removal of heavy gases or vapor and effective circulation of air.

The need still remains to carry out further testing of the confined space while work is in progress to ensure that the atmosphere remains safe.

13.16 Portable and transportable equipment

Portable equipment is that which can be carried by a person during normal use operation. All portable hand-tools and equipment should operate on 230 volt ac supply unless otherwise permitted.

If only ac equipment greater than 230 volt is available, special dispensation must be obtained, in writing, from the Owner. Dispensation will only be given if a monitored earth leakage unit is fitted.

Portable lighting shall operate at not more than 230 volt ac single-phase.

Transportable equipment is that which can be moved while remaining connected to the electrical supply, but which is not moved or carried in normal use. The Contractor shall inform the Owner of all transportable equipment to be used.

All electrical equipment must be in safe working condition and shall be regularly inspected and tested to the satisfaction of the Owner. Should equipment be found to be faulty it must be repaired or exchanged by the Contractor at his own expense.

Electrical welding equipment must be supplied with a flexible trailing cable of suitable conductor size to match the loading which should not exceed 63 A at 400 volts. Cable for use on three-phase supplies must be either 5 core or 4 core metallic screened cable, and for single-phase supply must be 4 core or 3 core metallic screened. Cables supplied to these specifications allow for the use of monitored earth leakage units. In all cases the electrode lead must consist of a suitable sized tough rubber-sheathed or PVC sheathed flexible copper conductor, both of which should be fire-resisting. In all cases the earth lead must extend to the equipment under weld. Structural steelwork may not be used as an earth return. All electrical welding equipment for use in tanks, vessels or where wet conditions prevail must be of the motor generator dc type and not ac transformer sets.

14 ENVIRONMENTAL CONSIDERATIONS

14.1 General

Disfigurement of the natural beauty and amenities of the area during construction must be avoided and special care shall be taken to prevent permanent damage. Needless adverse effects on the environment shall be avoided. All construction works having a considerable impact to the environment have to be agreed with the Owner or his Environmental Specialist. The Contractor shall take adequate steps to educate all members of his work force on the environmental laws and protection requirements of Israel and shall implement all necessary control measures in each area before work will be allowed to proceed.

Pipelines, power lines, telephone lines and other temporary services shall be located in a manner which will cause the least disturbance and disfigurement to the environment.

The groundwater shall be protected from direct or indirect spills of pollutants and waste water resulting from the Contractor's activities. The Contractor shall construct and operate the necessary collection facilities such as diversion mounds, ditches, drains, oil separation sumps, sedimentation ponds and the like, to prevent such contamination and to settle out suspended matter. Collected materials shall be disposed of in accordance with regulations in force in Israel. In the event of a spill, prompt action shall be taken to clear polluted or affected areas.

Dewatering, foundations or earthworks operations adjacent to, or encroaching on, a water body shall be conducted so as to prevent muddy water and eroded materials from entering them, and the necessary measures to satisfy this requirement may include the construction of intercepting ditches, bypass channels, barriers, settling ponds, or other approved measures.

Any unavoidable increase in turbidity in a water body arising from construction activities within the water body shall be kept to the lowest practicable level.

The water quality in all water bodies which could be impacted by any of the Contract activities shall be monitored by the regular collection and analysis of water samples as directed by the Owner.

14.2 Protection and Replanting of the Flora

The Contractor shall as far as practicable protect the flora within the work Site.

If areas are disturbed beyond the site boundaries the Contractor shall reinstate the ground and re-establish suitable vegetation as directed by the Owner. Such reestablishment shall not be left until the end of the Contract period but shall be carried out as soon as is practicable as determined by the Owner.

Reinstatement of temporary site establishment areas or working areas shall include replanting of trees of the type and in the manner and to the extent that trees existed on the areas before the Contractor was permitted access to the areas. Replanting of trees shall be to the approval of the Owner.

Special attention has to be given to the avocado plant in the main temporary works area. The Contractor shall uproot as many avocado trees as required to establish

all the premises at the main temporary works area, and will re-plant avocado trees as part of the rehabilitation process.

The Contractor shall ensure that his workforce does not trim, cut or fell any trees on Site or in the vicinity of the Site areas unless such trimming, cutting or felling is unavoidable for the execution of the works and has been approved by the Owner.

14.3 Protection of the Fauna

The Contractor and his employees shall protect all the fauna living within the Site area and shall ensure that hunting, shooting, egg-collecting or trapping does not occur. The Contractor shall inform his employees of any species of animal in the area which are known to be rare and/or endangered and that such species are to be protected.

14.4 Erosion Control and Storm-water

The Contractor shall take appropriate and active measures to prevent erosion resulting from his own works, operations and activities. All precautions shall be taken by the Contractor to prevent the erosion of soil from any lands used or occupied by the Contractor.

The run-off from any temporary or permanent road shall be channeled into natural water courses to optimize protection against erosion on land-holdings following the directions of the Owner.

Soil conservation measures on excavated surfaces or filled material which form part of the permanent works shall be undertaken in accordance with corresponding specifications and standards.

If, in the opinion of the Owner, the Contractor's operations in areas other than on excavated surfaces or filled material forming part of the permanent works cause an erosion hazard, the Contractor shall undertake such conservation measures in accordance with this Specification as directed by the Owner at the Contractor's own cost.

14.5 Atmospheric Pollution and Dust Control

The Contractor shall employ all such practicable methods and devices as are reasonably available to control and minimize atmospheric emissions or discharges of air contaminants.

If in the opinion of the Owner the exhaust gas emissions of any of the Contractor's Equipment or vehicles is excessive, due to poor engine adjustment, inefficient operating conditions, or any other rectifiable cause, the Owner may instruct that such Equipment or vehicles cease operation until adequate corrective repairs or adjustments are carried out, and the Contractor shall comply with such instruction immediately.

Burning of materials resulting from clearing of trees, bushes and other vegetation, and burning of combustible construction materials or rubbish, will only be permitted when atmospheric conditions are considered by the Owner to be favourable for burning.

The Contractor shall take appropriate measures to minimize the generation of dust as a result of his works, operations and activities, and to prevent dust which has originated from his operations from damaging crops, orchards, cultivated fields, dwellings, or causing nuisance to persons or animals. Such measures shall include regular watering of access roads and working areas and use of dust extractors on drilling equipment or wet drilling.

When instructed by the Owner the Contractor shall monitor dust levels and control the generation of dust to below the levels specified below.

The cost of all measures required to comply with the requirements of this clause shall be deemed to be included in the Contractor's proposal.

14.6 Restoration of the Site

On completion of construction works in any part of the site all temporary buildings and structures, including all footings, slabs, etc. shall be completely removed, and all disturbed areas shall be restored to a similar condition as that of adjacent areas, including the replanting of trees where appropriate, all in accordance with the specification and as directed by the Owner.

The scheduling of all clean-up operations at the end of the works and the restoration of all impacted areas, including but not limited to the quarries and other borrow areas, site establishment areas, accommodation areas, etc. and shall be included and shown in the construction schedule.

14.7 Geological, Paleontological and Archaeological Remains

It is possible that unknown geological, paleontological and archaeological remains exist on the site. The Contractor shall watch out for such remains and, if such are found, he shall avoid interfering with or damaging the remains and shall advise the Owner immediately and await further instructions.