

**PSPP MANARA  
156 MW**

ISRAEL

**PARTICULAR****CIVIL SPECIFICATIONS****TS-05 – Surface Excavation**

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Approved:	Binder	xx.xx.2019

Doc.No.: **MAN156/TD/CS/01/005**App. Code: **A**Rev.: **2.01**

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**REVISION NUMBER:**

1.0 First edition

~~1.1 220MW in header replaced with 156MW and comments incorporated~~2.0 Second edition: April 20192.1 Third edition: May 2019

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 SCOPE OF WORK

This Section covers all surface excavation work to be performed under this Contract, which shall consist of removing all existing material of whatever nature to the lines and grades shown on the Drawings or as otherwise directed by the Owner. This work shall include drilling and blasting, loading, hauling and disposal of materials in designated spoil or stockpile areas, according to these Specifications.

The Contractor shall also be responsible for excavation which is not specifically required for the construction of Permanent Works, but incidental to the installation of temporary facilities such as site roads, office buildings, campsite, construction plants, etc.

Slope protection and stabilization measures, which may be needed in conjunction with surface excavation work are covered in other Sections of these Specifications.

## 2 SUBMITTALS

Prior to the commencement of any surface excavation, the Contractor shall submit to the Owner details of the proposed excavation methods and sequences, including necessary site drainage and safety precautions.

Where the excavation for important permanent structures such as foundations for the reservoirs and reservoir embankments, access roads and portals, switchyard, control and auxiliary buildings, etc., involves blasting, the data shall include the following:

- a) Location and area of blast
- b) Diameter, spacing, depth, pattern and orientation of blast holes
- c) Type, strength, amount, column load and distribution of explosives to be used per hole, per delay and per blast
- d) The type of detonators, powder factor, and sequence and pattern of delays to be used per blast
- e) Description and purpose of any special method to be adopted by the Contractor

The plans shall be in conformity with detailed requirements for excavation sequencing, for blasting and for precautions in proximity to concrete and grouting operations.

Prior to dumping or stockpiling any material, the Contractor shall submit the layout of spoil or stockpile areas to the Owner, which will be within the areas designated on the Drawings. All pertinent data of working methods and provisions for the security, stability and temporary and permanent drainage of the areas shall be included. Details of volumes, material types, heights and grades shall be provided.

### 3 LINES AND GRADES

The Contractor shall be responsible for setting-out all the structures and slopes as shown on the Drawings, in accordance with TS\_03 "Surveying and Setting Out".

The final excavation grades shall in general be a rock of specified quality. However, where the final excavation grades are defined by line and grade, the Contractor shall take every precaution, and use the most appropriate method of excavation, to avoid the loosening of material or the breaking of rock beyond the lines and grades shown on the Drawings.

The bottoms of all excavations shall be trimmed to line and grade ~~to the satisfaction of the Owner~~ as designed by the Contractor. If necessary the final 20 cm of any loose geological formation in excavations where concrete is to be placed, shall be excavated by hand to avoid disturbance of the bottom.

If, for any reason, excavation is carried out beyond the lines and grades shown on the Drawings, the Contractor shall remove the excess material and take the necessary measures to restore the required lines and grades with approved backfill or concrete.

Should the Contractor wish to excavate beyond the limits given on the Drawings for his own convenience, he may do so only with the prior agreement of the Owner.

## **4 SLOPES, SLIDES, GEOLOGICAL OVERBREAK AND UNSUITABLE FOUNDATIONS**

If geological conditions during the performance of the work do not permit excavation of slopes as shown on the Drawings, or where the material is unsuited to form a firm foundation for the structures, the Contractor will modify the drawings accordingly or issue direct order to change the slopes and grades.

If overbreak, slides or rock falls occur, which are due to improper working methods or negligence by the Contractor, and the effective excavated surfaces are beyond the excavation lines shown on the Drawings, the Contractor shall remove all excessive material and place suitable backfill in the excavated voids.

If, in the Contractor's opinion the slopes as shown on the Drawings are unsafe or otherwise objectionable, and in his opinion should be changed, he shall obtain the agreement of the Owner prior to starting the work on such modified excavation.

Excavation beyond the lines and grades shown on the Drawings is defined as overbreak.

Materials used in refilling the voids created by overbreak, or in additional excavation, shall be compacted whenever it is practicable and desirable with rollers specified for use on the dam embankment. In such case the foundations shall be prepared, and material placed, moistened and compacted as stipulated in TS-11 "Embankment Construction and Backfill, Instrumentation".

## 5 EXECUTION

### 5.1 General

The Contractor shall conduct his operations so as to produce the required lines and grades.

The surface excavation shall be performed by any approved method using any excavating and hauling equipment suitable for the work in accordance with the submitted detailed plans and time schedule, or approved modifications thereof.

The work areas shall be properly drained in accordance with the provisions shown in TS-04 "Care of Water during Construction". When underwater excavation is to be performed, suitable equipment shall be used.

The Contractor shall carry out periodic cleaning to ensure that no hazardous accumulation of loose material occur on the slopes or on any berm or ledges forming part of the excavation profile.

Excavation for dam and structure foundations shall be performed in reasonably dry conditions. Final surfaces shall be protected against damage by erosion and travel of the construction equipment. Any damage caused shall be repaired by the Contractor.

Rock surfaces at sensitive locations, at structures and tunnel portals, shall be carefully excavated and preserved during construction. Line-drilling or smooth blasting techniques shall be used as appropriate. Rock supports shall be installed where indicated on the Drawings, or as agreed to suit the actual geologic conditions encountered.

The Contractor shall exercise particular care when excavating in the vicinity of existing structures or those under construction. He shall be liable for any damage to structures or equipment caused by his operations. Acceleration due to the blasting shall be monitored as specified hereinafter.

The Contractor shall protect the subsoil and particularly the ground water from contamination by fuel or oil from his equipment.

### 5.2 Clearing and Grubbing

Clearing means the removal, transport and disposal of all trees, brush, stumps, fences, existing structures, debris and other obstructions in the areas to be occupied by Permanent Works, surfaces of borrow and quarry areas, spoil and stock-pile areas, and where interfering with the prosecution or functioning of the work.

No trees shall be cut outside of the clearing limits without prior agreement by the Owner. All trees designated by the Owner to be left intact shall be protected from damage by the Contractor's operations.

The clearing limits, with exception of reservoir area clearing, shall extend (5 m) beyond the limits of excavation, toes of embankments and spoil tips except where otherwise indicated on the Drawings or otherwise directed. But the cleaning works is limited to the given land boundary shown in the drawings.

Grubbing means the removal, transport and disposal of all roots, buried logs, foundations of structures (except concrete or masonry in mortar) and other materials foreign to the natural topsoil in the areas to be occupied by Permanent Works and surfaces of borrow and quarry areas.

Clearing and grubbing work shall be performed either manually or with mechanical equipment. The Contractor shall make every reasonable effort to salvage such material which may be put to beneficial use.

### 5.3 **Stripping and Loose Excavation**

Stripping consists of removing all rubbish, humus, vegetable material and all or part of the organic topsoil in the areas and to the depth as indicated on the Drawings or as otherwise directed.

Loose Excavation means general excavation of material such as organic topsoil, clay, silt, sand, gravel, and boulders of up to 0.75 m<sup>3</sup> in volume and soft or disintegrated rock, which can be removed by common earth moving equipment without ripping or blasting.

Stripping and loose excavation shall be accomplished by proper excavation and hauling equipment suitable for the work which allows for an efficient work progress adopted to the soil conditions encountered.

When the bottom of excavation as indicated on the Drawings is not rock and the natural foundation material is disturbed or loosened, for any reason, the Contractor shall improve it by compaction or replace it with approved fill and compact as ~~directed by the Owner~~ designed by the Contractor and approved by the Owner.

### 5.4 **Rock Excavation by Ripping**

Ripable material is defined as rock which can be loosened or broken down by a bulldozer capable of developing 220 kW (300 PS) of continuous power equipped with a single shank rear-mounted, heavy-duty rock ripper, operating in low gear.

Material which in the opinion of the Contractor should be removed by ripping shall be exposed, and the Owner notified before proceeding further. The top of the rock surface shall be surveyed by the Contractor. The survey and classification is subject to approval of the Owner.

Contractor's failure to follow the procedure outlined above will forfeit his right to claim any classification other than that allowed by the Owner, who, in such case, will classify the excavated quantities.

Ripping shall be performed in such manner that the ripper tooth does not damage the material laying beyond the final excavation lines. Any material remaining to the

final excavation lines shall be removed by wedging, barring, broaching, or other suitable methods approved by the Owner.

## **5.5 Rock Excavation by Blasting**

Rock excavation by blasting includes all solid rock in place which cannot be removed until loosened by blasting, or by using metal wedges and sledgehammers, or compressed air drilling. Removal of all boulders or detached pieces of solid rock larger than 0.75 m<sup>3</sup> in volume, as well as any existing structural foundation made of concrete or masonry placed in mortar which cannot be destroyed by ripping will also be considered under this classification.

Drilling and blasting shall be done in such a manner as to ensure that the rock will break along the desired lines and grades. Rock shattered by blasting operations outside the established limits of excavation shall be removed and replaced by concrete if necessary. Rock faces and slopes shall be scaled or cleaned of loose or overhanging rock immediately after excavation. Rock surfaces, both temporary and permanent, shall be regularly inspected by the Contractor and rectified whenever necessary.

The diameter and the spacing of the blast holes shall be constantly adapted to the actual conditions at the Site. The Contractor shall develop the blasting techniques as the work progresses to obtain the best possible excavation surface after blasting.

Rock excavation close to the final excavated surfaces shall be performed using controlled blasting methods such as "presplitting", "cushion blasting", "smooth blasting" as defined in TS-06 "Underground Excavation". Line-drilling and broaching shall be used to limit the overbreak and damage of surrounding rock.

The excavation shall be made to sufficient depths to secure foundations on sound rock free from weathered materials or other objectionable defects. The exploratory investigations of the foundations are not sufficiently complete to disclose all seams, defects, and other irregularities that may exist in the foundation rock. The lines of excavation shown on the Drawings shall therefore not be interpreted as indicating the final or actual lines of excavation or that no defects exist. The excavations at all elevations shall be so shaped as to produce as uniform and regular a profile as is practicable to obtain using excavation methods described herein.

The final excavated surfaces shall have no abrupt changes in slope and sharp projections greater than 50 cm. Projections in excess of 50 cm shall be treated where necessary by supplementary excavation, to produce the desired surface of contact between concrete and rock.

Whenever further blasting may injure the rock upon or against which concrete is to be placed, or is otherwise undesirable, the use of explosives shall be limited to light charges or discontinued, and the excavation shall be completed by wedging, barring, line-drilling or other suitable methods in agreement with the Owner.

Should the presence of rock make excavation for foundation of structures unnecessary to the extent shown on the Drawings, the Contractor shall consult the

Owner before proceeding with such work. The Owner will issue a direct order in writing whether to proceed with the work as shown or to which extend the work shall be modified.

When the excavation has been completed to the approximate grade, as shown on the Drawings or otherwise established, the surface shall be cleaned off by barring, wedging, picking or other approved methods, and with an air and/or water jet under high pressure for purpose of inspection. If the foundation is found to be not satisfactory supplementary excavation shall be made as directed, and the surface again cleaned for inspection. This procedure shall be repeated until a satisfactory foundation is obtained. Just prior to placing the concrete, a final cleanup of the rock surface shall be made. All loose, shattered, or disintegrated material shall be removed, and the final surface cleaned with jets of air and/or water under high pressure.

As the excavation work for the reservoirs is progressing, the Contractor shall prepare topographic surveys plotted on a map to an appropriate scale depicting contours corresponding to the theoretical excavation lines shown on the Drawings. In addition, the Contractor shall survey and plot profiles of the excavated surface.

## 5.6 **Line-drilling**

Line-drilling shall be used where presplitting may cause excessive damage to the surrounding rock or where there are structures adjacent to the excavation.

Line-drilling is defined as a single row of unloaded holes drilled along the neat excavation line, spaced no more than two times the hole diameter on centers. These will form a surface of weakness to which the primary blast can break. Light blasting with well-distributed charges fired after the main excavation is removed may be permitted in the holes. If the blasting may injure the rock, the use of explosives shall be discontinued and the excavation shall be completed by broaching, wedging, or barring.

## 5.7 **Dental Excavation**

Dental excavation shall include the removal of unsuitable material from shear zones, clay seams, pockets, joints, caverns, or from spaces between boulders beyond the lines of excavation shown on the Drawings or established in the field, which are too small to be excavated by common earth moving equipment.

Dental excavation, depending on its extent, will require the use of a backhoe, hand tools, or other small excavating equipment, as well as the use of a high velocity air-water jet. The methods employed shall be such as to avoid fracturing of the rock adjacent to the material being removed.

Dental excavation shall be performed where directed. The extent to which such material shall be removed, including the depth, direction, and dimensions of the work, shall be determined in agreement with the [Owner/Designer and approved by the Owner](#). In general, however, excavation into cracks or seams shall be to the depth that is a minimum of three times the seam width, and such excavation shall be backfilled with concrete or shotcrete. No blasting will be permitted.

## **5.8 Minor Excavation Work**

Minor excavation work consists of excavation, in all materials, of trenches less than, or equal to 2 m of width and in small or restricted areas, which will be carried out manually or using small equipment.

The Contractor shall excavate to the limits, lines and grades shown on the Drawings.

Bracing, shoring or other methods of supporting the excavation shall be carried out as necessary.

Mechanical excavation of trenches, except those in rock, shall be stopped not less than 10 cm above final bottom level. The remainder of the excavation shall be removed, shaped, and graded manually.

In rock, the trenches shall be excavated to such depth than space for placing of compacted sand bedding at least 10 cm thick shall be provided between the rock and the underside of any equipment or pipe.

## 6 EXCAVATED MATERIALS

All suitable materials from the excavations shall be utilized to the fullest extent practicable as construction materials in Permanent Works.

The Contractor's blasting and excavating techniques shall be such, that as much as practicable, construction materials will be yielded. Where possible, suitable materials shall be excavated separately from materials to be wasted.

Whenever possible, the suitable materials shall be transported directly from the excavation to the designated final locations.

If the immediate placement in the final location is not possible e.g. rock fill of upper and lower reservoirs, the materials shall be stockpiled. If the moisture content of excavated materials which would be suitable for embankments or backfills is too high after excavation, such material shall be drained and dried in the stockpile until the moisture content is sufficiently reduced to allow for placement.

The Contractor shall remove any cobbles, boulders or rock fragments found in otherwise approved materials which are greater than permitted for specific embankment zones and place them in other zones or dispose of them appropriately.

## 7 DISPOSAL OF EXCAVATED MATERIALS

Excavated materials which are not suitable for, or are in excess of the construction requirements shall be disposed in areas defined by the Owner, or in areas designed as such in the course of the work.

The spoil tips shall be located where they will not interfere with the natural flow of streams or rivers, with construction operations in the borrow and quarry areas, with reservoir operation, with flow of water to outlet works, or with accessibility to the Site. Where required, the Contractor shall permanently divert (stage wise if necessary) the present courses of the streams.

No rock material may be dumped into rivers or creeks.

The Contractor shall shape and trim the spoil tips and stockpiles to the lines and grades as directed. Adequate diversion of water courses in such areas and proper drainage shall be provided.

The Contractor shall be liable for any damage to Temporary or Permanent Works or to the property of third parties caused by poor drainage in the spoil or stockpile areas.

## 8 PREPARATION AND PROTECTION OF EXCAVATION SURFACES

Excavation surfaces against or upon which concrete, embankment fill, or backfill will be placed shall be prepared and protected as specified herein and in combination with specifications contained in the pertinent Sections of these Specifications or as shown on the Drawings.

If, during excavation work, material beyond the limits of excavation shown on the Drawings is loosened or disturbed, the Contractor shall re-compact the loosened material or remove it altogether and replace it with other compacted fill as directed.

If, during excavation in rock for concrete structures or linings, the rock beyond the limits of excavation shown on the Drawings becomes broken or shattered, the Contractor shall remove all loose material and replace it with concrete or shotcrete as directed.

Foundation excavation shall be kept well drained and free of standing water. The Contractor shall provide all necessary drains, ditches and sumps, and use pumps when necessary, in order to ensure that foundation surfaces are not harmed by water. When foundations are thus affected, the affected material shall be removed and replaced with approved backfill.

Sprayed concrete shall be applied to finished excavation surfaces where it is deemed necessary to prevent air slaking, erosion or other deterioration of the surface. The protective coating shall be applied to excavated surfaces either with or without steel wire mesh reinforcement in accordance with the provision TS-10 "Sprayed Concrete".

## 9 PROTECTION OF EXISTING STRUCTURES DURING BLASTING

The Contractor shall adequately protect existing structures from the effects of blasting, both from impact with rock or debris and from excessive shock. Structures at risk shall be inspected both before and after blasting, and shall be monitored during the blasting operations by appropriate means.

In any case, the particle velocities shall be limited to 15 cm per second at new concrete structures and grout which have attained design concrete strength; 10 to 15 cm per second at structures 7 to 28 days old; and 0 to 4 cm per second for structures 0 to 7 days old, proportionally.

The above limits shall be approached gradually with caution using a commercially available velocity seismograph and with immediate inspection of structure for evidence of stress after each blast operation.

In the event of stress evidence, the limiting particle velocity shall be reduced to that of the blast prior to the one causing stress evidence and maintained at that level with continued velocity and stress monitoring as described above. If the structure cannot be inspected, particle velocity shall be limited to 5 cm per second.