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Annex. H
The Technical Volume

Storage Tanks Construction Project

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TECHNICAL VOLUME DOCUMENTATION CONTENTS

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- Schedule 2 – Quality Assurance & Quality Control
- Schedule 3 – BOQ & Prices Tables
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Schedule 1 – EPC Contractor's Scope of Work and Services

Project 2462
TENDER DOCUMENTATION

For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

SCHEDULE 1

EPC SCOPE OF WORK & SERVICES

	15/5/22	Tender Revision			C.A. E.I.L
P2	29/8/19	For approval after review	V.A	M.SH	
P1	26/3/19	For approval	V.A	M.SH	
P0	31/1/19	For comments	V.A	M.SH	
Rev.	**Date**	**Description**	**By**	**Checked**	**Client Approved**

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1. PROJECT DESCRIPTION

The objects of the work are 6 (six) vertical petroleum products storage tanks with operational volume of 50,000 m3 each with a total capacity of 300,000 m3. Tank diameters will be 54m.

The tanks will be built in an area adjacent to the existing PEI terminal installations at the Eshel site. A preliminary layout is attached for information.

All civil works will be designed and executed by others including earth moving and site preparation works, drainage, landscaping, access roads, removal of existing building(s), foundations, bund walls and any other required civil works.

Each of the six tanks will be provided with a fixed foam fire protection system to the floating roofs and a fixed cooling water spray system to the tank shells for exposure protection.

Both the foam and exposure protection cooling systems shall be designed and installed in accordance with the applicable codes and standards listed in Annex 2 of this RFP.

The foam system for fire protection will consist of forty eight (8 for each tank = 48 total)) fixed over the top low expansion foam generators and pourer unit for fire protection of external floating roof storage tanks.

The positioning of the spray nozzles and foam generators and rates of discharge shall be in accordance with NFPA codes of practice and requirements outlined in ANNEX 1 - Particular project specifications.

The Contractor that will be awarded the execution of the Project will be responsible for the detailed design, procurement of all required materials and labor, construction, testing and commissioning of the storage tanks in compliance with all the requirements of the tender and with the rules, regulations and laws applying to this type of installation.

The Basic Design and quantitative evaluation provided with this tender document will serve only for the purpose of the Contractor selection. The basis for the tanks construction will be final detailed design by Contractor that will be applicable after approval by the Employer.

The supplied installation will be fully compliant with all applicable standards as outlined in this RFP. Any deviation or selection of options allowed by the standards will need to be explicitly approved by the Employer.

The Contractor submittals during the bid stage and along the execution stage will comply with API 650 Annex W and with the requirements of this RFP.

2. SCOPE OF SERVICES

2.1. SITE ORGANIZATION

From the Date of Contract, the Contractor must establish a fully functional and adequately equipped office on Site ("Site Office") to enable his Project team to perform

all the Services described in this Schedule and in the Tender Documents in general for the execution of the Project.

This must include the following, as a minimum:

- Establishing and equipping of a Project specific office on site for the duration of the engineering phase of the Project;
- Provide drawing office CAD stations, standard software and plotters, project management software for control and tracking of project activities.
- Provide PC's , software and printers for all Home Office personnel;
- Establish e-mail connections for all members of the Contractor's Personnel;
- Establish communication links to the Contractor's offices;
- Equip the Site Office with all necessary equipment such as furniture, conference rooms, photocopiers, binding equipment etc;
- Provide adequate ventilation and air conditioning (cooling and heating).
- Provide first aid facilities
- Provide space, furniture and communication systems for the Employer's Personnel as agreed.

The Site Office and its staff will be the coordinator for all communications between Employer, Contractor headquarters and its other branches, Vendors and Subcontractors.

A suitable area will be made available to the Contractor for his camp, the location of which will be indicated to tenderers at the site inspection. The Contractor shall provide a suitable fence around his camp in order to define its boundaries clearly.

The contractor will plan for adequate space related to offices, materials storage and laydown areas, fencing and security measures, parking and access ways for the smooth operation of his works and will be responsible to obtain any related official authorizations and permits.

Housing of employees on the site of the Works or in the camp area will not be permitted. The Contractor shall make his own arrangement for the housing of his employees.

The Contractor will be responsible for all tie-downs and connection to utilities (telephone, internet, electricity, potable and construction water, wastes management and disposal, chemical toilets etc...).

Tenderers shall allow for all costs associated with their camp including fencing, security, maintenance etc.

Where possible and agreed at time of contract some such facilities could be provided by connection to Employer infrastructure.

2.2. PROJECT ENGINEERING SERVICES

The Contractor will perform a full detail design including all calculations, specifications, documents and drawings for the complete execution of the construction of 6 fully operational storage tanks within the framework and the requirements defined by this RFP and all applicable standards, the leading one being API 650 for Welded Oil Storage Tanks.

The Contractor must provide the following Engineering services, to be as considered as the "minimum required" for the complete Detail Engineering, Procurement, Construction, Management, Quality control, Pre-commissioning, Commissioning, Start-up to Final Completion:

- Review and validate the last versions of all of the design documents delivered by the Employer and advise of any changes necessary. It is noted that the design information and quantitative evaluation provided with this tender document will serve only for the purpose of the Contractor selection. The basis for the tanks construction will be final detailed design by Contractor which will be applicable after approval by the Employer.
- Review, validate and incorporate the findings contained in the Basic Design Review performed by PEI for this Project, provided by the Employer;
- Develop the full and complete Project detail Engineering as required, based on the above mentioned documents as defined in Scope of work;
- Issue all documents and drawings related to the detail design using PEI format (instructions will be sent to the tender winner), in English and as per regulations for document accessibility (as per Israeli governmental directive 35, year 2013).
- Coordinate all Engineering design concepts with Employer and his contractors, including the decision making procedure.
- Consider, incorporate and follow all necessary Israeli regulations and Design Practices.
- Consider, incorporate third party designs and work with specialized Consultants and with other disciplines not in the scope of the Contractor, whenever required.
- Perform risk analysis assessments, Operability and Maintainability studies on equipment, systems and services.
- Develop specifications for the supply, construction and erection of the tanks, any other equipment, the systems and the services.
- Provide timely issuance of drawings.
- Provide secretarial services as required (eventually bilingual).
- Perform project design using design software to speed up and ease detail drawings preparation, which could eventually be used later for operations and maintenance.
- Provide planning, scheduling monitoring and reporting of engineering, procurement, construction, commissioning services within the approved Project Schedule;
- Perform coordination and control of the construction Contractors' and Supplier documents, including receipt and issuing of documents, filing systems and document control;
- Prepare, check and issue of all computations, calculations and design sketches for construction – all in accordance to relevant standards and to Israeli regulations;
- Provide assistance to the Employer for the liaison with Authorities as necessary for approvals and permits;
- Provide Engineering services and documentation as required for the Employer to obtain Permits, Licenses and Approvals from Authorities, obtain construction permits, obtain permits for start-up and operation of the installations. In case that

aforesaid documentation is incomplete or is not in accordance with Israeli Law the Contractor is obliged to provide the Employer with adequate documentation;

- Prepare all documentation required for subcontract and purchasing tenders for procurement of equipment, materials and services;
- Expedite procurement and equipment fabrication and delivery;
- Report progress on the status and issue of deliverables as required by the agreed reporting cycles;
- Report the results of the QA/QC programs including the Quality Assurance Plan.
- Attendance at meetings;
- Issue "As Built" drawings for complete technical documentation and provide in the end of project as built MTO lists
- Prepare operating and Maintenance manuals for all equipment and systems for the Employer's use in English and/or Hebrew language, to Employer's satisfaction;
- Prepare technical recommendations for spare parts for 3 years operation and maintenance;
- Prepare specific chemicals requirements, consumables, parts/materials for commissioning and 6 months operations.
- Perform all required coordination with Employer's engineering consultants.
- Perform all measurements for the calibration of the tanks in accordance with agreed procedures.
- Perform all verifications and measurements including surveyor reports related to the settlement of the tanks in accordance with the API standards.
- Incorporate and follow systems handover process, including documentation, certification and tests reports;
- Perform, supervise, manage and assist in commissioning and start-up activities;

2.3. PROJECT CONSTRUCTION EXECUTION

The Contractor shall be responsible for the management and control of all phases of the Works and that of its Subcontractors and suppliers.

The Contractor shall execute the Works in accordance with the project schedule, project procedures and project organization detailed within the Contractor's Tender and all technical specifications.

The Contractor is required to submit their proposed Construction Coordination Procedure for the project, for review and approval by the Employer. The Contractor will be required to accommodate the Employer's reasonable requirements for coordination and project administration. The procedure is to be agreed as part of the Contract.

The project schedule shall be broken down into the following major elements, showing the Key Project Milestones.

- Engineering Design
- Interfaces
- Procurement
- Manufacture and Fabrication

- Construction and Erection
- Testing and Pre-Commissioning
- Commissioning
- Reliability Testing, Performance Testing and Take Over.

The Employer will establish a management team to review monitor and audit the Contractors activities.

The Employer shall review, audit and comment all project documents in accordance with the agreed Document Schedule.

The Employer shall conduct monthly progress meetings and site weekly meetings at which the Contractor shall be properly represented.

2.4. PROJECT MANAGEMENT

The Contractor's program must be based on the anticipated project completion time stated in the RFP. This time frame is a guideline and the Contractor is encouraged to offer an accelerated program where practical. Penalties may be imposed if these Interim Milestone dates are not achieved. Refer to Time Schedule Section of the RFP.

The Contractor must draw up his own program that complies with the project phasing requirements as will be dictated by the construction sequence and also with all requirements of this project and which suits his own resources.

2.4.1. Sequence of the Works

The sequence of the Works will be determined by the logical order of activities and the specified time for completion above as well as by the coordination with other disciplines being executed by other contractors under responsibility of the Employer.

It is important to note that:

- The bund walls, ringbeam and tank foundation will be prepared by the civil contractor with whom the company signed the contact separately.
- Bund floor and bund walls will be completed by the civil contractor prior to the erection of the tank. It is thus required to account for the correct methods and procedures to work under these conditions.
- All piping (process connections, drains, firefighting system including foam system) that is not supported on the tank shell will be done by others.
- Electrical, instrumentation and control disciplines will be fully covered by others under responsivity of the Employer, including all supplies and works.

A minimum of seven (7) days advance notice from the contractor is required to switch between work areas.

A contingency plan must exist to deal with interruptions of shifts by inclement weather, plant breakdowns or emergency closures of the work areas.

2.4.2. Methods and Procedures

The methods and procedures that must be complied with will include but are not limited to:

- Methods and Procedures in the Standards Specifications
- Civil Works Methods and Procedures (under civil design and construction by others)
- Occupational Health and Safety Specifications.
- Environmental Work Instructions
- Method of coordination with other contractors on site
- QA/QC procedures complying with the Employer's requirements and with the stipulations in Schedule 2 – Quality Assurance & Quality Control.

2.4.3. Construction Method Statement

Within 14 days of the Commencement Date the Contractor shall submit a detailed Construction Method Statement to the Engineer for approval by the Employer.

The Method Statement shall include but not limited to:

- Welding process (automated, manual, heat treatment, details of the procedure and the verification)
- Tank bottom construction method
- Tank wall construction method (use of jacks or cranes, positioning of tank sections for welding...)
- Tank roof construction method (prefabricated parts, other details)
- Whether the tanks will be constructed sequentially or in parallel
- All other relevant details demonstrating the ability of contractor to perform the construction works efficiently, within schedule and in accordance with all applicable quality standards.
- Measures and equipment that will be used on site to limit the ingress of water into the excavations and to remove rain water from the excavations.
- Measures to protect services (above and below surface) during construction.
- Procedures to ensure the whole work area is safe before removing staff or handing over of the site at the end of the each work shift.
- A watchman to remain on site of construction with telephone contact to the contract manager in case of emergency.
- Contractor to take into account that the work shall be completed as soon as possible and make sure that the work will be performed continuously, providing that no labor related rules are violated.

The cost of complying with the approved method statement is deemed to be covered by the tendered rates.

2.5. PROJECT CONTROL PROGRAM AND REPORTING

2.5.1. Planning Systems

The Contractor shall:

- Operate a tiered integrated planning system. This system shall be accessible from the Contractor's Site Office to the Employer's Office.
- Provide planning data to the Employer in a PDF and DWG format compatible with the in-house computer system of the Employer.
- Identify the planning system to be used.

2.5.2. Planning Network

The Works shall be monitored and controlled by use of an integrated and tiered planning system whereby all activities can be uniquely identified and directly related to activities at all other levels.

There shall be three levels of planning, as follows:

Level One - Overall Program: This document shall define the top levels of the network which relate to the contract and detail payment milestones, terminal works and all key dates and activities.

Level Two - Contract Control: This document shall be the main project management network for contract control and shall result from the integration of the lower level detailed networks. The Level Two program shall be a more detailed network from which project reports shall be produced and on which critical path and risk analyses shall be performed.

Level Three - Individual Detailed Networks: This document shall contain the Contractors detailed level of programming with a record for each activity. Each major subcontractor shall maintain and update its own section and pass all update information to the Contractor for incorporation into the Overall Program.

In order to ensure a correct gauge of progress during the execution of the works, the duration of each individual activity at planning Level Three should not typically exceed one reporting period. In addition, activities at this planning level should be weighted by consideration of the planned resource required to undertake the individual activity. Once agreed, the weightings applied to each activity at planning Level Three shall not be varied during the execution of the Works unless otherwise agreed by the Employer.

2.5.3. Progress Measurement

The Contractor shall develop systems and procedures for the measurement of progress against the Original Program. The Contractor shall maintain these systems and procedures for the duration of the Project.

The Contractor shall measure its own progress in accordance with, and at the levels of detailed as defined herein. The Employer reserves the right to participate in this process.

Progress achieved shall be measured concurrently at all Work locations. Unless otherwise stipulated in the Contract, the measurement cut-off date will be the last Friday of each calendar month.

Progress measurement at Site shall be undertaken on a weekly basis.

Prior to the formal issue of progress statistics to the Employer, the Contractor shall establish within its own organization the accuracy of the measure.

2.5.4. Tracking of Variations to Contract

In the event that the Employer agrees a variation to the Contract Scope of Work, activities associated with the variation shall be uniquely identified in the Planning Network. However, these activities shall be measured for progress independently of the original Contract Scope of Work.

2.5.5. Issues of Programs

The Contractor shall issue the complete Level Three Program and project control versions of the Levels One and Two Program no later than 90 (ninety) days after EPC Notice to Proceed.

The Contractor shall issue other Program in accordance with the agreed Contract Documentation Schedule.

2.5.6. Progress Reporting

The Contractor shall submit a detailed progress report to the Employer for each month up to the cut-off date.

The Monthly Progress Report shall be submitted (in electronic mode) to the Employer not later than five Business Days after the start of the following month (to satisfy the Employer's requirements).

The Monthly Progress Report shall address each of the following project phases:

- Engineering.
- Procurement.
- Expediting.
- Inspection.
- External Works
- Manufacturing and Fabrication.
- Construction and Erection.
- Testing and Pre-commissioning.
- Commissioning.
- Reliability Testing, Performance Testing and Take-Over.
- Training.

The Monthly Report shall contain, but not be limited to, the following:

- A list of activities more than two weeks late.

- Explanations of late activities that are having, or are likely to have, impact on the Schedule.
- Details of measures proposed to return late activities to schedule.
- Outstanding interface data and measures proposed to expedite the issue of critical interface data.
- Confirmation of the achievement of near-term milestones.

Additionally, the Monthly Report shall contain, but not be limited to, the following:

- An Executive Summary.
- Details of problem areas (and details of measures being taken to resolve problems).
- Copies of any safety incident reports during the reporting period and a statement of corrective actions planned or subsequently implemented.
- A statement of the number of Site personnel engaged in the Works during the reporting period and, where relevant, details of erection equipment in use or held in readiness.
- The Documentation Index, indicating the current status of documentation.
- The Purchasing Schedule, indicating the current status of procurement activities.
- Copies of Inspection and Test Reports that identify deviations from the standards required by the Contract and a statement of corrective actions.
- A schedule of all other inspections and tests performed.
- Copies of Quality Assurance audit reports that identify the need for corrective actions and evidence of the implementation of corrective actions.
- Copies of Safety audit reports undertaken during the reporting period.
- Color photographs showing the current progress of construction.
- The Original Program, updated to indicate the progress achieved for each activity.
- Updated copies of Histograms and "S"-curves identifying progress in the execution of the Works.
- A schedule of Variations.
- A 'Look Ahead' for the next month, i.e. description of work intended to be performed, etc.

2.5.7. Progress Meetings

A Monthly Progress Meeting shall be held at the Contractor's premises on site during the engineering and procurement phase of the Works. The Monthly Progress Meetings shall transfer to site once construction activities commence.

The Monthly Progress Meetings shall be supplemented by weekly site meetings held to review progress measurements of construction activities.

Additional meetings shall be convened as necessary in order to resolve particular issues arising during the execution of the Contract.

2.6. QUALITY MANAGEMENT

The project quality system will function per quality plan submitted by Contractor and approved by Employer prior to commencement of the works in compliance with the API

standard and Schedule 2 of this RFP and will include at least the performance of the following key activities:

- Quality Audits
- Program, Inspection and Material Certificate Requirements
- Site Quality Procedures
- Perform Positive Material Identification
- Reporting of the results of the QA/QC programs, including the Quality Assurance Plan
- Perform on-site QA/QC programs
- Monitor and report third party Vendor Proactive Quality/Certification Processes
- Monitor and report Subcontractor Proactive Quality/Certification Processes
- Develop, agree with Employer, follow and monitor quality plan

The Contractor will appoint suitably experienced personnel for the management of Quality Assurance (QA) and Quality Control (QC) tasks.

The above mentioned activities and all tasks related to QA and QC performance will be performed under the supervision of the Employer's QA and QC appointees.

2.7. PROCUREMENT

2.7.1. Procurement activities and procedures

The Contractor will be responsible for management of all procurement activities related to equipment, material and services required for the complete and timely execution of the Project.

Verification procedures for construction materials including FAT and SAT procedures will closely adhere to all the requirements of the respective standards (API, ASME or other) and as directed by the Particular Project Specifications in this tender.

Prior to delivery at supplier's premises and/or upon delivery of goods to the site Employer representative retains the right to perform at its sole discretion a visual control of all delivered packages.

Upon delivery of goods to the site Contractor's representative will perform a quality and quantity control of delivered Goods all in accordance with technical requisition and requirements stipulated in the respective Purchase Order/Subcontract in accordance with the approved design. Employer will not be responsible and liable for reimbursement or replacement of any lack of goods (materials or equipment) and/or for remedies in case the goods become defective or faulty due to improper storage conditions during shipping or on site.

Warehouse and storage of all goods received at site will be part of the Contractor's responsibilities. The Contractor will have to ascertain the availability of adequate space for indoor and outdoor storage. The Contractor shall be responsible for storage including handling, handing over of received Equipment and Material to Subcontractors for installation and handling, and warehouse record keeping.

Quality assurance of construction and workmanship, e.g. welding, pipe works, etc... will be in full adherence to the API 650 and related standards as well as the approved quality plan of the project.

2.7.1.1. Procurement of Materials and Equipment

- Preparation of a procurement plan, including the approach and strategy for sourcing key items of Equipment or Materials;
- Process all Purchase Orders and Subcontracts in a timely manner,
- Follow up, logistics, expediting and inspection of all purchases for compliance with schedule and quality, via controlling, monitoring and reporting during manufacture and supply, including performance of acceptance procedures and witnessed testing at Vendor works, when specialized equipment is purchased;
- Organizing Employer's presence on SAT and FAT and Employer's engineers' trainings;
- Management of all material inflow to Site, including plan of future expected deliveries with a 3 (three) months moving horizon, the generation of inspection reports, for materials received at Site; short and/or damage reports; non-conformance reports;
- Secure warranties and guarantees from the Vendors and permanent administration of their physical completion stages;
- Procurement of the Vendors' recommended materials and spare parts lists for tests and commissioning. List will be reviewed and approved by the Employer's representative;
- Preparation of the Vendors' recommended spare parts lists for maintenance. Spares list will need to be approved by the Employer;
- Reception of operation and maintenance data and requirements from the Vendors for incorporation into manuals;
- Collation of operating and maintenance data to facilitate the preparation of operating and Maintenance Manuals;
- Control, review and document all changes in regard to the Purchase Order's realization. All changes must be approved prior to commencement of work Preparation of a close out report on Vendor's performance for future reference of the Employer;
- Regular Reporting (weekly, biweekly, monthly basis or as per the Employer's request);
- Planning, organization and coordination of the activities of equipment manufacturers' representatives on the site (installation, testing, commissioning);
- Preparation of report on completed parts of the Works and provision of working time sheets.
- All materials documents shall be submitted to PEI approval before the purchase.

2.7.1.2. Procurement of the construction works– Subcontracts

- Preparation of a construction and services subcontracting master plan indicating the summarized scope and battery limits of each Subcontract, together with an activities list;
- Preparation of a construction and services subcontracts master schedule, showing the start and end dates, milestones, coordination with the timing for materials & equipment, interfaces and dependences between the different Subcontracts. This Schedule must be permanently linked to the Detailed Project Schedule;
- Administration of all Subcontracts;
- Act as Subcontract's superintendent under and in accordance with terms and conditions stipulated in such Subcontract;
- Secure warranties and guarantees from the Subcontractors and permanent administration of their physical completion stages
- Control, review and document all changes concerning the Subcontracts execution. All changes must be approved prior to commencement of work;
- Control and monitor the performance of all the Subcontractors;
- Receive, register and administer all the Subcontractors' safety, insurances and guarantees and transfer these to the Employer after Mechanical (physical) Completion;
- Issue of all certificates of Mechanical and Final Completion for the Subcontractors, once the Employer has advised of his acceptance of the work performed under each Subcontract;
- Upon completion of a Subcontract, prepare a close-out report summarizing Subcontractor's quality of performance;
- Regular Reporting (weekly, biweekly, monthly basis or as per the Employer's request).

2.7.1.3. Contracting with Subcontractors and Vendors

This tender considers that the contracts with Subcontractors and Vendors will be entered into by the Contractor. The selection of the Subcontractors and Vendors will be subject to Employer's approval at its sole discretion.

2.8. TRAINING

2.8.1. Introduction

- In conjunction with the Employer, the Contractor will develop training programs designed to ensure that every worker on Site receives training tailored to his or her specific role.
- Training manuals and detailed syllabus will be developed by Contractor and presented to Employer's review and approval prior to start of training program.
- The program will cover:
    - maintenance training

  - health, safety and environmental issues including but not limited to working on heights and in confined spaces.
  - Other topics (fire prevention, hazardous materials, etc...).
- In addition, project orientation training will be developed for use during development and construction stages. The program will be enforced and applied by the Contractor to all its employees as well as to all Sub-contractor's and Employer's employees involved in the project.

2.8.2. Project Orientation Training

All employees of every organization and visitors to the Site will attend an induction course that will address:

- safety objectives and regulations;
- Working on heights and in confined spaces
- the Project health program, including hygiene practices;
- security requirements;
- fire prevention safety procedures, personnel and equipment assignment;
- site regulations;
- transport regulations;
- physical and cultural environment existing in general proximity of the Site and the steps that will be taken to prevent or mitigate negative influences on it.

2.9. MECHANICAL COMPLETION

The Plant or parts of it will be considered as mechanically completed once the following steps are completed:

- All Materials and Equipment, components and systems constituting the Works have been constructed and installed (except for completion of minor portions of the Works such as external painting, final grading, final insulation, and any other portion of the Works not affecting the Commissioning, reliability, dependability, operability, safety, compliance with applicable laws and mechanical and electrical integrity of the Works) in accordance with the Contract
- The Contractor inspects the equipment and is satisfied that it is ready for commissioning.
- All permanent systems are available for Commissioning in accordance with the procedures set out in the Contract or mutually agreed to at the time by the Contractor and the Employer.
- The Works are mechanically and electrically sound, all instrumentation is working and all systems have been flushed, cleaned out and filled as necessary.
- The Contractor shall notify the Employer by means of a Mechanical Completion Protocol/Construction Completion Report. The report will state the different units/equipment which have been completed in accordance with the relevant specifications and passed the tests stipulated in the specification.
- The Contractor shall propose a test program to demonstrate the readiness of the equipment for start of commissioning.

- Upon the satisfactory completion of any such demonstration the Contractor and Employer's representative shall sign the Mechanical Completion Protocol/Construction Completion Report.
- If the Employer's representative is not satisfied that the equipment is substantially complete, it will be recorded in the report stating what is wrong with the necessary recommendations how to fix it. The Contractor shall then complete the necessary work and shall repeat the procedure described above.
- Once the Mechanical Completion Protocol/Construction Completion Report is signed by Contractor and Employer stating that equipment is ready for operation, a Mechanical Completion Protocol will be issued.

It will be noted that several of the above-mentioned actions will require the collaboration of more than one discipline including areas of responsibility outside the Contractors scope. Such activities will need to be driven by the contractor with the close assistance and support of the Employer.
The process of achieving this will be presented in the Method Statement

2.10. COMMISSIONING, START-UP AND HANDOVER

The Contractor's Commissioning team will be based at the Site office. Mobilization of this dedicated team will occur during the final weeks of construction and will be responsible to execute all the Commissioning and start-up phases up to and including handover to Employer as described in the relevant API standard(s) and in the Particular Project Specifications.

3. HEALTH SAFETY AND ENVIRONMENTAL PLAN

3.1. Environment

The Environmental requirements will be specified in the EHS section and the Contractor's approved EHS plan and will be aligned with the BAT guidelines provided by the BAT (Best Available Techniques) Reference Document (BREF), entitled 'Emissions from storage' which reflects an information exchange carried out under Article 16(2) of Council Directive 96/61/EC (IPPC Directive).

The contractor will submit all necessary information required by the Israeli authorities, including but not limited to an Environmental Impact Assessment Survey (EIS).

Contractor will comply, as a minimum, with guidelines in Schedule 8 of this RFP.

3.2. Safety

Prior to commencement of construction activities, construction areas will be handed over to Contractor. Contractor will be fully responsible for implementation of safety system at handed over area. General guidelines are provided herein and in Schedule 8 to this RFP which should be regarded as minimum requirements.

- The Contractor will establish the Safety and Health Plan which to be agreed with Employer. Among other things, the Safety and Health Plan will set out guidelines for the Site safety procedures and the safety goals of the Project.
- In addition to any other requirements stipulated in the Contract in respect of the Safety and Health Plan, the Safety Health Plan must address :
    - the legal responsibilities of the Employer, the Contractor, the Sub-Contractors (and their subcontractors) and all respective employees under applicable Law; and
    - the establishment of safety structures required by applicable Law and how they will be practically implemented to suit the needs of the Project.
- All persons accessing the construction area or participating in the construction works will be required to attend a safety training session prior to commencing work at Site. Validity of training and permit to access the site will be approved by Contractor's and Employer's safety representatives.
- The Contractor will appoint a site foreman responsible for all matters related to the execution of works at the construction site.
- The Contractor will designate an experienced and suitably accredited safety representative who will be responsible for implementing, enforcing the rules and carrying out investigations under the Health, Safety and Environmental (HSE) plans. The safety representative must implement all applicable Law and will regularly communicate with Sub-Contractors to ensure these plans and applicable laws are complied with.
- Sub-Contractors will be required to comply with the HSE plans and to nominate representatives who will be responsible for safety procedures.

3.3. Medical and First Aid Facilities

- Contractor will be required to provide first aid kits and qualified personnel in accordance with applicable Law.
- The Employer will provide emergency medical and casualty evacuation procedures and facilities.

4. DOCUMENTATION AND LOCAL PERMITS

The design documentation package will fully comply with all requirements according to Israeli legislation needed for obtaining permits and approvals as will be in force at time of applying for such permits.

The Contractor is obliged to submit to the Employer AS-BUILT design documentation.

All documents have to be available in a form suitable for editing and have to be presented in the following formats:

- Drawings in AUTOCAD (DWG) format
- Text in MS WORD
- Tables and listings in MS EXCEL
- Time schedules in MS PROJECT or similar

- All documents and drawings related to the detail design shall be issued using PEI format (instructions will be sent to the tender winner), in English and a as per regulations for document accessibility (as per Israeli governmental directive 35, year 2013).

5. BATTERY LIMITS

The battery limits for the work included in this tender consist of the tank(s), all appurtenances mounted on the tanks, including all vertical risers up to flanges for connection of each tank and its related systems to external supplies (product, foam, water...).

The piping for the fire protection systems shall terminate at the base of each tank and will be connected to the site firefighting foam and water system network by others.

The Contractor's scope of supply shall include the foam solution manifold for the foam system with the riser from the base of the tank to the circular manifold and the risers from the base of each tank to the cooling water manifold (see also ANNEX 1 - Particular project specifications).

Schedule 2 – Quality Assurance & Quality Control

Project 2462
TENDER DOCUMENTATION

For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

SCHEDULE 2
QUALITY ASSURANCE & QUALITY CONTROL

Issued by: EIL

	15/5/22	Tender Revision			C.A. E.I.L
P3	29/8/19	For approval after review	V.A	M.SH	
P2	26/3/19	For approval	V.A	M.SH	
P1	11/3/19	For comments	V.A	M.SH	
P0	7/3/19	For comments	V.A	M.SH	

Contents

1. Quality Assurance

1.1 Introduction

The Contractor shall, for all work covered by the Contract as dictated by the Conditions of Contract, establish and implement quality assurance arrangements which as a minimum fulfil the requirements set out in ISO 9001 : 2000 Quality Management Systems - Requirements. The Contractor is also required to implement a program of Quality Audits specific to work performed on this project.

Verification and tests will be performed and approved in accordance with the Inspection & Test Plan (ITP) document in Annex 3 of this RFP.

The quality plan shall ensure that all requirements of API 650 and all other applicable standards are fully met, taking into account the additional special requirements given herein.

The Owner retains the right to review the effectiveness of the quality system implemented by the Contractor and its subcontractors by means of inspection, quality surveillance, quality reviews or quality audits at its discretion.

Inspection by the Owner or any nominated Inspection Authority shall not absolve the Contractor from the responsibility for the quality of the works or from performing those inspections.

The Contractor will appoint suitably experienced personnel for the management of Quality Assurance (QA) and Quality Control (QC) tasks.
The QA engineer will be responsible to manage the manufacturing and construction processes for achieving a defect free execution of the works
The QC Engineer will be responsible for performing tests and verification demonstrating the compliance of the finished products and works with the specifications.

The QA and QC positions are considered as Key Personnel and, as such, a résumé of the proposed nominees shall be provided to the Employer for review and approval.

1.2 ISO 9001 Quality System Certification

The Contractor shall provide a copy of certification from a recognized Accreditation Authority as evidence of compliance with ISO 9001.

2. Quality Plan

Upon Notice to Proceed, the Contractor shall prepare a contract specific Quality Plan to detail the responsibilities, functions, procedures and requirements for all stages of the Works. The Quality Plan shall be submitted for review and comment no later than one calendar month after Contract Award.

The Quality Plan shall include:

a) A description of objectives, obligations and liabilities for the Contractor.

b) The Contractors project organisation chart, with particular reference to Quality Assurance and Quality Control functions for the Contractors premises and the Site.

c) Details of any work subcontracted to others, including the process for assessment of subcontractors and the control of work performed.

d) A list of all applicable Procedures and Work Instructions to cover:

- Management and Administration.
- Training of Staff.
- Qualification and Evaluation of Subcontractors and Suppliers.
- Quality Assurance in design, procurement, fabrication and erection.
- Quality Control activities and procedures.
- Certification, including subcontracted work.
- Handover Protocol for Construction to Commissioning, Commissioning to Operations, Operations to the Owner.
- Quality auditing.
- Safety
- Other functions, including reliability, operability and maintainability.

The Quality Plan should indicate details of those quality audits to be performed on the project and include a planned schedule for their execution.

The above mentioned activities and all tasks related to QA and QC performance will be performed under the supervision of the Employer's QA and QC appointees.

All quality related documents and reports will be signed by the Contractor's and the Employer's quality managers.

3. Quality Control Procedures

The Tank Contractor shall provide a Quality Management System in accordance with ISO 9001 and API 650 Monogram Program.

The contract shall be responsible for all relevant measurements demonstrating the compliance of all components of the works with the quality standards and the specifications, including but not limited to all required measurements for calibration and tank settlement. All means and instruments for performing these measurements will be provided by the contractor and included in his price.

A detailed Quality Control Plan (QCP) of hold, witness, and inspection (review) points is to be submitted by Contractor for approval by the Engineer before any work may commence.

The Quality Control Plan shall, as a minimum, cover the following:

1. Quality related activities including:
   (a) Documentation
   (b) Drawing Approval
   (c) Material Identification
   (d) Material ID Map
   (e) Welding Procedure Approval
   (f) Welders Certificate Approval
   (g) Approved QCP
   (h) Weld Map Approval
   (i) Dimensional Checks
   (j) Non-Destructive Evaluation (NDE)
   (k) Radiography
   (l) Magnetic particle inspection (M. P. I.)
   (m) Pressure Test
   (n) Erection / Jacking Procedure
   (o) Welding Procedure and Tests
   (p) Corrosion Protection (including internal coating)
   (q) Painting and coating certified examination
   (r) Fire suppression systems testing and certification
   (s) Final Inspection
2. Reference standards.
3. Vendor organization chart including areas of responsibility.
4. Inspection & test plan (including hold and witness points, and spaces for signatures & dates relating to inspections per Annex 3).

Prior to the start of fabrication, the Contractor shall submit the QCP to the Engineer for review and approval.

The Contractor shall ensure that all his sub-contractors have obtained a copy of this specification.

The Contractor shall accept full responsibility for the quality of his work and of materials used, irrespective of any quality surveillance that may be carried out by the Engineer or his representative.

The Engineer may, at his discretion, require a Quality Audit of The Contractor or any of the sub-contractors to ensure that he has the capabilities, resources and quality control facilities to carry out the work to ensure compliance with this specification.

The Contractor shall have available the latest issue of each of The Tank Contractor's data sheets for the materials to be used, all Specifications and Codes of Practice relevant to

the work to be carried out, including a copy of this specification, all of which shall be available to The Contractor's Quality Control Manager.

The Contractor shall:

1. Supply the Quality Control Plan and Quality Program at the time of tendering, both of which are subject to acceptance by the Engineer.
2. Maintain Quality Control records in accordance with the Quality Plan during execution of the contract. Such records shall be available to the Engineer or his Representative at each Quality Surveillance visit.
3. Mark or securely label each component with a unique identification tag, and
4. Carry out such tests as are required to ensure compliance with the specification.

The cost of Quality Control shall be inclusive in The Contractor's tender price.

The Engineer may, at his discretion, employ an independent technically qualified organization to carry out quality surveillance of the work on his behalf. In the event of dispute, the Engineer's decision shall be final.

The Contractor shall advise the Engineer in a timely manner, in writing, when and where the following processes will be carried out;

1. Completion of fettling or dressing prior to leaving the fabricator's works
2. Blast cleaning and application of the first or primer coat
3. After completion of all coats to be applied at The Contractor's works
4. At the commencement of repairs or overcoats of existing equipment to be carried out on site.

Failure of The Contractor to advise the Engineer of his program may result in rejection of the work. The cost of any such rejection shall be borne by The Contractor.

For carrying out quality surveillance, the Engineer or his representative shall be granted access to any part of The Contractor's premises relevant to the work being carried out, at any reasonable time.

The Contractor shall transfer the material trace number onto all pieces of the equipment.

The cost of Quality Surveillance will be borne by The Employer, except when surveillance results in rejection of the lot or when notice by The Contractor results in a fruitless trip, in which case the cost of surveillance shall be debited against The Contractor's account.

Quality Control Reports shall be updated regularly. No materials will be authorized by the Engineer unless a copy of an approval report has been received by him. The Engineer may withhold approval until a final report has been issued, giving approval to the components after installation on site and repair of damage to coating.

Proper and adequate quality control records shall be maintained by The Contractor for all stages of the work. These records shall be available for inspection by the Engineer or his representative at the time of Quality Surveillance. Incomplete, inaccurate or inadequate records shall be regarded as non-compliance with the specification, and the cost of surveillance will be back charged to The Contractor.

No variation from specification, or change of sub-contractor or materials to be used from those stated in the tender documents, will be permitted without the written approval of the Engineer. Products equivalent to those specified may be submitted for approval, but may not be substituted without the written approval of the Engineer. Adequate information shall be supplied by the Contractor to the Engineer in order to assess the claim of equivalence from The Contractor.

Notwithstanding any requirements or other information given, or submissions to The Engineer for approval, tank contractor shall retain full responsibility for the design and construction of the tank and associated fittings and ensure these meet all requirements of API 650, taking into account the additional special requirements given herein.

Schedule 3 – BOQ & Prices Tables

1	**Measurement modes and quantities**
1.1	This is a Lump-Sum Contract. No materials and/or works will be measured for accounting purposes.
1.2	All works and materials described and/or mentioned in the tender/contract documents, and which are required for the completion of the project to the full satisfaction of the company, are included in the clauses described in the this bill of quantities even if not explicitly specified.
2	**Prices, Units and Totals**
2.1	The unit prices include all consideration due to the contractor upon completion of the works or the purchase of the required materials as described in each clause of the bill of quantities.
2.2	The unit prices are fixed and are not subject to change for any reason.
2.3	Total prices are exactly the result of multiplying the unit's prices by the quantities in each clause.
2.4	Being the contract a Turn-Key Contract, the total sum for the contract indicated on the bottom line of the bill of quantities, cannot be changed without the express consent of the company.

No.	Description	References	Units	Quantity	Unit Price	Total
		spec. drwg. annxL.			USD/EURO	USD/EURO
1	**Mob&Demob**					
	Total for Mob&De-mob (10% of contract price)					
2	**Design**					
2.1	Preliminary design including: drawings of general project layout and orientations and general dimensions of tank parts, all detailed static and stability calculations, procurement specs for all steel plates.	Annex 1	comp.	1		
2.2	Final design including: detailed drawings of all tank parts, complementary calculations, procurement specs for all accessories, equipment, materials etc. to be mounted on the tank.	Annex 1	comp.	1		
2.3	Detailed design including: shop manufacturing drawings for each tank, erection drawings, preparing all detailed documentations including: construction specifications, method statements, quality control program and certifications etc. As per tank.	Annex 1	comp.	6		
	Total for Design (5% of contract price)					

No.	Description	References	Units	Quantity	Unit Price	Total
		spec. drwg. annxL.			USD/EURO	USD/EURO
3	**Procurement and Manufacture**					
3.1	Supply and manufacture of tank bottom steel plates, per tank	Annex 1	comp.	6		
3.2	Supply and manufacture of for shell plates, per tank	Annex 1	comp.	6		
3.3	Supply and manufacture of for roof plates, per tank	Annex 1	comp.	6		
3.4	Supply and Manufacture of materials for all steel works, as per tank	Annex 1	comp.	6		
3.5	Supply and manufacture of materials for all piping works, as per tank	Annex 1	comp.	6		
	Total for Procurement and Manufacture					
4	**Tanks Erection and Testing**					
4.1	Steel works for the placement and welding of tank bottom and annular plates, including: sump, piping supports, floating roof legs plate pads, and all other attachments to the tank bottom. As per tank.	Annex 1, Para 12	comp.	6		
4.2	Steel works for the erection and welding of tank shell plates, including all piping and manholes nozzles and their reinforcing plates. As per tank.	Annex 1, Para 12	comp.	6		
4.3	Steel works for the construction of the floating roof of the tank, including the welding of all plates and steel profiles, roof supporting legs, sliding ladders, guide poles and all steel parts attached to the roof plates. As per tank.	Annex 1, Para 12,14	comp.	6		
4.4	Steel works for the construction of tank ascent stairs and ladders, walkways and service platforms. As per tank	Annex 1, Para 11	comp.	6		
4.5	Piping works for the installation of tanks fire-fighting systems including foam and cooling water risers and rings pipes. As per tank.	Annex 1, Para 17	comp.	6		
4.6	Fuel piping works including all nozzles and all attachments needed, drain pipes and manholes. As per tank.	Annex 1, Para 12	comp.	6		
4.7	Hydrostatic testing including all what is needed for water filling and emptying, nozzles blocking, settlements measuring, and all according to the technical spec. and API 650 std.	Annex 1, Para 19	comp.	6		
	Total for Tanks Erection					

No.	Description	References	Units	Quantity	Unit Price	Total
		spec. drwg. annxL.			USD/EURO	USD/EURO
5	**Tanks internal&outside painting**					
5.1	Inside painting of upper 2 meters of tank shells. As per tank.	Annex 6	comp.	6		
5.2	Complete External painting of floating roofs(upper side) including all pontoons compartments and all attachments to the external side of roof plates and nozzles. As per tank.	Annex 6	comp.	6		
5.3	Complete internal painting of floating roofs (under side) including supporting legs, guide pole and all attachments to the internal side of roof plates and nozzles. As per tank.	Annex 6	comp.	6		
5.4	Internal painting of lower 1 meter of tank shells including all internal piping works and all attachments to the tank shells and internal parts of nozzles. As per tank.	Annex 6	comp.	6		
5.5	Complete Internal painting of tanks bottom plates including all attachments to the bottom plates. As per tank.	Annex 6	comp.	6		
5.6	Complete External painting of tanks shell including external side of nozzles, manholes cover plate and all attachments to the shell plates. As per tank.	Annex 6	comp.	6		
5.8	Complete Painting of all steel works attached to the tanks. As per tank.	Annex 6	comp.	6		
5.9	Complete Painting of all External piping works attached to the tanks. As per tank	Annex 6	comp.	6		
	Total for Tanks Painting					

No.	Description	References	Units	Quantity	Unit Price	Total
		spec. drwg. annxL.			USD/EURO	USD/EURO
6	**Completion of Works, Tanks Calibration, Final Installations, Final Documentations, Running-In And Delivery**					
6.1	Calibration of tank's volumes and preparation of calibration tables signed by a qualified surveyor. As per tank.	Annex 1, Para 20	comp.	6		
6.2	Supply&Installation of floating roofs primary and secondary seals, foam dames and weather shields. As per tank.	Annex 1, Para 14	comp.	6		
6.3	Supply&Installation of foam generators for the fire-fighting systems. As per tank.	Annex 1, Para 17	comp.	6		
6.4	Supply&Installation of spray nozzles on the cooling rings. As per tank.	Annex 1, Para 17	comp.	6		
6.5	Supply&Installation of floating roof drainage pipes. As per tank.	Annex 1, Para 17	comp.	6		
6.6	Supply&Installation of floating suction arms. As per tank.	Annex 1, Para 16	comp.	6		
6.7	Presence of contractor representatives in Running-In operations including filling and emptying the tanks with fuel. As per tank.	Schedule 1	comp.	6		
6.8	Hand over of Tanks including the transference of all quality, materials and supplies documentations and As-Made drawings and signing the Certificate of Completion for each tank.	Schedule 1	comp.	6		
	Total for the Completion of Works					
	Totals					
	Total for Mob&Demob (5% of contract price)					
	Total for Design (5% of contract price)					
	Total for Procurement and Manufacture					
	Total for Tanks Erection					
	Total for Tanks Painting					
	Total for the Completion of Works					
	Total for the contract (excluding VAT)					

Schedule 4–Occupational Safety, Health, Environmental and Fire Protection

Project 2462
TENDER DOCUMENTATION

For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

SCHEDULE 4
Environment, Health & Safety

	15/5/22	Tender Version			C.A. E.I.L
P1	27/3/19	For approval	V.A	M.SH	
P0	30/1/19	For comments	V.A	M.SH	
Rev.	**Date**	**Description**	**By**	**Checked**	**Client Approved**

Contents

1 HEALTH AND SAFETY

1.1 Health and Safety at Work

The tanks shall be constructed with due and proper regard given to health and safety and all Acts, Orders, Regulations, Guidance Notes and Codes of Practice relevant thereto and in accordance with all reasonable rules and regulations.

The Owner is committed to the health and safety of its staff and members of the Public. The Contractor shall ensure that it is likewise committed and provide to the Owner a copy of its Corporate Health and Safety statement and a project specific preliminary Health And Safety Plan as part of the Contract. This Plan shall be submitted to the Israeli Authorities for review and approval and shall be updated regularly throughout the entire duration of the Contract.

The Contractor shall hold regular Health and Safety meetings. The Contractor shall request and approve Subcontractors' Health & Safety Plans which shall be based on the Contractor's project specific plan.

All warning and instruction notices and signs shall be in Hebrew and English Language.

1.2 Hazardous Substances

The Contractor and all Subcontractors on the Owner's premises have a duty, so far as is reasonable practical, to implement the regulations for the protection of his personnel, the Employer's personnel and the personnel of other Contractors with regard to hazardous substances associated with their activities. The Contractor shall submit sufficient information about the work to be carried out for assessment by the Owners Engineer.

This shall include:

- The identification of hazardous substances that shall be brought onto the Site and in what quantity.
- The identification of hazardous substances that are produced on the Site during the activities of the Contractor and their Subcontractors.

The Contractor shall have in its possession Material Data Sheets for all chemicals, solvents, oil, greases, and liquids brought to the site during construction, start-up and commissioning of the works.

1.3 HAZOP

The Contractor shall undertake and provide a Hazard and Operability Study (HAZOP) as an integral part of the detailed design of the tanks. The Owners Engineer reserves the right to be represented during these studies.

The HAZOP Study shall incorporate a systematic review of the design in order to identify deviations from normal operating conditions that could lead to hazardous operations or operability problems.

The potential consequences of these deviations and the measures taken to reduce these consequences shall also be assessed.

The Contractor shall provide Written Schemes of Examination, as required by applicable design codes and statutory regulations.

1.4 Special Requirements

No asbestos or materials containing asbestos shall be used in the design and construction of the Plant.

The Contractor shall remain responsible for the disposal of any contaminated or hazardous material removed during the clearance of the Site by the Contractor. All such material shall be disposed of at a licensed facility in accordance with local regulations.

1.5 Site Specific Health and Safety Issues

The Contractor shall apprise himself of all site specific health and safety issues and take full responsibility for their elimination, avoidance or mitigation during design, procurement, construction and start-up phases of the project. Those site specific issues that the Contractor is encouraged to investigate further are as follows:

- Disposal of contaminated materials.
- Restricted heights for site access.
- Rail traffic.
- Road traffic.
- Overhead electrical cables over site and laydown areas.
- Dust and fumes.
- Noise emissions
- Natural water course re-routing/channeling construction, including road bridges construction and possibility of flooding of site during construction.
- Local industry near to site.
- Local archaeological digs etc.

Special attention and protection to personnel should be taken regarding the nearby existing operational oil storage tank farm.

2 Fire Protection /Detection Systems

The fire protection and detection systems requirements will be provided by the Employer as part of this RFP. The system will comply with the NFPA rules and directives for oil storage installations. It is, however, the contractor's responsibility to perform all required tasks for the best implementation of the systems and obtain certification for it from the designated authorities while using BAT in all aspects of safety and environmental protection.

2.1 Statutory and Local Authority Requirement Standards

The fire protection systems and equipment used during construction shall be designed and supplied to appropriate standards or codes of practice and shall be in fully accordance with all statutory and local authority requirements.

The operational fire protection and detection systems and equipment will be per the Employer's fire safety consultant specialist design. The completed site installation shall be acceptable for the issue of a Fire Certificate from the local regulatory body.

2.2 Access for Fire Fighting

The Plant shall be arranged to give ease of access for all areas of fire fighting. Local fire authority requirements shall be complied with in this respect.

Equipment and Buildings shall be so arranged that access/escape to and from any major items of equipment and elevated platforms is possible from at least two directions.

3 ENVIRONMENTAL MANAGEMENT

3.1 General

The Environmental requirements will be specified in the Contractor's approved EHS plan and will be aligned with the BAT guidelines provided by the BAT (Best Available Techniques) Reference Document (BREF), entitled 'Emissions from storage' which reflects an information exchange carried out under Article 16(2) of Council Directive 96/61/EC (IPPC Directive).

The Contractor shall comply with the Environmental Impact Assessment (EIA) related to the construction permit obtained by the Employer and all relevant legislation on environmental standards and industrial codes of practice. Additionally, the Contractor shall adopt positive management practices with the aim of preventing pollution noise and other adverse environmental effects.

Specifically, the Contractor shall comply with the following in addition to all legal requirements:

- The Contractor shall use best practicable means and Best Available Technology (BAT) to prevent emissions that may have an adverse environmental impact while carrying out the project and during subsequent operation of the tanks.
- The Contractor shall handle all wastes produced during the project in the proper manner.
- The Contractor shall take a positive approach to protection of the environment while carrying out the project.
- The Contractor shall ensure that all sub-contractors comply with these requirements.

3.2 Environmental Management System

The Contractor shall implement an effective Environmental Management System to control environmental performance of the project, in accordance with the project EIA (Environmental Impact Assessment), BAT BREF and applicable law.

The Contractor shall provide an Environmental Management Plan specific to the project, including at minimum:

- The Contractor's environmental policy
- An overview of the Contractor's environmental management system as applicable to the project.
- Project environmental organisation and responsibilities
- An index of environmental documents and procedures to be produced for the project.

The Plan shall include O&M requirements after first commercial operation and shall be maintained during construction of the Plant, and then handed over to the Employer. The Owner shall have the right to monitor the application of the Plan by environmental audit or review. The Contractor shall provide assistance, access and suitable liaison to the Owner's personnel.

3.3 General Environmental Performance Requirements

The Contractor shall ensure that the project shall comply with all requirements of the EIA as provided with this document.

Annex 1 – Particular Project Specifications

TENDER DOCUMENTATION
For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

Annex 1

WELDED STEEL TANKS FOR OIL PRODUCTS STORAGE

PARTICULAR (PROJECT) SPECIFICATIONS

Issued by: EIL

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Rev.	**Date**	**Description**	**By**	**Checked**	**Client Approved**

Contents

1. General

The objects of the work are 6 (six) vertical petroleum products storage tanks with operational volume of 50,000 m3 each with a total capacity of 300,000 m3. Tank diameters will be 54m.

The tanks will be built in an area adjacent to the existing PEI terminal installations at the Eshel site. A preliminary layout is attached for information (See Annex 8).

The tanks are to be designed and constructed in accordance with the latest edition of the American Petroleum Institute Standard Specification, API Standard 650. Other relevant specifications are listed in Annex 2 as reference. In the event of a conflict between any of the relevant documents referred to in this RFP, the order of precedence shall be as follows:

1. This specification
2. API 650 Standard for Welded Tanks for Oil Storage
3. SI 4468 Israel Standard for Welded Steel Tanks for Oil Storage
4. Employer comments and requests

Under special circumstances, other standard(s) may take precedence. Such cases will be explicitly indicated where applicable.

All standards referred to in this specification and in the RFP in general shall be considered as the latest edition for these standards in effect at the time of proposal date.

Layout details and dimensions of the tanks are shown on the attached drawings.

Each tank shall be designed for the storage of any of the following distillates (fuel products):

Service	Israeli Standard
Lead free gasoline	SI 90 part 2
Diesel Fuel (Gas Oil) for engines	SI 107 part 1
Diesel Fuel (Gas Oil) for heating Jet engine fuel	SI 5563
Kerosene	SI 100

Above references are to the latest edition of the shown standards.

The construction of the tanks may be started in parallel to and will continue after completion of the civil works related to the building of bund walls and foundations. The Contractor must therefore take into account these conditions in his construction methodology and planning of erection works.

The design of bunds, foundations and all civil works will be performed by others and will be made available to the tank contractor for his review and comments guaranteeing the tank contractor's acceptance of compliance with the tank erection requirements.

The Standard Specifications provide, in certain clauses, for a choice to be specified in the Construction Specifications between alternative engineering solutions, materials or methods of construction and for additional requirements to be specified to suit a particular contract.

When more than one alternative exist the Contractor will notify the employer of the selected alternative.

This particular specification also contains some additional specifications required for this particular contract.

The particular project specifications hereunder are meant to amplify, clarify or supplement the requirements of API 650 and are not necessarily exhaustive. The Contractor detail design will complete and adapt all details to the actual conditions as will be agreed and approved by Employer.

Contractor will take in consideration that this specification is provided at this stage for supporting his preparation of an offer and will subsequently become part of the contract for use as the specification of the works.

2. Design Requirements

The contractor will be responsible for the detailed design of the tanks based on the information provided in the RFP.

The design will consist of the following:

2.1 Basic Design

The Basic Design will include layouts, dimensions and calculations sufficient for performing the procurement of steel products required for the construction of the tanks.

This stage will include the seismic calculations, static calculations for defining sheet metal thicknesses and quantities and calculations related to the floating roof.

The design at this stage can be generic for all 6 tanks which are expected to be identical.

2.2 Final Design

The Final Design will include the detailed drawings and materials specifications for procurement of all materials and appurtenances.

The design at this stage can be generic for all 6 tanks which are expected to be identical.

2.3 Full Detailed Design

The Full Detailed Design will include all calculations and lists showing all that is required for the complete execution of the project.

This stage will include all manufacturing drawings with full details for manufacturing of all parts for their assembly towards the construction of each tank.

The detail design will be specific for each tank.

Each of the above phases in the design will be subject to Employer's approval as a prerequisite for proceeding to the next stage.
The contractor will also prepare a method statement for each work stage, from the design stage and up to the completion and hand-over, including but not limited to: Design, site preparation, material procurement and storage, floor construction, fuel piping, fire fighting piping, hydrostatic pressure test, painting etc.

3. Structural Design considerations

The contractor will be responsible for the detailed design and construction of the structural aspects related to the provision of the tanks.

The structural design will take into consideration all aspects of the civil design and execution of the foundations provided by others.

Contractor will be responsible to obtain any statutory and regulatory certifications of the structural design and calculations as required by Israeli regulations in force for this subject. This will include, where applicable, the review and approval of a certified Israeli engineer. The Contractor will be the sole responsible entity with regards to the local authorities. The Contractor will be in charge of the structure skeleton as defined by the Israeli laws and regulations and will sign the building permit as this function.

The Israeli Engineer appointed by the Contractor will act as the the engineer who's is charge of structure skeleton and will certify the steel tank structure

excluding the foundations which will be separately certified by the Employer's civil contractor. This structural engineer will submit required calculations and will perform supreme supervision for the construction process as required under the building law. This engineer will be the one certifying the submittal of the tank for statutory permitting.

The design and construction will comply with the Israeli standard SI 413 & SI 414 and the API standards applicable with regard to seismic and wind resistance characteristics of the tanks. It will be noted that the Israel Standard will supersede where conflicts exist.

The tanks will be of unanchored type and the design will account for all stipulations made in the API 650 standard in relation to wind loads or any other relevant considerations.

It will also be noted that the basic design being presented with this tender includes the seismic and wind load resistance calculations as a basis for preparation of Contractor's offer without derogating from the Contractor's obligation and responsibility for accounting for these factors in the detailed design for construction.

3.1 Seismic design

The tanks will be built to withstand earthquakes according to SI 413 "Standard for Resistance to Earthquakes", in particular part 2.2. The design will also fulfil API standard 650 Annex E. It will be mandatory to ensure that all stipulations of the Israeli standard are fully adhered to.

The Seismic Use Group will be assumed to be SUG III per SI 413 and API 650 definition.

In order to enable proper structural and seismic design the Employer is performing a Site-specific spectral response analysis and a comprehensive soil survey, the results of which will be provided to the Contractor – See Annex 7.

3.2 Wind Load design

Consideration of wind loads and their effect on the tank structure will be in accordance with API 650 within the context of Israeli standard SI 414 "Typical Loads in Structures: Wind Loads". It will be mandatory to ensure that all stipulations of the Israeli standard are fully adhered to.

3.3 Tank Anchorage:

Tanks will be of unanchored or self-anchored type.

The Tank Contractor shall review all the assumptions with the Engineer to ensure that:

- account is taken for the minimum level of product considered to be in the tank;
- the proposed foundation design is fully compatible with all design considerations;
- account may need to be taken for cases that may result in tank floating as will be determined by the HAZOP.

4. Gaskets

Design and materials selection of all gaskets will be in accordance to the API 650 standard and will provide BAT (Best Available Technology) for the prevention of leaks or emissions potentially harmful to the environment.

All gaskets shall have an appropriate legible marking to show the gasket type.

4.1 Gasket Materials:

Soft gaskets, such as non-asbestos fibre with suitable binder (may be used for manholes)

All gaskets shall be asbestos free.

4.2 Gasket Dimensions:

Gasket dimensions, when used in conjunction with thin-plate flanges described in API 650 section 5.7.5 (Shell manholes).

Where SW gaskets are chosen, these gaskets shall be self-centering dimensioned to ASME B16.20.

Flat Faced Flanges to have full faced gaskets.

Gaskets should be pre-cut. Cutting of gaskets on-site should be avoided.

5. Plates:

Mill Test Certificates (MTC) for all plates shall be obtained by The Tank Contractor from steel maker and shall be made available for inspection by the Engineer prior to plates purchase with not less than 14 days advance notice.

The minimum thickness of wall plates will be 10mm with minimum corrosion allowance of 2mm relative to the minimum thickness.

Tiers (width of wall plates) will be designed in accordance with section 5 of API 650 and section 10 in Appendix L of API 650 but under no circumstances will these be inferior to 2,000mm.

The basis for this tender is plates made from A-537 Cl1 for shell and floor and A-36 for the roof. Contractor may propose alternative plate materials of construction, provided that their properties are at least technically equivalent to or exceeding those mentioned above. Such suitability claim will be supported by full set of calculations proving the adequacy of the alternative solution.

6. Shell Attachments and Tank Appurtenances:

External & internal pad attachments to the tank shell shall be fully seal welded to prevent crevice corrosion (and to permit internal lining).

Piping connections through the tank bottom shall not be used.

Contractor shall install appropriate attachments for shell grounding.

Contractor shall install all appropriate attachments for fixed lighting on the tank according to the instructions that will be provided by the electricity designer.

7. Shell Openings:

There shall be a minimum of 3 manholes for each tank. The manholes shall be sized to DN900 and shall be located 120 degrees apart.

All shell manholes shall be provided with "davit arms" and handles to facilitate routine removal/replacement; these shall be located such that davit arm does not impede access either in open or closed position.

The design of penetrations through the external annular ring shall be inherently water-tight (i.e. sealant shall not be the primary method of preventing water ingress).

8. Shell Nozzles and Flanges:

Shell nozzle connections shall be constructed of seamless pipe as specified in API 650

Electric resistance welded (ERW) pipe is not permitted for shell connections.

Unless otherwise specified, shell nozzle flanges, excluding manholes, in sizes NPS 11/2 through NPS 20 and NPS 24 shall meet the requirements of ASME B16.5.

For sizes larger than NPS 24 but not greater than NPS 60, flanges shall meet the requirements of ASME B16.47, Series A or Series B. Series A and Series B flanges are not compatible in all sizes and must be carefully selected to match the mating flange. If diameters, materials of construction, and flange styles of ASME B16.47 are unavailable, fabricated flanges with drilling template (bolt circle diameter, number of holes, and hole diameter) matching Series A or Series B shall be used. These fabricated flanges shall be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Section UG-34 and Annex 2.

9. Water Draw-off Sumps:

The Tank Contractor shall design the centre sump and centre plates so that the specified minimum 1:100 slope towards the sump is achieved on completion of floor plate welding. The centre plates shall be formed into a conical shape; dishing the centre plates to a spherical radius is not acceptable.

10. Setting Fill Levels & Overfill Protection:

The height of the tank wall will be determined in accordance with API-2350 "Overfill Protection for Storage Tanks in Petroleum Facilities" with following factors taken in consideration:

- Maximum filling rate as shown below
- Operational volume of the tank as measured from tank floor
- Floating roof and sealing accessories
- Sloshing (movement) of the liquid medium in case of earthquake.
- If the tank is filled to the highest safety limit level (LSHH) typical thermal expansion shall not cause overtopping and shall not exceed the shell height (minus the curb angle allowance).

10.1 Top Wind Girder

The top wind girder shall be located at or near the top of the top shell course, on the outside of the tank shell

An additional curb angle margin should be considered when the top wind girder is located more than 0.6 m (2 ft) below the top of the shell per design drawing in accordance with API 650 para 5.9.3.2.

10.2 Filling / Emptying Rates

The maximum filling rate of product is 1000 m3/h

The maximum emptying rate of product is 1000 m3/h

11. Platforms, Walkways, Stairways and Handrails

The stairs and handrails shall be in accordance with the preliminary geometry shown in general arrangement drawing provided with these specifications and must fully comply with all relevant Israeli rules and regulations as per SI 1142 (handrails), SI 1918 (stairs), design & construction regulation SI 11422 part 4 for ladders.

Loadings for non-working platforms, gangways and stairways not supporting any equipment shall be 3.0 kN/m^2.

Loadings for working platforms expected to be subjected to heavy loads shall be 7.5 kN/m^2.

Maximum permitted bearing pressure of steel on concrete in stanchion bases shall be 3.0 N/mm^2.

The minimum width of platforms and walkways shall be the stricter approach between the design and construction regulations in force for external staircases and the following:

- 900 mm - for frequent use
- 1100 mm - high use walkway with persons walking in opposing directions.

Platform and walkway flooring shall be galvanized, non-slip, open steel grating.

11.1 Setting Out and Leveling:

The Contractor is responsible for all setting out and levelling of access platforms, stairs and ladders.

11.2 Handrailing:

Handrails shall be solid steel bar or sections (to avoid risks associated from hollow tube rotting unnoticed from the inside).

Handrails shall be designed as per SI 1142, Guardrails and Handrails. The handrails shall confront loading as per a/m SI.

Access to all roof nozzles shall be provided.

11.3 Fire Water Cooling Rings:

The design of fire water cooling rings shall not interfere with access from the stairs or the ladder to peripheral openings and local instrumentation.

11.4 Top Foam Pourer Maintenance Access Platform:

Top foam pourers (fixed foam discharge outlets mounted above the top of the tank shell) shall be accessible for maintenance from a platform within the confines of a permanent platform with handrails.

12. Fabrication:

Fabrication will comply with all requirements of API 650 section 6.

Contractor will prepare a Method Statement outlining procedures for the fabrication and erection of the tanks (see Schedule 1).

Welding shall be undertaken by qualified welders and welding operators in accordance with Section IX of the ASME Code. Weld Procedures shall be in accordance with Section IX of the ASME Code and API 650 standard.

When required to attach platforms, piping or other equipment to tanks or vessels, purpose designed suitable lugs shall be welded on to the vessel by The Tank Contractor; prior to vessel pressure testing.

To avoid corrosion in inaccessible areas, all welds shall be continuous unless stated otherwise.

Holes for bolting shall be drilled and all burrs removed.

Flame cut holes are not permitted.

After fabrication all weld spatter and all sharp edges shall be removed for safety and quality of painting and/or galvanizing.

12.1 Dimensional Tolerances:

In accordance with section 7.5 of API650

12.2 Welding:

Prior to commencement of welding, details of all welding procedures shall be defined in the Welding Procedure Specification (WPS), which shall be subject to approval by the Engineer. This information is required for nozzles and mountings etc. and all permanent and temporary attachments as well as for shell annular butt joints, shell to bottom joints etc. Typical details will suffice for temporary attachments provided that all cases are represented.

The Tank Contractor shall submit a welding plan identifying all welds in the tank with the corresponding Weld Procedure Specification, for review by the Engineer prior to tank construction.

In addition to the number and type of tests required in Section IX of the ASME Code, the Engineer reserves the right to request additional tests on shell butt welds and shell to bottom welds where, in the opinion of the Engineer, the normal tests are insufficient to demonstrate that the proposed procedures are adequate.

The Contractor shall submit to the Engineer WPS & PQR for all welders that will execute the work.

12.2.1 Thermal Stress Relief

In accordance with section 5.7.4. of API 650, when the shell material is Group IV, IVA, V, or VI, all opening connections requiring reinforcement in a shell plate or thickened insert plate more than 13 mm (1/2 in.) thick shall be prefabricated into the shell plate or thickened insert plate, and the prefabricated assembly shall be thermally stress relieved within a temperature range of 600 °C to 650 °C (1100 °F to 1200 °F) for 1 hour per 25 mm (1 in.) of thickness prior to installation.

12.2.2 Repairs to Welds:

In accordance with section 7.4 of API650

All defects found in welds shall be called to the attention of the Employer's inspector, and the inspector's approval shall be obtained before the defects are repaired. All completed repairs shall be subject to the approval of the Employer's inspector. Refer to welding tests section and to API 650 sections related to welding process and verification procedures.

Acceptance criteria are specified in 8.2, 8.4, and 8.5 of API 650, as applicable.

Where repair welding is required, for example as a result of removing temporary attachments, the procedure to be used shall use API 653 and shall be subject to approval by The Engineer.

Circumferential butt welds in nozzles shall be 100% visually examined to ensure complete fusion.

On completion, magnetic particle crack detection shall be carried out where accessible.

13. Painting:

The contractor will be responsible for the specifying and performing the internal lining and external coating for the tanks.

Details of painting requirements will be per painting system specifications and under the supervision provided by the Employer's painting consultant.

For full details of methods, requirements and recommended paint systems refer to ANNEX 6 - Fuel Oil Tanks Coating Specification prepared by Employer's painting consultant.

Specific requirements related to the painting of fire suppression system pipes are found in this document.

Painting of the tanks will include without limitation:

- External painting of full height of tank wall
- External painting of floating roof
- Internal (lower surface) painting of floating roof metal plates with fully sealed welds on the underside of the roof plates.
- Internal painting of tank floor
- Internal painting of tank wall up to a height of 1m from bottom
- Internal painting of the top 2m of tank wall
- Painting of all internal and external fittings and accessories mounted on the tank.
- Internal lining and external coating will be executed on site after erection and hydrostatic testing.

14. Roof

The tanks shall be designed as External Floating Roof (EFRT) type.

Design will allow for the possible future addition of a fixed dome.

Floating Roof shall be of pontoon type. The tank designer shall provide calculations for buoyancy and the strength of self-supporting roofs.

Tank walls will be designed to support a fixed dome roof which may be optionally installed in future. Such fixed dome roof will comply with Appendix G of the API 650 standard and preparation must be made for allowing this future addition in a convenient manner as will be agreed and approved by Employer.

As it is expected that the fixed roof may be added in future it should be treated per requirements of API 650 Annex G, section G.1.3.2 for Existing tanks.

External and internal pad attachments to the tank roof shall be fully seal welded to prevent crevice corrosion.

Minimum thickness of floating roof plates will be 6mm.

Appropriate attachments for roof grounding will be provided by others (by roof vendor).

The Contractor shall be responsible for the prevention of air pollution including installing means for prevention of emissions from the Gauge Pole and from the Roof Legs, including leg socks and/or any other mean as defined in the BREF Integrated Pollution Prevention and Control document issued by European commission.

14.1 Rolling ladder

A rolling ladder for safely accessing the roof top from the peripheral walkway will be designed and built according to API 650 requirements. The ladder will be equipped with all required safety measures including a life-line and anchor lugs.

14.2 Centering and Anti-rotation Devices

A guide pole shall be provided as an anti-rotation device for the floating roof and shall be located near the gauger's platform.

The guide pole shall have all required emission control devices around the well opening where it penetrates the roof.

14.3 Gauging Device

Each roof shall be provided with gauging ports (gauging wells or hatches) with one port located adjacent to the gauger's platform and remote from regions of turbulent flow.

Each tank will be equipped with an ATG (Automatic Tank Gauge) in accordance with the specific information that will be provided to the Contractor. In addition, each tank will be equipped with a mechanical high-high level switch for overfill protection.

14.4 Slotted guide pole gauge wells

The guide pole shall be in accordance to API 650.

Gauging system instrumentation will be provided by Employer.

The Contractor shall be responsible for all necessary design details and all preparations and arrangements for the installation of the gauging system as well as the reference plate at the tank's bottom in coordination with the calibration of the tank.

14.5 Sample Hatches

Sample hatches (dip hatches) shall be:

- NPS 8 pipes projecting at least 150 mm (6 in.) above the roof's outer rim.
- Attached to a non-sparking cap.
- Hinged with latch and lockable cover.
- Flat-face pipe flanged with a full-face gasket at its top, with B16.5 Class 150 bolt pattern.

14.6 Roof Vents

The tank shall be equipped with automatic bleeder vents (vacuum breakers) for normal and vacuum pressure relief all in accordance with the API 650 and API 2000 requirements including considerations for normal and emergency venting

Each compartment (pontoon) shall be vented to protect against internal or external pressure. Vents may be in the manhole cover.

Each automatic bleeder vent (vacuum breaker vent) shall be equipped with a gasketed lid, pallet, flapper or other closure device.

Free and P&V vents shall be provided with single layer coarse mesh screen (minimum distance between centers of wires 6.35mm and wire dia. 0.610mm - smaller holes are not permitted as they can be blocked) to prevent bird nesting and ingestion of large items. The material of the mesh shall be stainless steel, AISI 316 wire and it shall be suitable for maintenance (i.e. removable for cleaning therefore bolted or flanged).

14.7 Roof Manholes:

Roof manholes shall be provided as shown on the drawings and manhole gaskets shall be full faced.

To facilitate the internal inspection of the tank when the manhole cover is removed, roof manholes, including those used for emergency venting, shall be fitted with a removable safety barrier.

Minimum two roof manholes shall be provided. Each manhole shall have a nominal diameter of 30in (762 mm) and shall have a liquid-tight gasketed bolted cover.

14.8 Roof sealing:

The design, purchase and installation of the roof seal shall be according to BAT as defined in the BREF Integrated Pollution Prevention and Control document issued by European commission, and will consist of a Mechanical Shoe Primary Seal and a Rim Mounted Secondary Seal.

14.9 Roof drain:

The design, purchase and installation of the roof drain (flexible or pivot) shall be according to API-650 and sized per relevant rainfall calculation.

15. Storage Tank Foundation & Floor

15.1 Foundations:

The tank foundation will be a concrete ring with secondary sealing and leak detection monitoring. Filling of the space within the foundation ring will be by means of sand or suitable filling material.

The outer elevation of the foundation ring relative to the ground will be 60cm.

A Cathodic Protection system with spiral anodes and reference cells will be installed in the space within the foundation ring as well as all necessary measures for the grounding of tank walls.

Design and construction of the foundation including bund walls, leak detection systems, cathodic protection system and all preparations related to sump will be by others. Full details of the design will be transmitted to the Tank Contractor for his review, including soil surveys, civil engineering drawings and cathodic protection design.

15.2 Bottom Plates:

The floor/bottom plates of the storage tanks are to be sloped to a central sump drain (1% slope) as shown on the preliminary design drawings attached to this specification.

Tank bottom requiring sloping shall have a minimum slope of 1:100 toward center of the tank. The ground preparation under the tank bottom will be coordinated with the civil engineering and construction as needed to fully and correctly support the bottom structure under all operational conditions with suitable sloping matching the tank bottom configuration. This is to include support for the center sump.

Minimum plate thickness for floor plates shall be 10mm.

Minimum thickness of Annular Bottom Plates will be 12mm.

Corrosion allowance of floor plates relative to the minimum thicknesses (standard or calculated) will be 3mm.

The Contractor shall submit a floor layout indicating the arrangement of plates, installation sequence and welding sequence to the Engineer for approval.

The approved welding sequence and other special requirements for welding the floors shall be added to the floor layout drawing.

The Tank Contractor shall carry out dimensional and level/slope control throughout the installation and welding of the bottom. Particular attention shall be paid to level of center sump. It is imperative that center sump remains firmly supported by foundation; tie-downs to the foundation are not permitted.

16. Floating Suction

The inlet nozzle will be equipped with an inner flange suitable for the installation of a floating suction device.

The Contractor will fully design the floating suction and add it to his offer. Design will follow the API 650 standard requirements.

The tank shall be designed to take into account any special requirements of the floating suction, including:

- A compatible flange on the inner shell nozzle (this may need to be flat faced, if the floating suction swivel flange is made from aluminum).
- Any permanent attachments required to support the swivel joint assembly.
- Lugs for the connection of the floating suction restraining wires.

Floating Suction Units (FSU's) shall be designed to withstand operation stresses; in particular:

- FSU shall not collapse, buckle or fail when empty of product, floating and exposed to external pressure caused by full tank head.
- FSU shall not collapse, buckle or fail due to bending caused by the uplift force of a fully submerged float.
- The suction line shall be able to withstand an external pressure 2 x atmospheric pressure.

All seals shall be compatible with the specified fuels.

All bolts and fasteners shall be stainless steel.

Float check cables, retaining cables and fasteners shall be stainless steel.

Plastic coated stainless steel cable shall not be used.

Hoses shall be of an approved type suitable for continuous total immersion in aviation fuel (wetted inside and outside)

Floats shall be prevented from over-rotation - to not strike the floor or tank shell - even with no product in the tank. Floats shall not retain water.

All required venting and draining shall be provided for the FSU with suitable valves and protectors as well as valves and pipework for filling the floating suction arm during commissioning or otherwise.

The Tank Contractor is to source, supply and install the floating suction in accordance with the supplier's installation requirements.

The floating suction shall be designed to withstand the external pressure that would arise if the tank is full of product and the floating suction is full of air.

Floating suction lines using rigid articulated (having one or more swing joints) pipe shall be designed to travel in a vertical plane and prevent damage to the floating roof and the suction line through its design range of travel. These lines shall be designed so that the vertical plane is as close as possible to, and in no case greater than 10 degrees off, a radial line from the tank centerline to the nozzle. Adjustments shall be made to clear internal structures.

17. Fire Protection (Fire Suppression System):

The firefighting system will be installed on the walls and roof of the tank in accordance with Israel Fire Marshal Office directive 511 for tank farms and the NFPA 11 standard for foam systems.

This specification includes the design and recommendations prepared by a certified Fire Protection consultant and, where applicable, approved by the Israel Standards Institute with regard to relevant components.

The detail design of fire protection systems is provided by Employer's consultant and will not be part of the contractor's responsibility. Implementation of the design will be by the Contractor and will be supervised by the Employer's Fire Consultant for approval.

The contractor's scope will include:

- Vertical piping for supply of water and foam from tank ground level to the roof
- Foam generators and Foam ring for supplying sufficient quantity of foam to the foam generators on the tank perimeter
- Cooling water ring upon which sprinklers will be installed
- Manifold for the flushing of the above-mentioned rings

However, it will be noted that he Contractor's battery limit with respect to the fire protection system will be within the confines of the tanks as shown on attached design drawings and will not cover external connective piping or peripheral equipment supporting the firefighting (see also Schedule 1 - EPC Scope of Work & Services).

17.1 Firefighting Foam system

The foam system shall be designed and built for a full surface fire.

The fixed foam discharge outlets shall be mounted above the top of the tank shell with a maximum spacing between discharge outlets as per NFPA 11 table 5.3.5.3.1, but with application rate assuming a full surface fire, i.e. 4.1 litres / per minute /m2

The foam concentrate/water solution supply to each foam generator shall be by riser connected to a solution manifold around the top of each tank.

Two pipe risers located at 180° to each other shall supply the manifold.

The Contractor's scope of supply shall include the solution manifold, and the riser from the base of the tank to the circular manifold.

17.1.1 Firefighting foam supply to roof

The foam system shall be by "over the top" foam generators equally spaced around the top of the tank as illustrated in the NFPA 11 code. Specification for foam generators included in this RFP.

A typical foam dam for a floating roof tank is shown below.

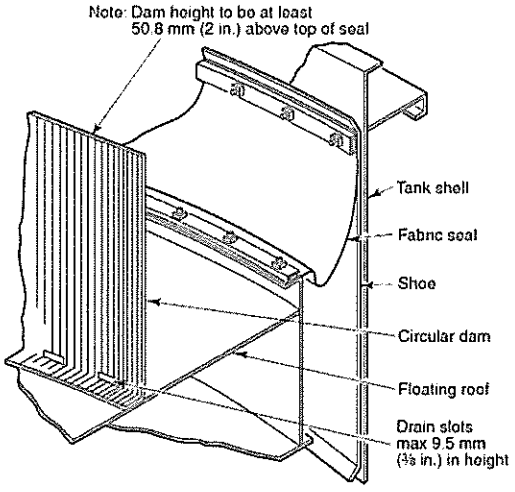


FIGURE 5.3.5.4.5 Typical Foam Dam for Floating Roof Tank Protection.

17.1.2 The foam solution

Foam solution consisting of 3% AFFF foam concentrate in potable water will be piped to a point outside the dike area. A valved pipeline will connect to the base of the riser pipe

connecting to the circular solution manifold to which the fixed foam generators are connected.

The supply of foam solution and all related equipment for providing adequate supply will be the Employer's responsibility.

The riser and manifold are included in the scope of work of the Contractor.

The valved connection from the dike to the riser is excluded from the Contractor's scope of work and will be provided by the Employer.

17.1.3 Foam Generator Specification

The foam system for fire protection will consist of forty eight (8 for each of the 6 tanks) fixed over the top low expansion foam generators and pourer unit.

Contractor shall submit with his proposal for suppliers a list of installations in which similar equipment is in use and will also provide data on tests performed and on actual incidents in which proposed equipment was utilized for intended purpose. Any equipment installed by contractor will be subject to Employer's approval prior to purchase. Local supplier will be preferable for providing convenient maintenance and implementation of warranty obligations.

17.1.3.1 Duty and requirements

- Foam generator and pourer units are to be installed at the top of storage tank shell, for fire protection of stored liquid surface area.
- The unit shall deliver low expansion foam gently into the seal area / liquid surface.
- The design shall ensure that the foam will flow intact onto the inside wall of the tank and from there run down onto the surface area.
- The foam generator shall be designed with a vapor seal to prevent vapors from leaking out in to the pipe.
- The foam generator shall be equipped with a test outlet, designed to test the unit without pouring foam into the tank.
- Minimum foam solution pressure at generator inlet will be 4 barg.
- Foam Solution: The foam solution shall consist of 3% AR-AFFF foam concentrate and 97% potable water.
- Performance: The foam generator shall be designed to supply ,1200 liter/min of pre-mix capacity at minimum inlet pressure of 4 barg.

17.1.3.2 System components

- Deflector, or other arrangement, to ensure delivery of foam to inside the tank wall.
- Inlet ANSI 150# Raised Face flange for connection to foam solution supply piping.
- Vapor seal
- Mesh or other means intended to protect foam outlet against dirt (birds, objects that drift in the wind etc.).
- Test outlets, designed to test the unit without pouring foam into the tank.

17.1.3.3 Connection

The inlet connection flange shall be ANSI B16.5 150# raised face flange.

17.1.3.4 Materials of construction

The materials shall be as per vendor recommendations to fit site conditions.

Prevailing weather conditions are:

- Temperature: Minimum 2 °C - maximum 48 °C
- Average relative humidity: 30%

The minimum material requirements are:

- Body: Stainless Steel
- Internals: Bronze / Stainless Steel
- Flange: Galvanized Steel
- Mesh: Stainless Steel

17.1.3.5 Nameplate

The minimum requirements for nameplate materials are stainless steel grade 316 sheet metal having thickness of 1.59mm (gauge 16) containing the following data:

- Name of manufacturer
- Year of manufacture
- Order number.
- Manufacturers serial or reference number
- Model number
- Performance data

17.2 Exposure cooling system

The exposure cooling system shall provide shell cooling water at a rate of 15 litres per minute per meter of tank circumference.

The sprinklers shall be connected to a circular split manifold at the top of the tank shell. Two pipe risers located at 180° to each other shall supply the manifold. See specification for typical acceptable sprinklers for cooling system attached at the end of this document as attachment A.

The spray nozzles shall remain effective when operating at 75% of the design pressure of the system.

The Tenderer's scope of work includes the risers from the base of each tank to the cooling water manifold.

Each tank shall be fitted with two semi-circular manifolds adjacent to the top of the shell, each connected to open-type sprinklers providing cooling water to half of the tank shell, at a rate of 15 liters/minute per meter of tank circumference.

Each manifold section shall supply cooling water to 180° of the tank circumference. Each section will be connected to an individual riser connected to a valved pipeline with the valve located outside the dike area.

The two manifold sections and risers are included in the Contractor's scope of work.

The valved connection from the dike to the riser is excluded from the Contractor's scope of work and will be provided by the Employer.

17.3 Piping for firefighting system

Pipe fabrication will be in accordance with ANSI B31.3 Chapter V (Fabrication, Assembly and Erection).

Piping for fire suppression system will comply with the following minimum requirements as well as all details shown in the design drawings.

- Material: Carbon steel
- Pressure – temperature rating: 16 barg @ 50°C
- Corrosion allowance: Nil (for galvanized pipe)
- Minimum process line: 1"
- All pipe to be galvanized inside and out.

Where welding of galvanized pipe is required, the welding procedure shall take into account the hazards associated with the welding galvanized surfaces (see OSHA recommendations).

Welding procedure shall be in accordance with AWS specification D-19.0 (Welding Zinc-coated Steel).

Once the weld is completed, any repair of the weld area will be performed using the procedures described in ASTM A780, to complete the corrosion protection on all surfaces.

Piping design and installation shall be in accordance with NFPA 15, sections 5.3, 5.4 and 5.5.

The type of hangers used shall be in accordance with the requirements of NFPA 13.

Pipe wall thickness shall not be less than the thickness specified on piping specification for firefighting system (Attachment E).

Weld connections – Butt welds shall be full penetration.

All pipe connections shall be flanged.

Slip-on flanges shall be both internally welded and hub-welded.

Pipes shall be welded (grooved pipe and fittings shall not be used).

Weld procedures shall be in accordance with API 1104 and as dictated by the Weld Procedure Specification provided by Contractor and approved by Employer.

All pipes will be galvanized inside and out, to EN ISO 1461 or equivalent standard.

Where welded piping is to be galvanized, pipe shall be fabricated into the maximum practical spooled sections and galvanized after fabrication to minimize site welding of galvanized pipe.

All fire suppression system piping is to be painted in accordance with specification for firefighting paint system (Annex 6).

17.4 Calculations

All calculations related to fire systems components, piping and appurtenances will be provided as part of the detailed design performed by Employer's consultant. Contractor will demonstrate that the construction is complying with the parameters dictated by the design.

17.5 Site firefighting foam and water system

The Employer is responsible for the installation of the site firefighting foam and water systems. These systems include potable water storage tank, diesel- and electrical-driven fire water pumps, foam concentrate storage tanks, foam-water proportionators, site piping and deluge valves and the fire suppression control system.

Both foam solution and cooling water will be available at the base of each tank at a pressure of 8 barg and at the required flows for the discharge times specified in the relevant NFPA code.

18. Materials of Construction & Unacceptable Materials

Materials used in the construction of tanks shall conform to the specifications listed in API 650.

Allowed types of steel for all components of the tank will be detailed in the design documents in accordance with the specifications provided under applicable standards. Selection of material will take technical and economic aspects in consideration.

Contractor will make the final selection of material and submit to Employer for approval.

Components requiring hot galvanization, bolts and connectors with the requirements for corrosion protection and types and sizes of all required seals will be designed in accordance with applicable standards.

Only material with a traceable test record/s shall be used.

19. Testing

All testing is to be in accordance with API 650, including all measures to be taken with regard to elements used temporarily for testing purposes and disassembled at the end of testing.

For joints and any other parts that will not be disassembled after testing all components will be the final service parts compliant with all the design requirements.

NDE procedures and certification procedure will be according to API 650 and subject to additional considerations listed herein.

All the testing shall be completed before the application of the internal lining or external corrosion protection systems which may only commence with the written approval of the Engineer.

19.1 Examination and Testing of the Tank Bottom:

Upon completion of welding of the tank bottom, the bottom welds and plates shall be examined visually for any potential defects and leaks. Particular attention shall apply to areas such as sump-to-bottom welds, dents, gouges, three-plate laps, bottom plate breakdowns, arc strikes, temporary attachment removal areas, and welding lead arc burns. Visual examination acceptance and repair criteria are specified in 8.5 of API 650. In addition, all welds shall be 100% tested by Vacuum box test in accordance with section 8.6 of API 650, or equivalent test as described in section 7.3.3 of API 650.

The Tank Contractor shall provide a method statement for the testing process for review and approval of The Engineer.

Following completion of shell and roof construction and prior to the hydrotest, the floor slope shall be proven by pouring 5 liter containers of water on to the annular plates at 1000mm spacing around the circumference and uphill of all floor attachments. The water from each location shall flow freely to the drain sump without the formation of any freestanding puddles. If there is a failure, the floor slope shall be corrected and the test re-performed prior to the hydrotest.

Upon completion of the hydrotest and emptying of the tank a visual examination of the tank bottom shall be performed for verifying that the slopes are maintained and that no puddles remain. If faults are observed, the floor slope shall be corrected.

Corrections after tests shall not decrease the tank's operational volume or contradict any of the design and construction parameters.

19.2 Examination and Testing of the Shell

Complete penetration and complete fusion are required for welds joining shell plates to shell plates. Examination for the quality of the welds shall be made using either the radiographic method specified in 8.1 of API 650 or alternatively, by agreement between the Employer and the Contractor, using the ultrasonic method specified in 8.3.1 (see Annex U). In addition to the radiographic or ultrasonic examination, all welds shall also be 100% visually examined.
Furthermore, the Employer's inspector may visually examine all welds for cracks, arc strikes, excessive undercut, surface porosity, incomplete fusion, and other defects. Acceptance and repair criteria for the visual method are specified in 8.5 of API 650.

After the entire tank and roof structure is completed and prior to painting / coating, the shell shall be tested by Hydrostatic Testing according to API 650.

19.3 Examination and Testing of Sump Welds

Welds of sumps shall be examined visually for any potential defects and leaks. This examination shall be performed before installation and may be conducted in either shop or field. Visual examination acceptance and repair criteria are specified in section 8.5 of API 650.

In addition, all welds shall be leak tested by one or any combination of the methods described in section 7.3.4 of API 650.

The Tank Contractor shall provide a method statement for the testing process for review and approval of The Engineer.

19.4 Examination and Testing of the Roof

In addition to a visual examination roof joints shall be inspected and tested in accordance with section C.4 of API 650.

Where fitted, roof emergency vents shall be tested prior to fitting or may be tested as part of the roof soapy water test.

Deck seams and other joints that are required to be liquid - or vapour-tight shall be examined for leaks by means of penetrating oil or any other method described in API650

The Tank Contractor shall provide a method statement for the testing process for review and approval of The Engineer.

19.5 Joint Tests:

Within the limits of choice permitted by the code, the location for examinations by radiography shall be determined by the contractor and approved by The Engineer's Inspector. Examination shall be made as the work progresses and as soon as practicable after the joints have been welded.

19.5.1 Radiographic Method

X-Ray Radiography shall be used for site inspection unless prior approval is obtained from The Engineer for the use of the test method and its adherence to local rules allowed for such testing.

Radiographic examination is required for shell butt-welds , annular-plate butt-welds and flush-type connections with butt-welds

Radiographic examination shall be performed according to section 8.1 of API 650 .

Except as modified in section 8.1 of API 650, the radiographic examination method employed shall be in accordance with Section V, Article 2, of the ASME *Code*

Welds examined by radiography shall be judged as acceptable or unacceptable by the standards of Paragraph UW-51(b) in Section VIII of the ASME *Code*.

After the completion and acceptance of the tank by The Engineer, all radiographic films and their associated signed records shall be handed over to The Engineer in good condition upon which they will become the sole property of The Employer.

Radiographic inspection (and other NDT) and the cost thereof shall be included in the rates tendered for fabrication.

19.5.2 Magnetic Particle Examination

When magnetic particle examination is specified, the method of examination shall be in accordance with Section V, Article 7, of the ASME Code.

Magnetic particle examination shall be performed in accordance with a written procedure that is certified by the Manufacturer to be in compliance with the applicable requirements of Section V of the ASME Code

The following welds shall be inspected wet magnetic particle inspected with accordance to API 650:

- The shell to bottom plate weld on the inside and outside after each weld pass (alternatively dye penetrant crack detection may be used with the approval of The Engineer).
- Top surfaces of finished butt welds between annular ring plates that will be covered by the tank shell and bottom sketch plates.
- Surfaces of first pass welds joining insert plates to their tank shells.
- Welds of Shell nozzles and flanges
- Weld repairs
- The welds of permanent attachments.
- Areas where temporary attachments are removed

19.5.3 Ultrasonic Examination

Ultrasonic examination may also be used instead of or alongside Radiography for testing of the shell, floor and roof joints. This shall be agreed with The Engineer prior to construction and shall be in accordance with Section 8.3 of API 650 requirements.

The method of examination shall be in accordance with Section V, Article 4, of the ASME Code.

Ultrasonic examination shall be performed in accordance with a written procedure that is certified by the Manufacturer to comply with the applicable requirements of Section V of the ASME Code.

19.5.4 Vacuum Testing

The bottom seams and the shell to bottom plate welds shall be 100% tested by the vacuum box method (in accordance with API 650 section 8.6).

Vacuum testing shall be performed in accordance with a written procedure prepared by the contractor and approved by the inspector.

19.6 Liquid Penetrant Examination

When liquid penetrant examination is specified, the method of examination shall be in accordance with Section V, Article 6, of the ASME Code and API 650.
Liquid penetrant examination shall be performed in accordance with a written procedure that is certified by the Manufacturer to be in compliance with the applicable requirements of Section V of the ASME Code.

19.7 Visual Examination

The Manufacturer shall determine and certify that each visual examiner meets the requirements of API 650 section 8.5.

19.8 Hydro-Testing:

The tank will be water tested in accordance with API 650.

The Contractor shall allow for hold periods for settlement measurements.

Sourcing of water for the test and disposal of the water after use will be provided by the Employer.

The Contractor shall perform all tasks and bear all costs associated with filling the tanks with water including, couplings, hoses, pumps, etc.

On completion, the entire tank shall be free from leaks to the satisfaction of The Engineer's Inspector attested by his written approval.

Roof manholes, vents, and nozzles above water test level shall remain open during hydrotest to prevent over pressurization of the tank.

19.8.1 Hydrostatic Testing Requirements:

All the testing shall be completed before the application of the internal lining or external corrosion protection systems which may only commence with the written approval of the Engineer.

The contractor will use the same water for testing all tanks by transferring it from one tank to another.

All costs associated with the specified testing procedures shall be deemed to be included in the rates tendered including testing, draining and drying of the tanks and appurtenances as well as all required means (couplings, hoses, pumps, etc...) for filling, transferring and disposal of the water for and after hydrotest.

The rate of filling shall not exceed that specified in the procedure and in the design.

The level of water will be monitored by the permanent gauging system of the tank provided by Employer.

The tank shall remain filled with water for a minimum period of at least 24 hours to determine that all joints are leak-proof. The tank may need to remain filled with water for a longer period if foundation settlement is being monitored or if the water has to be retained in the tank until a subsequent tank is ready to carry out a hydrostatic test. As the water may be stagnant in a tank for a relatively long period the use of suitable inhibitors must be considered.

Water temperature shall not be less than 5°C for the duration of the hydrotest.

19.9 Shell and bottom settlement measurement:

Shell and bottom settlement measurement shall be made by The Tank Contractor according to API 650 and API 653 with specific considerations as follows:

Shell settlement measurements shall be made after tank erection, prior to hydrostatic testing and during water filling, at the 1/4, ½, ¾ and at least 24 hours after the tank has been filled to the maximum test height corresponding to the maximum filling height of the tank.

Levels will in any case be in accordance with API 2350.

Settlement measurements shall be taken at equally spaced intervals of approximately 9000mm around the tank shell on well-marked locations on the annular plate or on clips welded to the shell,

Bottom internal measurements shall be made before and after hydrostatic testing. Such measurements shall be made at 3000mm intervals on the diameter,

A 100% visual examination of the tank bottom shall be carried out to detect any localized depressions. The location and extent of depressions shall be indicated on the tank bottom plate layout drawing. Localized depressions that retain water will require repair to eliminate the water trap – to be agreed with the Engineer.

The residual differential settlement after hydro test between the shell and tank centre shall be measured. Any temporary equipment required for this test shall be supplied by The Contractor. All measurements will be performed by a certified surveyor.

The settlements recorded shall be compared against predicted settlement as specified in Annex 7 and shall be submitted to the Engineer for approval.

Faults found with regard to settlement of the tank will be remedied in accordance with API 653 guidelines and directives.

19.10 Testing of Fire Suppression systems

The fire suppression system is comprised of the foam and cooling water sub-systems.

On completion of each sub-system the piping shall be cleaned and blown out to remove all debris and dirt. Following examination and flushing, sections will be hydrostatically pressure tested at a pressure of 200 psi for 2 hours (see NFPA 13).

On completion and following connection to the site firefighting water and foam systems, performance tests shall be carried out by the Employer on both the foam and cooling water systems. The Contractor shall be present during the performance tests and shall make any modifications or additions as may be shown to be required.

19.11 Painting Works Inspection and Examination

The painting work will be inspected at shop and on-site.

Contractor will appoint a professional paint inspector approved by the Employer. Quality control plan of the contractor will include submittal of detailed painting inspection certificates for each tank according to ISO 12944-7.

Complete requirements for the inspection and examination procedure are found in ANNEX 6 - Fuel Oil Tanks Coating Specification.

20. Tank Calibration - Strapping Tables

The tanks shall be calibrated (strapped) by an independent specialist firm appointed by contractor and approved by Employer, to give an accurate relationship between level and volume preferably at 1mm vertical intervals, or alternatively at a maximum of 2mm vertical intervals with interpolation for 1mm.

The standard of calibration shall be according to methodology as will be presented by contractor to the inspector's approval. The generated dipping tables shall be approved and stamped by Employer prior to lamination in clear plastic.

Results of the calibration will demonstrate that he tank is constructed in full compliance with the theoretical dimensions and that its contents correspond with the required operational volume.

The employer retains the right to appoint an additional agent to verify and/or execute the calibration process.

21. Nameplate

The tanks shall be identified by a nameplate according to API 650 (SECTION 10),

The nameplate shall indicate in characters (stamped) not less than 4mm high providing the all information per API 650 section 10.1.1.

Design pressure shall be shown as "atmospheric".

Design temperatures shall be shown in Deg. C

The tanks being multi-purpose for storage of the different products required, the Specific gravity will be shown as the range corresponding to the lowest and highest values.

Suitable markings for thermal stress relief will be applied in accordance with the stress relief method as agreed with Engineer.

The nameplate shall be of corrosion resistant metal and shall be riveted or otherwise permanently attached to an auxiliary plate of ferrous metal which shall be attached to a manhole reinforcing plate by continuous welding all round.

22. Quality Control

Prior to commencement of the works The Contractor shall submit for approval by the Engineer his Quality Control Plan (QCP), all Welding Procedure Specifications (WPS) and Approved Records (WPAR).

The quality control will, as a minimum, comply with the requirements in this RFP and the API 650 standard.

See also information in Schedule 2 for QA/QC.

On completion of the works The Contractor shall certify to the Employer by a letter that the tanks have been constructed in accordance with the applicable requirements of API 650 together with an as built data package which shall include all relevant documentation, drawings and certificates to the satisfaction of the Employer

No separate payment will be made for costs incurred in the preparation and submission of this documentation.

23. Construction Utilities

The Contractor will be responsible to provide his own electrical power supply, telephone lines and water of potable quality for use during the construction period.

Temporary connections may be supplied through PEI for office electrical supply and for daily water usage. However, the Contractor will need to coordinate the utility connection and payments with PEI and utility providers, with the assistance of the Employer.

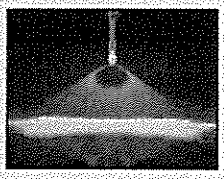
Water for testing of the tanks will be supplied by Employer.

The Contractor shall supply all other services necessary to the execution of the Works.

Attachment A - Specification for Spray Nozzles for Cooling System

FloodJet™ Spray Nozzles, Wide Angle Spray

C



K

1/8" to 1" NPT or BSPT (M)

Features and Benefits

- Wide-angle flat fan spray pattern with uniform distribution and medium impact
- Medium-sized drops
- Unobstructed flow passages minimize clogging
- Precision engineered for dependable, accurate control of deflection and spray angle

C FLAT SPRAY NOZZLES

Optimization Tips

- See page C2 for optimization tips.

See Also

- Accessories
  - Adjustable ball fittings
  - Check valves
  - Jet stabilizers for reduced turbulence
  - Pressure gauges
  - Pressure relief valves
  - Split-eyelet connectors
  - Strainers
  - Swivel connectors

Applications

- Cooling conveyor belts
- Film washing
- Fire suppression/prevention
- Foam knockdown
- Spray agitation
- Spraying eliminator plates
- Water curtain

Dimensions and Weights

Standard	Nozzle Type	Orifice Dia. Nom. (in.)	Length (in.)	Hex (in.)	Net Weight (oz.)
	K (M)	1/8	1	7/16	1/2
		1/4	1-7/32	9/16	1
		3/8	1-3/4	11/16	2
		1/2	2	7/8	4
		3/4	2-9/16	1-1/2	14
		1	3-5/8	1-7/8	32

Based on largest/heaviest version of each type.

Materials

Material	Material Code	Nozzle Type K
Brass	(none)	•
303 Stainless Steel	SS	•
316 Stainless Steel	316SS	•
Polyvinyl Chloride	PVC	•

Other materials available upon request.

Ordering Info

STANDARD SPRAY NOZZLE

1/8	K	–	SS	2
Inlet Conn.	Nozzle Type		Material Code	Capacity Size

BSPT connections require the addition of a "B" prior to the inlet connection.

C

FloodJet™ Spray Nozzles, Wide Angle Spray

FLAT SPRAY NOZZLES

Performance Data

K

*At the stated pressure in psi.

Inlet Conn. (in.)						Capacity Size	Equiv. Orifice Dia. (in.)	Capacity (gallons per minute)*									Spray Angle (°)*		
1/8	1/4	3/8	1/2	3/4	1			3	5	7	10	15	20	30	40	60	7	20	60
•						.25	.017	–	–	–	–	.03	.04	.04	.05	.06	–	83	117
•						.50	.023	–	–	–	–	.06	.07	.09	.10	.12	–	89	122
•						.75	.029	–	–	–	.075	.09	.11	.13	.15	.18	–	106	125
•						1	.033	–	–	–	.10	.12	.14	.17	.20	.24	–	103	128
•						1.5	.040	–	–	.13	.15	.18	.21	.26	.30	.37	73	103	125
•	•					2	.047	–	–	.17	.20	.24	.28	.35	.40	.49	83	113	129
•	•					2.5	.052	–	.18	.21	.25	.31	.35	.43	.50	.61	98	122	133
•	•					3	.057	–	.21	.25	.30	.37	.42	.52	.60	.73	86	112	126
•						4	.066	–	.28	.33	.40	.49	.57	.69	.80	.98	97	123	132
•	•					5	.074	.27	.35	.42	.50	.61	.71	.87	1.0	1.2	114	128	142
•	•					7.5	.091	.41	.53	.63	.75	.92	1.1	1.3	1.5	1.8	101	119	134
•	•					10	.105	.55	.71	.84	1.0	1.2	1.4	1.7	2.0	2.4	115	133	145
•	•					12	.115	.66	.85	1.0	1.2	1.5	1.7	2.1	2.4	2.9	128	139	153
•	•					15	.128	.82	1.1	1.3	1.5	1.8	2.1	2.6	3.0	3.7	98	113	123
•	•					18	.140	.99	1.3	1.5	1.8	2.2	2.5	3.1	3.6	4.4	106	120	131
•	•					20	.148	1.1	1.4	1.7	2.0	2.4	2.8	3.5	4.0	4.9	110	122	133
	•					22	.155	1.2	1.6	1.8	2.2	2.7	3.1	3.8	4.4	5.4	113	125	136
	•					24	.162	1.3	1.7	2.0	2.4	2.9	3.4	4.2	4.8	5.9	115	131	144
	•					27	.172	1.5	1.9	2.3	2.7	3.3	3.8	4.7	5.4	6.6	119	135	146
		•				30	.181	1.6	2.1	2.5	3.0	3.7	4.2	5.2	6.0	7.3	100	110	121
		•				35	.196	1.9	2.5	2.9	3.5	4.3	4.9	6.1	7.0	8.6	105	119	128
		•	•			40	.208	2.2	2.8	3.3	4.0	4.9	5.7	6.9	8.0	9.8	111	126	136
		•				45	.222	2.5	3.2	3.8	4.5	5.5	6.4	7.8	9.0	11.0	115	130	140
			•			50	.234	2.7	3.5	4.2	5.0	6.1	7.1	8.7	10.0	12.2	117	131	140
			•			60	.256	3.3	4.2	5.0	6.0	7.3	8.5	10.4	12.0	14.7	120	134	142
			•			70	.277	3.8	4.9	5.9	7.0	8.6	9.9	12.1	14.0	17.1	123	137	146
			•			80	.296	4.4	5.7	6.7	8.0	9.8	11.3	13.9	16.0	19.6	127	138	149
				•		90	.317	4.9	6.4	7.5	9.0	11.0	12.7	15.6	18.0	22	120	133	140
				•		100	.334	5.5	7.1	8.4	10.0	12.2	14.1	17.3	20	24	123	136	145
				•		110	.350	6.0	7.8	9.2	11.0	13.5	15.6	19.1	22	27	125	138	148
				•		120	.366	6.6	8.5	10.0	12.0	14.7	17.0	21	24	29	126	143	150
				•		140	.395	7.7	9.9	11.7	14.0	17.1	19.8	24	28	34	118	127	135
				•		160	.423	8.8	11.3	13.4	16.0	19.6	23	28	32	39	121	130	137
				•		180	.448	9.9	12.7	15.1	18.0	22	25	31	36	44	124	133	139
				•		210	.484	11.5	14.8	17.6	21	26	30	36	42	51	126	139	145
					•	300	.579	16.4	21	25	30	37	42	52	60	73	110	128	135
					•	450	.709	25	32	38	45	55	64	78	90	110	118	132	138

Annex 2 – Standards

Project 2462
TENDER DOCUMENTATION

For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

ANNEX 2

Project Standards and Specifications

	15/5/22	Tender Version			C.A. EIL
P2	27/3/19	For approval	V.A	M.SH	
P1	26/2/19	For approval	V.A	M.SH	
P0	30/1/19	For comments	V.A	M.SH	
Rev.	**Date**	**Description**	**By**	**Checked**	**Client Approved**

Contents

1. GENERAL

The various units will be designed, fabricated, erected and tested according the Standards and Specifications listed below which shall be used in all phases of the project .

The list refers mainly to the most common codes and standards and are not exhaustive. Contractor will be responsible for adding to the list any standards that may be relevant to the design and construction, subject to Employer's prior approval.

It is noted that the leading standards are API 650 and the Israeli Standard 4468 part 2. Should any conflict or differences exist between the two standards the more stringent approach between the two will always be the one used for the design.

The Contractor may propose, for particular, limited cases (economical reason, cases not covered by listed codes and standards., etc...) alternative equivalent standards, subject to Employer's or Engineer's approval.

All exceptions to the listed codes and standards shall be proposed by the Contractor to the Employer or Engineer for advance approval with the submission of his technical bid. No exceptions will be accepted after the order is made effective.

The exception to be suitable for the Employer's consideration must be caused by one of the following reasons:

- improvement of design
- standardization of components
- other reason presented by Contractor with proper justification

Contractor shall ensure that vendors and sub-contractors will be acquainted with the relevant specifications which apply to his scope of work and will fully comply with them.

For all laws, codes and standards mentioned in the list, reference must be made to the latest edition existing at the date of contract award, unless otherwise indicated.

All Project Documentation shall be designed in accordance with local standards, for obtaining valid approvals and permits by local Authorities if and where applicable.

All procured and installed equipment has to be in accordance with local standards (or International standards accepted by Local authorities).

All employees on site must comply with local safety standards as minimum.

2. LIST OF STANDARDS & SPECIFICATIONS

Item/Discipline	Standard/code
Tanks	API 650 - : Welded Tanks for Oil Storage SI 4468 part 2
Pressure Vessels	ASME Section VIII Div.1
Safety	API RP-500A, IP, NFPA Local Regulation
Piping and Fittings	ASME B16.5 Pipe Flanges and Flanged Fittings ASME B16.47 : Large Diameter Steel Flanges ASME B16.9 Factory-made Wrought Steel Butt Welding Fittings ASME B16.10 Face-to-face and end-to-end Dimensions of Valves ASME B16.34 : Forged Steel Fittings, Socket Welding and Threaded API 5L – 41st Edition : Specification for Line Pipe ANSI B 31.3 Process Piping Guide ASME B16.21 : Nonmetallic Flat Gaskets for Pipe Flanges ASME B16.20 : Metallic Gaskets for Pipe Flanges
Valves	API 6D : Specification for Pipeline Valves API 598 : Valve Inspection and Test ASME B16.34 : Valves-Flanged, Threaded and Welding End
Safety Valves	API RP-520, RP-521
Pressure Relief Systems	API 526 and 527 ASME VIII DIV. I ANSI B31.3
Water Pollution Air Pollution Soil & Groundwater Pollution	EPA and EU Regulation (96/61/EC;91/692/EC; 94/66/EC; 99/13/EC;96/82/EC;91/689/EC;76/464/EC;200/60/EC) and the regulations arising there from; Dutch List; Local regulation whichever is the more stringent.
Noise	EPA and EU Regulation
Painting	ISO 8501.01, ASTM
Fire protection	NFPA 11, Standard for Low, Medium and High Expansion Foam NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection NFPA 16, Standard for the Installation of Foam-Water Sprinklers and Foam-Water Spray Systems NFPA 30, Flammable and Combustible Liquids Code
Area Classification	IEC 60079; API RP 505; local regulation Equipment and materials to be installed in hazardous area shall be in line with ATEX 95 (ATEX 100 A).

Materials	ASME, ASTM, ISO, EN, API 5L, DIN, EU
Welding	API 1104 : Standard for Welding Pipelines and Related Facilities API 650 - : Welded Tanks for Oil Storage ASME Section VIII Div.1 : Pressure Vessels ASME B16.9 : Factory-made Wrought Steel Butt Welding Fittings ASME B16.34 : Forged Steel Fittings, Socket Welding and Threaded ASME Section IX : Welding procedures and welders certification Welding and Brazing Qualifications ASME Section V: Non-destructive examination (NDE)

Annex 3 - Inspection & Test Plan (ITP)

LUDAN Engineering Israel Ltd	Project 2462 ANNEX 3 - INSPECTION AND TEST PLAN (ITP)	ENERGY INFRASTRUCTURES

Customer:	EIL	Unit:	0		
Location:	ESHEL ISRAEL	Doc.No.:	ANNEX 3		
Project:	TK CONSTRUCTION OF STORAGE TANKS	Page No.:	3 of 3	Rev.:	P1

- Each activity will need to be approved as successfully executed by signature of Employer or Contractor representative as applicable

CLASS:	TYPE: Vertical Tanks for Oil Products with External Floating Roof	MR: -
	INSPECTION LEVEL	

STAGE	ACTIVITIES DESCRIPTION	1		Approvals		
				Name of approver	Date	Signature
BEFORE FABRICATION	Preinspection Meeting	H				
	Suborders Check	R				
	Welders and N.D.E. operators qualifications	R				
	Welding consumable certificates	R				
	Material test certificates	R				
	Inspection of sub-ordered components	W				
	N.D.E. on raw materials	W				
DURING FABRICATION	Check of the correct assignment of the materia	H				
	Marking transfer	W				
	Fit-up	W				
	Tank bottom and sump welds check	W				
	Tank Shell and roof welds check	W				
	Weld repairs (if any)	H				
	Intermediate N.D.E.	W				
	External and internal visual and dimensional ch	H				
	PWHT - Check of positioning of the pieces, loc	H				
	X-Rays inspection	R				
	Final N.D.E.	W				
	Hardness test of welds	H				
	Mechanical test of production coupons	H				
	PMI	H				
FINAL TEST	Spark test	W				
	Pneumatic test	W				
	Internal and external visual check	H				
	Dimensional check	H				
	Hydraulic test	W				
	Settlement measurements					
	Tank Calibration (strapping)	W				
	Nameplate check & marking	W				
	Surface preparation/painting check	W				
	Loose material check	W				
DOCUMENTATION	Detail Drawings and calculations	H				
	Quality Control Manufact. Dossier check	H				
	Copies of all test reports	R				

LUDAN Engineering Israel Ltd

Project 2462
ANNEX 3 - INSPECTION AND TEST PLAN (ITP)

ENERGY INFRASTRUCTURES

Customer:	EIL	Unit:	0
Location:	ESHEL ISRAEL	Doc.No.:	ANNEX 3
Project:	TK CONSTRUCTION OF STORAGE TANKS	Page No.:	2 of 3 Rev.: P1

- THE «ITP» IS A GUIDELINE DEFINING THE EXTENT OF CONTRACTOR AND OWNER/OWNER REPRESENTATIVE FOR ALL INSPECTION LEVELS
- TYPE AND EXTENT OF TESTS SHALL COMPLY WITH CODES AND/OR ORDER SPECIFICATIONS

CLASS:	TYPE:	MR:
	Vertical Tanks for Oil Products with External Floating Roof	-

STAGE	ACTIVITIES DESCRIPTION	INSPECTION LEVEL 1	2	3	4	5	REQ. OF CERTIF	APPLICABLE DOCUMENTS AND REMARKS
BEFORE FABRICATION	Preinspection Meeting	H					-	
	Suborders Check	R					-	For main materials and/or activities complete with all the technical attachments
	Welders and N.D.E. operators qualifications	R					YES	
	Welding consumable certificates	R					YES	
	Material test certificates	R					YES	Type EN 10204-3.1 minimun for main components MTC for plates
	Inspection of sub-ordered components	W					-	To verify correct marking against certificates, surface condition, thickness, etc.
	N.D.E. on raw materials	W					YES	If required
DURING FABRICATION	Check of the correct assignment of the materials and relevant certificates	H					YES	As soon as assigned to the specific item - Location map is requested
	Marking transfer	W					-	
	Fit-up	W					-	To verify correct application of welding and fabrication procedure and bevels preparation
	Tank bottom and sump welds check	W					YES	As soon as available
	Tank Shell and roof welds check	W					YES	As soon as available
	Weld repairs (if any)	H					YES	To be recorded
	Intermediate N.D.E.	W					YES	Joints, welds and weld repair tests
	External and internal visual and dimensional check	H					YES	Before PWHT
	PWHT - Check of positioning of the pieces, location of thermocouples and calibration of the necessary devices	H					YES	Only if heat treatment required. Recorded chart and calibration certificate is requested
	X-Rays inspection	R					YES	Film review - Location map is requested
	Final N.D.E.	W					YES	Per agred test plan according to API 650 (radiographic and Magnetic Particle)
	Hardness test of welds	H					YES	Per WPS and API 650 Annex L
	Mechanical test of production coupons	H					YES	
	PMI	H					YES	Only if specifically required (see also Annex L)
	Paint and coating surface preparation	H					-	Supervised by paint consultant
	Paint and coting spot checks	W					-	Supervised by paint consultant
FINAL TEST	Spark test	W					YES	For non metallic lining
	Pneumatic test	W					YES	For reinforcing pads.
	Internal and external visual check	H					-	
	Dimensional check	H					YES	As built sketch to be provided
	Hydraulic test	W					YES	
	Settlement measurements							
	Tank Calibration (strapping)	W					YES	
	Nameplate check & marking	W					-	Copy on the Quality Control Manufact. Dossier
	Surface preparation/painting check	W					YES	
	Loose material check	W					YES	To check correspondence and quantity of loose materials as spares, internals (if not installed) etc.
	Paint and coating examination	H					YES	Supervised by paint consultant
DOCUMENTATION	Detail Drawings and calculations	H						Per API 650 Annex W and contract terms
	Quality Control Manufact. Dossier check	H					-	
	Copies of all test reports	R						

- THE «ITP» IS A GUIDELINE DEFINING THE EXTENT OF CONTRACTOR AND OWNER/OWNER REPRESENTATIVE FOR ALL INSPECTION LEVELS
- TYPE AND EXTENT OF TESTS SHALL COMPLY WITH CODES AND/OR ORDER SPECIFICATIONS

EQUIPMENT DESCRIPTION:	Vertical Tanks for Oil Products with External Floating Roof	
CRITICALITY RATING:	INSPECTION LEVEL: **1** (1)	MR CODE:
VENDOR:	INSPECTION AUTHORITY:	
REMARKS:		

1. SCOPE

This Inspection and test plan is an engineering document which defines for each type of equipment:

- The type and extent of Contractor and Employer/Employer Representative involvement in each phase of fabrication, control and testing requiring an inspection.
- The resulting Suppliers contractual obligations, in accordance with applicable Project General Purchase Conditions.

Note: The inspection and test plan may under no circumstances be used as a substitute for the Suppliers Quality Control Plan.

2. DEFINITION OF PEI INVOLVEMENT

The nature of PEI involvement is indicated against each activity of fabrication and testing by means of the letters, H, W and R the meaning of which is the following:

H: (Hold) Point

The Supplier cannot carry out the specified controls and tests without Inspector attendance.

Consequently, the attendance to witnessing is mandatory. The Supplier must notify PEI by e-mail of the dedicated inspection activity at least fifteen (15) days in advance.

The Supplier cannot deviate from this rule unless written approval has been given by PEI.

The approval for such activity will be by Employer signature.

W: (Witness)

The Supplier must notify PEI of the dedicated inspection activity at least fifteen (15) days in advance. PEI representative witnessing is not mandatory, but optional. When a percentage value is indicated (i.e. W 10%) the inspection activities will be witnessed on spot basis as per percentage indicated.

If PEI representative choses not to be present, the Supplier may proceed with his own inspection, provided controls and tests records are made available to Inspector for review.

PEI and/or its authorized representative shall have the right to inspect equipments at any time during fabrication and tests to be assured that the equipments materials and workmanship are in accordance with the specification

The approval signature for such activity will be by Employer if witnessed or Contractor if Employer chose not to attend

R: (Review) - Review of Documents

The Supplier has either to submit to Inspector for comments the documents required prior to the performance of the dedicated activity or to transmit or make available for the review of Inspector the results of the controls and tests conducted, as the case may be.

The approval for such activity will be by Employer signature.

3. SUPPLIER'S FABRICATION AND QUALITY CONTROL PLAN

- The Supplier must issue a Fabrication Methodology and Quality Control Plan for the construction process.
- The Supplier's Fabrication Methodology and Quality Control Plan will define in a chronological manner the list of the operations of fabrication, controls and tests in accordance with his own "know-how" and with the requirements specified by the design.
- Following information shall be clearly specified against each operation:
  - Reference documents (drawings, procedures, etc.)
  - Acceptance criteria (code, etc.)
  - Recording documents for controls and tests
  - Involvement of the Quality Control department of the Supplier and/or his subsupplier

This Supplier's Fabrication Methodology and Quality Control Plan will have to include all inspection activities defined in Inspection and Test Plan as will be agreed prior to commencemenet of works. Inspection activities scheduled by an Independent Inspection Authority and/or the Employer will apply.

- For equipment of inspection levels 1, 2 and 3, the Supplier's Fabrication and Quality Control Plan will have to be submitted compulsory to PEI for comments before the pre-inspection meeting is held.
- Inspection level assumed for this ITP is Level 1

Annex 4 - Definitions and Abbreviations

Project 2462
TENDER DOCUMENTATION

For The Provision Of
Engineering, Procurement & Construction (EPC) Services
Storage Tanks Construction Project

ANNEX 4

Definitions and Abbreviations

	15/5/22	Tender Version			C.A E.i.L
P1	26/3/19	For approval	V.A	M.SH	
P0	13/3/19	For comments	V.A	M.SH	
Rev.	**Date**	**Description**	**By**	**Checked**	**Client Approved**

Contents

1. DEFINITIONS

The following terms are used throughout this RFP per the definitions listed below.

Project	Lump Sum Turn Key provision of 6 new vertical storage tanks at PEI's Eshel Terminal site
Employer	PEI
Engineer	PEI representative in charge of technical aspects of the Project
Inspector	Person assigned by the Engineer for supervising and approving inspection processes
Owner	PEI
Contractor	The selected turn key contractor that is responsible for engineering, procurement, construction and commissioning of 6 new vertical storage tanks at PEI's Eshel Terminal site.

2. LIST OF ABBREVIATIONS

The following abbreviations are used throughout this RFP:

BOQ	Bill of Quantities
BOM	Bill of Materials
BAT	Best Available Techniques
BL	Battery Limit
BREF	Best Available Techniques Reference Document
EFRT	External Floating Roof Tank /Type
EHS	Environment Health & Safety
EIA	Environmental Impact Assessment
EPC	Engineering Procurement & Construction
FSU	Floating Suction Unit
ITP	Inspection & Test Plan
JV	Joint Venture
LSTK	Lump Sum Turnkey
MPI	Magnetic Particle Inspection
MTC	Mill Test Certificate
NDA	Non-Disclosure Agreement
NDE	Non-Destructive Examination
NDT	Non-Destructive Test
NTP	Notice to Proceed
OEM	Original Equipment Manufacturer
PMI	Positive Materials Identification
PQR	(Welding) Procedure Qualification Record
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
PEI	Petroleum & Energy Infrastructure Ltd.
PWTR	Post Weld Thermal Relief
RFP	Request for Proposal
TOFD	Ultrasonic Time of Flight Diffraction
WPS	Welding Procedures Specification

WPAR	Welding Procedure Approval Record
WQTR	Welder Qualification Test Record

Annex 5 – Data Sheet (API 650 Annex L)

API	API Std 650 Storage Tank Data Sheet	Data Sheet Status: Page 1 of 8

* For boxes marked with *, if blank, Mfr. shall determine and submit as per Annex L. For all lines, see Annex L for line-by-line instructions.

GENERAL Special Documentation Package Requirements: _____

Measurement Units to be used in API Std 650: SI ☒ US Customary ☐

1. Manufacturer* _____ Contract No.* _____
   Address* _____
   Mfg. Serial No.* _____ Year Built* _____ Edition & Addendum to *API 650** Edition 12, Addendum 3
2. Purchaser ENERGY INFRASTRUCTURES LTD. Contract No. _____
   Address Hasadnaot 3, Herzlia, Israel
   Tank Designation T 551- T 556
3. Owner/Operator ENERGY INFRASTRUCTURES Location Eshel Facility near Be'er Sheva
4. Size Limitations* _____ Tank Diameter* 54m ID. Shell Height* 25.100 m - To Be Calculated by Contractor
   Capacity: Maximum* 50000m3+overfill Net Working* _____ Criteria:* API 2350, API 650
5. Products Stored:
   Liquid Lead free gasoline (+MTBE)/Diesel / Engine Gas Oil/Heating Gas Oil/ Jet fuel/Kerosene Design Specific Gravity: 0.850 at 15 C °
   Minimum Design Specific Gravity: 0.720 at 15 °C
   Blanketing Gas N.A. Vapor Pressure _____ PSIA at Max. Operating Temp.
   % Aromatic 35% v/v Suppl. Spec. _____ H_2S Service? Yes ☐ No ☒ Suppl. Spec. _____
   Other Special Service Conditions? Yes ☒ No ☐ Suppl. Specs. MTBE -15% in volume (15% v/v) See remarks 23.1+23.2

DESIGN AND TESTING Purchaser to Review Design Prior to Ordering Material? Yes ☒ No ☐

6. Applicable API Standard 650 Appendices:* A ☐ B ☐ C ☒ F ☐ G ☐ H ☐ I ☐ J ☐ L ☒ M ☐ O ☐ P ☐ S ☐ U ☐ V ☐ W ☒
7. Max. Design. Temp. 45 °C Design Metal Temp.* 15 °C Design Liquid Level* 23475 mm - To Be Calculated by Contractor
   Design Internal Pressure _____ Design External Pressure _____ Internal Pressure Combination Factor _____
   External Pressure Combination Factor _____ Maximum Fill Rate 1000m3/hr Maximum Emptying Rate 1000m3/hr
   Flotation Considerations? Yes ☐ No ☒ Flot. Suppl. Spec:* _____ Applied Supplemental Load Spec. _____
8. Seismic Design? Yes ☒ No ☐ Annex E ☒ Alternate Seismic Criteria SI 413 & Soil report / Geophysical report Seismic Use Group 3
   MBE Site Class _____ Vertical Seismic Design? Yes ☒ No ☐ Vertical Ground Motion Accelerator A_v: 67% SDS
   Basis of Lateral Acceleration (Select one): ☒ Mapped Seismic Parameters? S_s ✓ S_1 ✓ S_0 ____; ☒ Site-Specific Procedures?: MCE
   Design Required? Yes ☒ No ☐; ☐ Other (Non-ASCE) Methods _____
   ☒ Freeboard Required for SUG I Design Roof Tie Rods @ Outer Ring?* Yes ☐ No ☒
9. Wind Velocity for non-U.S. sites, 50-yr wind speed (3-sec Gust)* SI 414
   Top Wind Girder Style* _____ Dimensions* b=800 mm (min) Use Top Wind Girder as Walkway? Yes ☒ No ☐
   Intermediate Wind Girders?* Yes ☐ No ☐ Intermediate Wind Girder Style* _____ Dimensions* _____
   Check Buckling in Corroded Cond.? Yes ☒ No ☐
10. Shell Design: 1-Ft Mthd?* Yes ☒ No ☐ ; Variable-Des-Pt Mthd?* Yes ☐ No ☐ Alternate ☐; Elastic Anal. Mthd?* Yes ☐ No ☐ Alternate
    Plate Stacking Criteria* Centerline-Stacked? Yes ☐ No ☐ Flush-Stacked? Yes ☒ No ☐ Inside ☒ Outside ☐
    Plate Widths (Shell course heights) and Thicknesses * Numbers below Indicate Course Number.
    1. _____ 2. _____ 3. _____ 4. _____ 5. _____
    6. _____ 7. _____ 8. _____ 9. _____ 10. _____
    11. _____ 12. _____ 13. _____ 14. _____ 15. _____
    Joint Efficiency* 0.85 % Shell-to-Bottom Weld Type* inside&outside corner fillet Shell-to-Bottom Weld Exam Mthd* VE & MT/PT/VB
    Exceptions to Seal-welded Attachments (see Section 5.1.3.7): Intermittent welding is not permited

Approvals:	Revisions: P1	Title: T-551-556
		By: Y.G. Ck'd: M.SH. Date: 20.06.2022
		Drawing No.: Sheet 1 of 8

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* If box is blank, Manufacturer shall determine and submit as per Annex L.

11. Open-Top and Fixed Roofs: (See Sheet 6 for Floating Roofs) Open Top? * Yes ☒ No ☐
Fixed Roof Type* See remark 23.3 Roof Support Columns*: Pipe ☐ Or Structural Shape ☐ _____
Cone Slope* _____. Dome or Umbrella Radius* _____ Weld Joints* _____ (Lap, Butt, Other)
Seal Weld Underside of: Lap-Joints? Yes ☐ No ☐; Seal Weld Underside of Wind Girder Joints? Yes ☒ No ☐
Gas-tight? Yes ☐ No ☐ Joint Efficiency* _____%
Thickness* _____In. Snow Load * _____ App. Suppl. Load Spec.* _____ Column Lateral Load _____
Normal Venting Devices* _____ Emergency Venting Devices* _____
Free Vents in Areas Where Snow and Ice May Block Vent* _____
For Non-Frangible Roofs: Seal Weld Roof Plates to Top Angle on the Inside? Yes ☐ No ☐ ; Weld rafters to Roof Plates Yes ☐ No ☐
Roof-to-Shell Detail* _____ Radial Projection of Horizontal Component of Top Angle* Inward ☐ Outward ☐

12. Bottom: Thickness* 10/12 mm Style* Cone down to center Slope* 1%. Weld Joint Type* Single-welded full-fillet lap joint & ????
Provide Drip Ring? Yes ☐ No ☒ Alternate Spec. _____
Annular Ring? Yes ☒ No ☐ Annular Ring: Minimum Radial Width* _____ Thickness* 12 mm

13. Foundation: Furnished by* Others - See remark 23.4 Type* Concrete ring wall
Soil Allow. Bearing Pressure* _____ Per Spec.* _____ Anchors: Size* _____ Qty* _____
Foundation Design Loads: Base Shear Force: Wind* _____ Seismic* _____ Overturning Moment: Wind* _____ Seismic* _____\
Ring Forces: Weight of Shell + Roof New* _____ Corroded* _____ Roof Live Load* _____ Internal Pressure* _____
Partial Vacuum* _____ Wind* _____ Seismic* _____ Hydrotest Exemption design per 7.3.6, Item 2) a) _____
Bottom Forces: Floor Wt. New* _____ Corroded* _____ Product Wt.* _____ Water Wt.* _____ Internal Pressure* _____
Partial Vacuum* _____ Other Foundation Loads* _____ Min. Projection of Fdn. Above Grade: _____

14. Exemption from hydrotest? Yes ☐ No ☒ Responsibility for Heating Water, if Required: Purchaser ☐ Manufacturer ☐
Hydro-Test Fill Height* Max designed Settlement Measurements Required? Yes ☒ No ☐ Extended Duration of Hydro-Test: _____
☐ Predicted Settlement Profile is Attached
Application of coating on weld joints shall be performed after hydrostatic testing is performed, unless otherwise specified to be
☐ before hydrostatic testing is performed.
Responsibility for Setting Water Quality: Purchaser ☒ Manufacturer ☐ Supplemental Test Water Quality Spec. _____
Test Water Source & Disposal Tie-In Locations TBD Hydro-Test Annex J Tank? Yes ☐ No ☐
Post-Pressure-Test Activities Required of the Manufacturer: Broom Clean ☒ Potable Water Rinse ☒ Dry Interior ☒
Other ☐ Per 7.3.6.2 (4,5,6,7)

15. Inspection by TBD in Shop; Purchaser in Field
Supplemental NDE Responsibility _____ Supplemental NDE Spec. _____ (Purch., Mfg., Other)
Positive Material Identification? Yes ☒ No ☐ PMI Requirements: Per QA specification
Max. Plate Thickness for Shearing per 6.1.2
Must Welds not exceeding 6 mm (1/4 in.) Be Multi-Pass? Yes ☒ No ☐ Must Welds greater than 6 mm (1/4 in.) Be Multi-Pass? Yes ☒ No ☐
Leak Test Mthd: Roof* per C.4 Shell* hydrostatic test Shell Noz./Manhole Reinf. Plt.* Pneumatic pressure test per 7.3.5
Bottom* Vacuum box test per 7.3.3 Floating Roof Components* per 7.3.6 per C.4
Modify or Waive API Dimensional Tolerances (see 7.5)? No ☒ Yes ☐ Specify: _____
Specify Additional Tolerances, if any, and Circumferential and Vertical Measurement Locations:
- Allowable Plumbness: _____ Measure and Record at a Minimum of ____ Locations or Every ____ m (ft) around the Tank, at the Following Shell Heights: (select one box): ☐ 1/3 H, 2/3 H and H ☐ Top of Each Shell Course ☐ Other: _____
- Allowable Roundness: ** _____ Measure Radius and Record at a Minimum of _____ Locations or Every _____ m (ft) around the Tank, at the Following Shell Heights (select one box):

☐ Top of Tank, H ☐ 1/3 H, 2/3 H and H ☐ Top of Each Shell Course ☐ Other: _____

**See Data Sheet Instructions for the Maximum Allowable Additional Radial Tolerance.

Approvals:	Revisions: P1	Title: T-551-556
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16. Coatings:
Internal Coatings by: manufacturer Per Spec.* Attached
(Not Req'd., Others, Tank Mfg.)
External Coating by: manufacturer Per Spec.* Attached
(Not Req'd., Others, Tank Mfg.)
Under-Bottom Coating by: _____ Per Spec.* _____
(Not Req'd., Others, Tank Mfg.)

17. Cathodic Protection System? Yes ☐ No ☒ Per Spec.* See remark 23.5

18. Leak Detection System? Yes ☐ No ☒ Per Spec.* See remark 23.6

19. Release Prevention Barrier? Yes ☐ No ☐ Per Spec.* See remark 23.6

20. Tank Measurement System: Required? Yes ☐ No ☒ Type: Float and tape gauge _____

Servo gauge: _____ Hydrostatic gauge: _____ MTG multifunction gauge: _____ Other gauge: _____

Remote Capability Required? Yes ☐ No ☐
By:* _____ Per Spec.* See remark 23.7

21. Weight of Tank: Full of Water* _____ Empty* _____ Shipping* _____ Brace/Lift Spec.* _____

22. References*: *API Std 650, Annex L*

23. Remarks*: General: These data sheets are intended to be a supplement to all other requirements presented in the tender (contract) documents, and the information given in these data sheets would not derogate or change in no case any other requirements presented in all the other tender (contract) documents.

23.1 Other service conditions - HON (Hazardous Organic National Emission Standart for Hazardous Air Pollutant) - Clean Air Directives-2011.
23.2 Other service conditions - Demands and Procedures of Ministry of Environment for the Reduction and Treatment of Emission from storage tanks within the Permits of Emission to air, 2015.
23.3 Fixed Roof - The design will take into account that in the future a fixed roof of aluminium geodesic dome may be installed on the tanks.
23.4 Concrete ring wall will be designed and constructed by others. General drawings of the foundations enclosed (see Annex X7).
23.5 Cathodic Protection - under bottom active cathodic protection system was designed and will be constructed by others. General drawings of the of the installation of the system enclosed with the tender documents (see Annex 8)
23.6 Leak detection system and release prevention barrier - will be designed and constructed by others as part of the foundations design and construction, see remark 23.4 above.
23.7 Tank measuring system - based on automatic tank gauging (ATG) Instrumentation (servo type produced by "Enraf") will be installed in the tanks by others. The system is composed of continuous liquid level measurement gauge, temperature gauging system and electro-mechanical proximity level switch. The contractor will be responsible for the detailed design and installation of mounting accesories for the system such as: diameter adaptor for the ATG on the guide pole, 2" steel pipe for thermowell for the thermal gauge connected outside to the guide pole, mounting of the electro-mechanical level swich in place, installation of Datum plate.

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* If box is blank, Manufacturer shall determine and submit as per Annex L.

TABLE 1 MATERIALS OF CONSTRUCTION

Component	Material*/Thickness*	C.A.	Component	Material*	C.A.
Shell, Course 1 to 1	A-537 Cl.1 or equivalent	3	Reinforcing Pads	A-537 Cl.1	2
Shell, Course 2 to 11	A-537 Cl.1 or equivalent	2	Manhole/Nozzle Necks	A-106 Gr.B	2 (Sch. 80)
Shell, Course __ to __			Manhole/Nozzle Flanges	A-105	2
Shell, Course __ to __			Flange Covers	A-105/A537 Cl.1	2
Shell, Course __ to __			Anchor Attachments		
Roof	A-516 Gr.70 or equivalent		Submerged Piping	A-106 Gr.B	2
Bottom		3	Wetted Structurals		+
Annular Ring		3	Non-wetted Structurals		+

+ Check here if C.A. is to apply to each exposed surface ☐.

TABLE 2 BOLTS AND ANCHORS

Component	Head Type*	Bolt or Anchor Material*	Nut Material*	Thread Series*	C.A.
Flange Bolting	Stud bolts	SA 193 B7	SA 194 H-2		++
Structural Bolting					++
Anchor Bolts					++

++ Total C.A., on the nominal diameter.

TABLE 3 NOZZLE AND MANHOLE SCHEDULE* (for Fixed Roof, Shell, and Bottom) Acc. to nozzle drawing

Mark	Service	Size, NPS, or Dia. (In.)	Minimum Neck Sch or Wall Thick.	Reinf. Plate Dimensions	Full Pen. On Open. (Y/N)	Flange Type	Flange Class or Thick.	Gasket Bearing Surf. Dimen. and Finish	Gasket Thick. and Dimen.	Gasket Mat'l. and Descript.	Proj. to FF or CL or from Datum Lines
A	INT	16	80			R.F.	150				
B, B1	OUT	18	80			R.F.	150				
C	RFD	min.4	80			R.F.	150				
D	WTD	6	80			R.F.	150				
D1	WTD	1.25	80			R.F.	150				
G1-8	FOG	4									
M1,2,5	MNH	36	80			R.F.	API				
SP	SPR	8	80			R.F.	150				
W	FSF	1	80			R.F.	150				

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* If box is blank, Manufacturer shall determine and submit as per Annex L.

OTHER TANK APPURTENANCES

24. Platform, Stairway, and Railing: Galvanizing Req'd?* Yes ☒ No ☐ Stairway Style* Straight&Helical (Straight or Helical) Walk Surf. Type* Grating

Handrail height (if required)* (30 in.–38 in.) SI 1142, SI 14122 part 4 Tread rise/run* SI 1142, SI 14122 part 4

Stair and Walkway Clear Width* _____ National Safety Standards* _____

Architectural/Structural Specification* _____

Material Specification(s): _____

Gauger's Platform Req'd? Yes ☒ No ☐ Qty Req'd.* 1 Per Spec. * _____

25. Jacket Required?* Yes ☐ No ☒ Other Heaters/Coolers Required?* Yes ☐ No ☒

Supplemental Jacket, Heater, or Cooler Specifications* _____

26. Mixer/Agitator: Quantity N.A. Size* _____ Per Spec.* _____

27. Insulation: Required? Yes ☐ No ☒ Thickness* _____ Material* _____

Per Specs* _____ Responsibility for Insulation and Installation _____ (Purchaser, Manufacturer, Others)

28. Structural Attachments: Lift Lugs?* Yes ☒ No ☐ Desc.* For manholes

Shell Anchorage?* Yes ☐ No ☒ Type* _____ Scaffold Cable Support? Yes ☐ No ☒

29. Various Other Items: Welded Flush-Type: Shell Connection ☐ Cleanout Fitting ☐ Waive Application of Annex P? Yes ☒ No ☐ TBC

Miscellany #1 _____ Miscellany #2 _____

Miscellany #3 _____ Miscellany #4 _____

Miscellany #5 _____ Miscellany #6 _____

TABLE 4 OTHER TANK APPURTENANCES*

Mark	Quantity	Service or Description	Size	Orientation	Height from Datum	Material	Remarks
TRW	1	Thermowell	2"	on guide pole			Thermowell - see remark 23.7
FLS	1	Suction Arm		on A noz.			Suction ARM- See Spec.
FSM	1	Floor Sump	See draw.	Center			Sump-See dwg.
		Inspection hatches on roof					
							For suction Arm- See draw.
		Piping Detailes	(Inlet D, diffusers,draw-offs, etc.)				
		Grounding clips	x4				

Approvals:	Revisions: P1	Title: T-551-556
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* If box is blank, Manufacturer shall determine and submit as per Annex L.

FLOATING ROOF DATA

30. **Floating Roof Selection**

Design Basis: Annex C ☒ Or Annex H ☐

Type of Roof: (External or Internal): Single Deck Pontoon* ☒ Double Deck* ☐

(Internal Only): Tubular Pontoon* ☐ Metallic Sandwich Panel* ☐

Other ☐ _____ Supplemental Spec.: _____

31. **Seals**

Primary Seal: Shoe ☐ Envelope ☐ Wiper/Compression Plate ☐ Other ☒ Liquid mounted mechanical shoe seal Supplemental Spec: Best Available Tech.(BAT) See remark 23.2

Shoe Mechanism: Mfg. Std. ☐ Other ☐ _____

Electrically Isolate Mechanism from Shoes? Yes ☐ No ☐ Wax Scrapers Required? Yes ☐ No ☒

Minimum Shoe Thickness* _____ Carbon Steel Shoes to be Galvanized? Yes ☐ No ☐

Secondary Seal: Shoe ☐ Envelope ☐ Wiper ☐ None ☐ Other ☒ Rim mounted Supplemental Spec: BAT

32. **Data for All Floating Roofs:** TBC by vendor

Overflow Openings in Shell Acceptable? Yes ☐ No ☒ Shell Extension? Yes ☐ No ☐

Roof-Drain Check Valves Required? Yes ☒ No ☐ Roof-Drain Isolation Valves Required? Yes ☒ No ☐

Freeze Protection for Roof Drains Required? No ☒ Yes ☐ Supplemental Requirements: _____

Roof-Drain Piping to External Nozzles: Mfg. Std. ☐ Armored Flexible Pipe ☒ Swivels in Rigid Pipe ☐ Other ☐ _____

Foam Dam? Yes ☒ No ☐ Supplemental Spec. _____

Minimum Deck Thickness* 6 mm

Bulkhead Top Edges to be Liquid-Tight? Yes ☒ No ☐ Seal-weld Underside of Roof? Yes ☒ No ☐

Electrical Bonding: Shunts: Yes ☒ No ☐ Cables: Yes ☒ No ☐ Supplemental Spec. _____

Qty of Non-Guide-Pole Gauge Wells Required 1* Qty of Sample Hatches Required 3 * Thermowell 2" pipe

Guide Pole for Gauging? Yes ☒ No ☐ Slots in Guide Pole? Yes ☒ No ☐ Datum Plates? Yes ☒ No ☐ Striking Plates? Yes ☐ No ☐

Guide Pole Emissions-Limiting Devices: Sliding Cover ☐ Pole Wiper ☐ Pole Sleeve ☒ Float ☐ Float Wiper ☐ Pole Cap ☐

Qty. of Roof Manholes* 2 on deck 28 on pontoons Alternative High-Roof Clearance Above Bottom: 2 m

Alternative Low-roof Clearance Above the Highest Obstruction and the Floating Roof: 1.5 m

Removable Leg Storage Racks? Yes ☐ No ☐ ; Leg Sleeves ☒ or Fixed Low Legs ☐ +steel pads

33. **Additional Data for External Floating Roofs:**

Weather Shield? Yes ☒ No ☐ Suppl. Spec. by seal vendor

Rolling Ladder Req'd? Yes ☒ No ☐ Field Adjustable Legs? Yes ☐ No ☐

Design Rainfall Intensity 33.8 ~~in/hr~~ (mm/hr) Based on a 60 Minute Duration Associated with the 10 year Storm

Design Accumulated 24-Hour Rainfall 250 ~~in~~ (mm) Based on the 100 year Storm

Out-of-Service Drains Required? Yes ☒ No ☐ Supplemental Specification _____

Distortion and Stability Determinations Required? Yes ☒ No ☐ Supplemental Specification _____

Landed Live Load* _____

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		By: Y.G.	Ck'd: M.SH.	Date: 20.06.2022
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34. **Additional Data for Internal Floating Roofs:**

Two-Position Legs? Yes ☐ No ☐ Cable-Supported Roof? Yes ☐ No ☐ Fixed-Roof Inspection Hatches Required?: Yes ☐ No ☐

Internal Roof Drain Required? Yes ☐ No ☐ Omit Distribution Pads Supporting Uniform Live Loads? Yes ☐ No ☐

Corrosion Gauge Required? Yes ☐ No ☐ Fixed Ladder Required?: Yes ☐ No ☐ ; Type of Roof Vent: *_____

Modified Minimum Point Load? Yes ☐ No ☐ Supplemental Specification _____

Mfr. to Leak Test * ___ % of Compartments ☐ in Assembly Yard ☐ in Erected Position ☐ Unknown; see separate contract terms

Roof Erector's Flotation Test: w/ tank hydro ☐ at completion of roof ☐ at later date ☐ _____ Not required ☐

Flotation Test Media: Water ☐ Product ☐ (see H.6.6.1) Water Quality: Potable ☐ Other ☐ See Supplemental Spec _____

Flotation Test: Duration _____ Fill Height: _____

Flotation Test Items provided by Purchaser (see H.6.7): None ☐ List Attached ☐

Responsible Party for Inspecting Roof during Initial Fill: Purchaser ☐ Other ☐ _____

TABLE 5 FLOATING ROOF MATERIALS

Component	Material*/Thickness*	C.A./Coating*	Component	Material*/Thickness*	C.A./Coating*
Deck Plate			Datum Plate		
Inner Rim Plate			Tubular Pontoon		
Outer Rim Plate			Pontoon Bulkhead		
Foam Dam			Submerged Pipe		
Sandwich Panel Face Plate			Guide Pole		
Sandwich Panel Core			Secondary Seal		
Gauge Well			Secondary Seal Fabric		
Drain Sumps			Wiper Tip		
Opening Sleeves			Wax Scraper		
Floating Suction Lines			Weather Seal		
Primary Fabric Seal			Envelope Fabric		
Foam Log Core			Shoe Mechanisms		
Landing Legs			Primary Seal Shoe		
Landing Leg Bottom Pads			Removable Covers		
Manhole Necks			Rolling Ladder		
Vents			Inlet Diffusers		

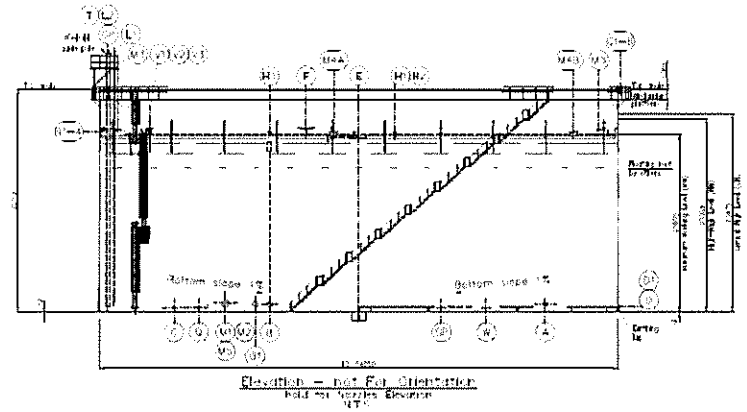
Approvals:	Revisions: P1	Title: T-551-556		
		By: Y.G.	Ck'd: M.SH.	Date: 20.06.2022
		Drawing No.:	Sheet 7 of 8	

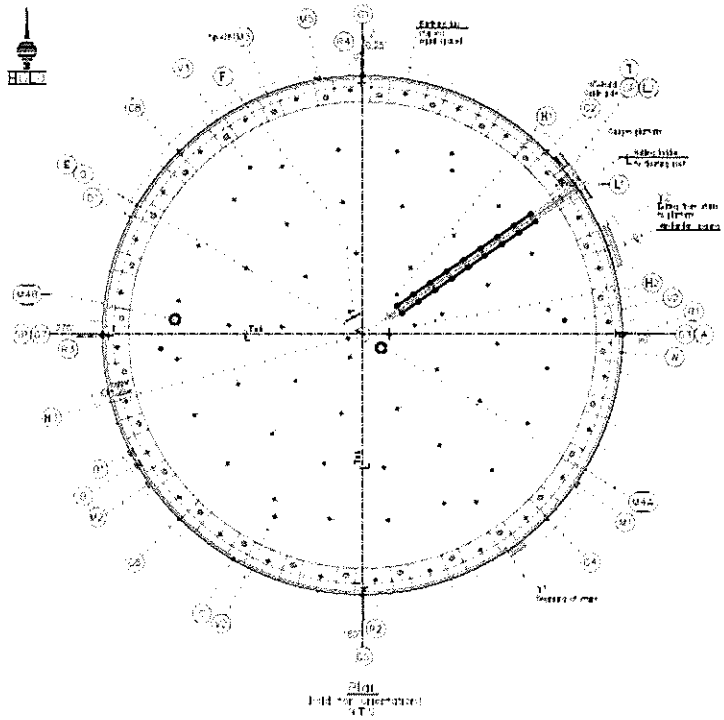
API	API Std 650 Storage Tank Data Sheet	Page 8 of 8

* If box is blank, Manufacturer shall determine and submit as per Annex L.

Tank Plan and Sketches:

(See also attached drawings: 07-2462-DRG-001, 07-2462-DRG-002, 07-2462-DRG-003, 07-2462-DRG-004, 07-2462-DRG-005, 07-2462-DRG-010, 07-2462-DRG-011)





Notes:

Approvals:	Revisions: P1	Title: T-551-556		
		By: Y.G.	Ck'd: M.SH.	Date: 20.06.2022
		Drawing No.:	Sheet 8 of 8	

Annex 6 – Fuel Oil Tanks Coating Specification

25 February 2019

Project 2462
TENDER DOCUMENTATION
ANNEX 6

Re: <u>Fuel Oil storage tanks coating systems</u> ©
<u>Storage tanks construction project</u>

General

1. This document is for the coating specifications of internal lining and external coating systems for six Fuel Oil tanks in the project of storage tanks construction at Eshel.
2. Annex A is for Tambour / International coating systems.
   Annex B is for Nirlat / PPG coating systems.
   Annexes A2 & A3 are paint specifications for external coating of galvanized pipes (e.g. - fire extinguishing pipes).
   The contractor may submit for approval alternative equivalent paint systems fulfilling the coating systems requirements in addition to the above coating systems.
3. Internal lining and external coating will be executed on site after erection.
4. Metal Finish before painting will be as follows:
   Welds inside the tanks will be finished according to NACE RP 0178 "D".
   All steel surfaces shall be free of all welding spatter, welding slag, undercuts, visible pores and visible end craters. Surface of all welds will be smooth (i.e. - fully dressed). All edges shall be rounded with a radius of not less than 2 mm.

Coating systems requirements

5. Fuel oil – Storage tanks internal surface, expected durability > 25 years.
   The internal lining will be compatible to fuel storage tanks containing: Diesel fuel, Jet-fuel, and Unleaded gasoline with MTBE-ETBE and/or Methanol or B.T.X (Benzene, Toluene, and Xylene).
6. Fuel oil – Storage tanks external surface, expected durability > 25 years acc. ISO 12944-5:2018.
   Environment: Corrosion category acc. ISO 12944-2:2018, C4 (VH), Fuel Oil.
7. If alternative equivalent coating systems will be proposed by the Contractor for approval, they should include accredited laboratory test results certificates for high resistance to the above fuel oils and reference list of at least 6 years of a successful service, with approvals of qualified laboratories and actual testing by recognized fuel-oil companies.

Quality Control and Documentation

1. The painting work will be inspected at shop and on-site.
   Contractor will appoint professional paint inspector approved by the Company.
   Quality control of the contractor will submit detailed painting inspection

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certificates for each tank according to ISO 12944-7. Color shades shall be according to PEI specification and instructions.

2. QC/QA – QC procedure shall be performed and controlled by the Contractor in cooperation with the coatings supplier. The Contractor will submit Quality Plan (ITP) for the storage tanks construction project that will also include all surface preparation and painting activities and paint inspection.
   The Contractor QC department and the paint inspectors will have adequate and calibrated equipment for testing the paint work.
3. Competent and certified coating personnel shall be employed by the Contractor in sufficient numbers to ensure that coating related activities, including testing, are adequately inspected for conformance to the coating specifications and procedures.
4. Coating inspectors shall have a sound knowledge of surface preparation and coating processes and possess the knowledge and skills to carry out the tasks stated in the approved Quality Plan (ITP) that will be submitted by the Contractor, including the following:
   a. Routine inspections and checks on site and/or at Contractor premises in a systematic and timely manner.
   b. Production and maintenance of accurate records and reports.
5. Coating inspection reports for each tank will include daily reports and final paint inspection certificates with the following information and testing:
   a. Coatings brand name + Batch number for part A and Part B, shelf life, as well as names of thinner used.
   b. Information on painting process and equipment.
   c. Time of application and time between layers.
   d. Surface preparation testing. (cleanliness, roughness, salt and dust levels)
   e. Environmental conditions testing.
   f. Coating DFT measurements acc. SSPC PA2 (or ISO 19840).
   g. Curing testing by the MEK Double Rub Test.
   h. Holiday detector testing per NACE RP 0188 or ASTM D5162 for the internal lining.
   i. Pull off test for adhesion acc. ISO 4624 shall be carried out on separate test panels painted in parallel to the tanks painting process. Thickness of steel test panels shall be 5 mm.
      The minimum pull-off strength for the coatings will be 5 MPa, when using automatically centered test equipment
6. The paint inspector should have the knowledge and experience in performing these tests and in preparing professional paint inspection reports.
7. Coating repairs will be carried out with the original coating systems.

Dr. Ami Markfeld,
Painting, Materials & Corrosion Consultant

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Attachment:
Annex A - Tambour - fuel oil tank painting specifications.
Annex B - Nirlat - fuel oil tank painting specifications.

Annex A – "Tambour" Tanks Paint Specifications

A1- Internal lining – FUEL OIL – Storage Tanks, internal surface (welded at site)

Tank bottom: for tank bottom and extending 1,500 mm above from tank bottom. Application - on site **Floating roof:** for floating-roof underside and 1,000 mm below top most plates. Application - on site.	Carbon steel tanks with operating temperature wet < 60 ^{0}C
Prefabrication primer: Application at shop. A weldable zinc ethyl silicate prefabrication primer Interplate 937 may be used as temporary corrosion protection to protect during fabrication/transportation if required by logistical reasons. Interplate 937 dry film thickness: 15-25 µm. Before internal lining the surface should be re-blasted to remove all prefabrication primer according to paint manufacturer instructions.	

Surface preparation
Degreasing: (SSPC SP 1 solvent cleaning) - High pressure water cleaning. Wipe with a cloth saturated with Thinner 1-32, and then drying the surface with a dry cloth or spray oil remover ECOCLEAN 2230 of GES, accompanied by rinsing with fresh water until a neutral pH.
Cleanliness (ISO 8501): Minimum Sa 2.5, free of visual and non-visual contaminations like dust, oil, grease, condensation and salts.
Roughness (ISO 8503): Grade Medium G (50-90 µm, R_{y5}). Angular abrasives.
Dust Control by Transparent Tape (ISO 8502-3): Dust degree 1.
Soluble Salt Test (ISO 8502-9): Maximum conductivity corresponding to 20 mg/m^2 NaCl or 14 mg/m^2 Cl^-. Maximum conductivity 4 µS/cm.

Paint manufacturer: International / Tambour

Paint system			NDFT µm	Over-coating interval		Dry to touch	Color RAL	Gloss
No.	Product name	Type of coat		min.	max.			
1	Interline 982	Epoxy holding primer (SBV 30%)	25-40	24 hrs	21 days	1 hrs	Red oxide	N/A
2	Interline 984	Solvent free epoxy Phenolic tank lining	440	12 hrs	28 days	6 hrs	White, Yellow Light green	N/A

Total nominal dry film thickness: 475 µm + Stripe coats applied by brush to all welds, corners, behind angles, edges and areas not fully reachable by spray.
Measurement and 90/10 acceptance criteria for DFT per ISO 19840 (or SSPC PA2).

Notes:
1. Manufacturer instructions should be followed closely.
2. Do not apply the paint at steel temperature less than 3°C above the dew point.
3. Apply stripe coat of Interline 984 at 120 µm on edges and all welds by brush, minimum 20 mm on each side of edge/weld.
4. No thinner should be added to Interline 984.
   Thinning and/or diluting of the product Interline 984 are strictly forbidden.
   Induction period of Interline 982 is 30 minutes.
   Induction period of Interline 984 - None.
5. Use heavy duty single feed airless spray equipment, preferably 60:1 pump ratio and suitable high pressure hoses. The length of the hoses should be as short as possible.
6. Perform holiday detection according to ASTM D5162 Test Method A - Low voltage wet sponge testing at 90 V (or Test Method B - High voltage spark testing at max 1,500 V).
7. Data are at 24 ^{0}C and 65% R.H.
8. **Documentation**: A certified paint inspection report will be submitted by the paint contractor quality control department in accordance with ISO 12944-7.

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A2 - External coating - Storage tanks external + structural steel, steel pipes, supports and components (Exterior Areas)

External coating. Medium exposure. Structural steel work (C4/VH) Tank exterior + structural steel, steel pipes, supports and components (Exterior Areas)	Carbon steel structures with operating temperature < 90 ^{0}C (dry heat).
Prefabrication primer: Application at shop. A weldable zinc ethyl silicate prefabrication primer Interplate 937 may be used as temporary corrosion protection to protect during fabrication/transportation if required by logistical reasons. Interplate 937 dry film thickness: 15-25 µm. Before prefabrication primer is over coated the surface should be cleaned and sweep-blasted according to paint manufacturer instructions.	

Surface preparation

Degreasing: (SSPC SP 1 solvent cleaning) – High pressure water cleaning. Wipe with a cloth saturated with Thinner 1-32, and then drying the surface with a dry cloth or spray oil remover ECOCLEAN 2230 of GES, accompanied by rinsing with fresh water until a neutral pH area.
Cleanliness (ISO 8501): Sa 2.5 free of visual and non-visual contaminations like dust, oil, grease, condensation and salts.
Roughness (ISO 8503): Grade Medium G (50-85 µm, R_{y5}). Angular abrasives.
Dust Control by Transparent Tape (ISO 8502-3): Dust degree 1.

Paint manufacturer: Tambour **C4/VH per ISO 12944-5: 2018**

Paint system			NDFT µm	Over-coating Interval @ 25C		Dry to touch	Color RAL	Gloss
No.	Product name	Type of coat		min.	max.			
1	Zinc rich epoxy SSPC (842-100)	Zinc rich epoxy (50% SBV)	70	6 hrs	21 days	20 minutes	grey	Mat
2	Ecopoxy 80 MIO	High solid epoxy (78% SBV)	150	5-8 hrs	30 days	2 hrs	Light grey RAL 7035 / Off-white	Mat to Satin
3	Tamaglass PE	Aliphatic-polyester Polyurethane topcoat (50% SBV)	50	16 hrs	30 days	4 hrs	RAL 9016 White	Satin

Total nominal dry film thickness: 270 µm + Stripe coats applied by brush to all welds, corners, behind angles, edges and areas not fully reachable by spray.
Measurement and 90/10 acceptance criteria for DFT per ISO 19840 (or SSPC PA2).

Notes:

1. Manufacturer instructions should be followed closely.
2. The zinc rich epoxy will contain 80% zinc by weight in the dry film. Remove zinc salts.
3. Do not apply the paint at steel temperature less than 3°C above the dew point.
4. Apply stripe coats for each layer of Ecopoxy 80 MIO with 20% dilution of thinner 4-100 at 60-70 µm on edges and welds by brush, minimum 20 mm on each side of edge/weld.
5. Application conditions (winds, distance of spray gun from infrastructure, thinning) should be adjusted for maximal reduction of over spray.
6. Each layer including stripe coats will be in a different shade.
7. PU top coat will be applied in one or two layers to get uniform shade and full coverage.
8. Data are at 24 ^{0}C and 65% R.H.

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9. **Documentation**: A certified paint inspection report will be submitted by the paint contractor quality control department in accordance with ISO 12944-7.

A3 - External coating of galvanized pipes (e.g. - Fire Extinguishing) + structural galvanized steel, galvanized pipes, galvanized supports and components (Exterior Areas).

Tambour option

1. The chemical composition of the steel will be suitable for hot-dip galvanizing with Si≤0.030%, P≤0.024%, and Si + 2.5P≤0.090%.
   Hot Dip Galvanizing will be performed according to I.S 918 or ISO 1461
2. The paint system will be adequate for corrosivity category C4/VH (for Very High durability) as defined in ISO 12944-5: 2018.
3. Surface preparation: Degreasing with Ecoclean 2230 detergent and water rinse / wash to remove all residual detergent, and then sweep blasting to roughness of 25-40 µm with ultrafine non-metallic and chloride free grits (0.2 mm - 0.8 mm, e.g. Eurogrit A1).
4. The paint system:
   i. Epoxy primer for HDG, Epogal @ 50 µm.
   ii. Epoxy intermediate Ecopoxy 80 MIO @ 140 µm.
   iii. Polyurethane top-coat Tamaglass PE @ 50 µm, Satin.
   Total NDFT: minimum 240 micron above the HDG + Stripe coats by brush on edges, welds and areas not accessible for spraying.

Notes:
- PU top coat will be applied in one or two layers to get uniform shade and full coverage.
- Manufacturer instructions should be followed closely.

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Annex B – Nirlat Tanks Paint Specifications

B1- Internal lining - FUEL OIL - Storage Tanks, internal surface (welded at site)

Tank bottom: for tank bottom and extending 1,500 mm above from tank bottom. Application - on site **Floating roof:** for floating-roof underside and 1,000 mm below top most plates. Application - on site.	Carbon steel tanks with operating temperature wet < 65 ^{0}C
Prefabrication primer: Application at shop. A weldable zinc ethyl silicate prefabrication primer SIGMAWELD 199 may be used as temporary corrosion protection to protect during fabrication/transportation if required by logistical reasons. SIGMAWELD 199 dry film thickness: 15-25 µm. Before internal lining the surface should be re-blasted to remove all prefabrication primer according to paint manufacturer instructions.	

Surface preparation

Degreasing: (SSPC SP 1 solvent cleaning) – High pressure water cleaning. Wipe with a cloth saturated with Thinner 1-32, and then drying the surface with a dry cloth and/or spray oil remover ECOCLEAN 2230 of GES, accompanied by rinsing with fresh water until a neutral pH.

Cleanliness (ISO 8501): Minimum Sa 2.5, free of visual and non-visual contaminations like dust, oil, grease, condensation and salts.

Roughness (ISO 8503): Grade Medium G (50-90 µm, R_{y5}). Angular abrasives.

Soluble Salt Test (ISO 8502-9): Maximum conductivity corresponding to 20 mg/m^2 NaCl or 14 mg/m^2 Cl^-. Maximum conductivity 4 µS/cm.

Paint manufacturer: PPG / Nirlat

Paint system			NDFT µm	Over-coating interval		Dry to touch	Color RAL	Gloss
No.	Product name	Type of coat		min.	max.			
1	Sigmaguard 260	Phenolic epoxy novolac holding primer. 68% SBV	50-75	8 hrs	30 days	3 hrs	Pink	Egg shell
2	Novaguard 840	Solvent free novolac phenolic epoxy	415	24 hrs	30 days	6 hrs	Light green, cream	Gloss

Total nominal dry film thickness: 475 µm + Stripe coats applied by brush to all welds, corners, behind angles, edges and areas not fully reachable by spray.

Measurement and 90/10 acceptance criteria for DFT per ISO 19840 (or SSPC PA2).

Notes:

1. Manufacturer instructions should be followed closely.
2. Do not apply the paint at steel temperature less than 3°C above the dew point.
3. Apply stripe coat of Novoguard 840 at 120 µm on edges and welds by brush, minimum 20 mm on each side of edge/weld.
4. The temperature of the mixed base and hardener should preferably be at least 20°C.
5. No thinner should be added to Novaguard 840. Thinning and/or diluting of the Novaguard 840 product are strictly forbidden.
6. Induction period of Sigmaguard 260 is 10 minutes.
   Induction period of Novaguard 840 - None.
7. Use heavy duty single feed airless spray equipment, preferably 60:1 pump ratio and suitable high pressure hoses. The length of the hoses should be as short as possible.
8. Minimum over coating time with NG840 at 30°C – 24 hours.
9. Maximum over coating time with NG840 at 30°C – 1 month.
10. Perform holiday detection according to ASTM D5162 Test Method A - Low voltage wet sponge testing at 90 V (or Test Method B – High voltage spark testing at max 1,500 V).

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11. Data are at 24 ^{0}C and 65% R.H.
12. **Documentation**: A certified paint inspection report will be submitted by the paint contractor quality control department in accordance with ISO 12944-7.

B2 - External coating - Storage tanks external + structural steel, steel pipes, supports and components (Exterior Areas)

External coating. Medium exposure. Structural steel work (C4/VH) Tank exterior + structural steel, steel pipes, supports and components (Exterior Areas).	Carbon steel structures with operating tempera < 90 ^{0}C (dry heat).
Prefabrication primer: Application at shop. A weldable zinc ethyl silicate prefabrication primer SIGMAWELD 199 may be used as temporary corrosion protection to protect during fabrication/transportation if required by logistical reasons. SIGMAWELD 199 dry film thickness: 15-25 µm. Before prefabrication primer is over coated the surface should be cleaned and sweep blasted according paint manufacturer instructions.	

Surface preparation

Degreasing: (SSPC SP 1 solvent cleaning) – High pressure water cleaning. Wipe with a cloth saturated with Thinner 1-32, and then drying the surface with a dry cloth or spray oil remover ECOCLEAN 2230 of GES, accompanied by rinsing with fresh water until a neutral pH area.
Cleanliness (ISO 8501): Sa 2.5 free of visual and non-visual contaminations like dust, oil, grease, condensation and salts.
Roughness (ISO 8503): Grade Medium G (50-85 µm, R_{y5}). Angular abrasives.
Dust Control by Transparent Tape (ISO 8502-3): Dust degree 1.

Paint manufacturer: Nirlat C4/VH per ISO 12944-5: 2018

Paint system			NDFT µm	Over-coating interval		Dry to touch	Color RAL	Gloss
No.	Product name	Type of coat		min.	max.			
1	Amercoat 68 G (66% SBV)	Zinc rich epoxy primer	70	5 hrs	2 months	2.5 hrs	Reddish grey	Flat
2	Epoxy-kol MIO (82% SBV)	High solid, surface tolerant epoxy	150	6-8 hrs	30 days	4.5 hrs	Light grey RAL 7035	Semi-Gloss
3	Niroglass (52% SBV)	Aliphatic-polyester polyurethane topcoat	50	6-8 hrs	30 days	0.5 hrs	RAL 9016 White	Satin

Total nominal dry film thickness: 270 µm + Stripe coats applied by brush to all welds, corners, behind angles, edges and areas not fully reachable by spray.
Measurement and 90/10 acceptance criteria for DFT per ISO 19840 (or SSPC PA2).

Notes:

1. Manufacturer instructions should be followed closely.
2. The zinc rich epoxy will contain 80% zinc by weight in the dry film. Remove all zinc salts before over-coating.
3. Do not apply the paint at steel temperature less than 3°C above the dew point.
4. Apply stripe coats of Epoxy-kol MIO for each layer with 20% dilution of thinner 4-100 at 60-70 µm on edges and welds by brush, minimum 20 mm on each side of edge/weld.
5. Application conditions (winds, distance of spray gun from infrastructure, thinning) should be adjusted for maximal reduction of over spray.
6. Each layer including stripe coats will be in a different shade.
7. PU top coat will be applied in one or two layers to get uniform shade and full coverage.
8. Data are at 24 ^{0}C and 65% R.H.
9. **Documentation**: A certified paint inspection report will be submitted by the paint contractor quality control department in accordance with ISO 12944-7.

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B3 - External coating of galvanized pipes (e.g. - Fire Extinguishing) + structural galvanized steel, galvanized pipes, galvanized supports and components (Exterior Areas)

Nirlat Option

1. The chemical composition of the steel will be suitable for hot-dip galvanizing with Si≤0.030%, P≤0.024%, and Si + 2.5P≤0.090%.
   Hot Dip Galvanizing will be performed according to Israeli Standard I.S 918 or ISO 1461
2. The paint system will be adequate for corrosivity category C4/VH (for Very High durability) as defined in ISO 12944-5: 2018.
3. Surface preparation: Degreasing with Ecoclean 2230 detergent and water rinse/wash to remove all residual detergent, and then sweep blasting to roughness of 25-40 µm with ultrafine non-metallic and chloride free grit (0.2 mm - 0.8 mm, e.g. Eurogrit A1).
4. The paint system:
   i. Epoxy primer for HDG, HB55 (red oxide) @ 50 µm.
   ii. Epoxy intermediate Epoxy-kol MIO, high build @ 140 µm.
   iii. Polyurethane top-coat Niroglass @ 50 µm, Satin.

   Total NDFT: minimum 240 micron above the HDG + Stripe coats by brush on edges, welds and areas not accessible for spraying.

Notes:

- PU top coat will be applied in one or two layers to get uniform shade and full coverage.
- Manufacturer instructions should be followed closely.

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Annex 7 – Civil guide and base design

Contents

1. The Geotechnical Report No. 6-2018-10R Eng, G.Y.A. – Soil and Foundation Engineering, 04 April 2019
2. The Design Response Spectrum, The Geophysical Institude of Israel, July 2018
3. Civil Engineering Drawings: Drawing No. 208 – details of tank foundations in soft soil.
   Drawing No. 209 – detail of tank foundations in rock.

ENERGY INFRASTRUCTURES

The Geotechnical Report (English version)

No. 6-2018-10R Eng

G.Y.A. – Soil and Foundation Engineering

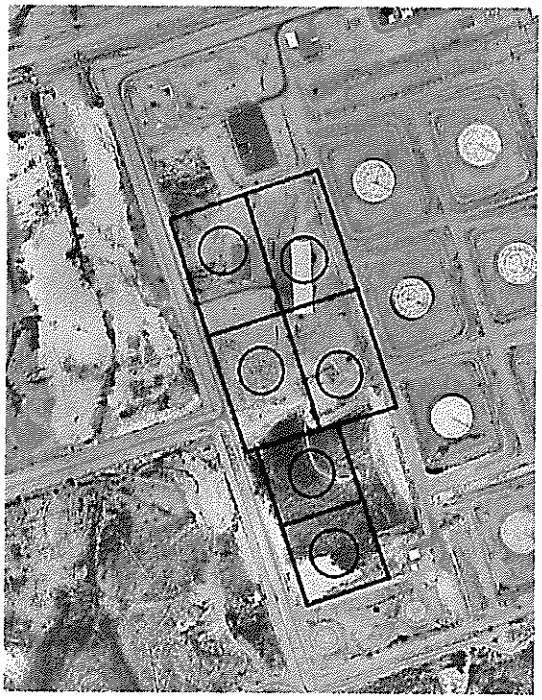
04 April 2019

6-2018-10R Eng
04 April , 2019

Eng. Haim Arbel haim@pei.co.il
Project manager – Petroleum & Energy Infrastructures Ltd.

Eshel Hansih terminal – Oil Tanks

The geotechnical report



Sincerely
G.Y.A. Soil and Foundation Engineering Ltd
Dr. Israel Keissar Eng. Rober Shukha

Copies: Eng. Anton Mashrikov, Star Engineers.

תוכן עניינים:

1 Introduction

This is the geotechnical report for the design of the foundations of the oil tanks and the spill containments.

This report includes: a general description of the site and the designed structures; the existing geotechnical data; site investigation findings; definition of the soil/rock profile and soil parameters suggested for the design; Instructions regarding the seismicity at the site; recommendations for earthworks and the foundations of the oil tank and the oil spill containments.

The report is based on the following:

- The general plan, based on the topographic map and the locations of the oil tanks (received from Eng. Haim Arbel).
- General plan and cross sections including spill containments walls. These plans were provided by the designer at 8.1.2019.
- Earthquake risks report by Dr. Polishuk. "לחוות מיכלים אשל סקר סיכוני רעידות אדמה תשתיות נפט ואנרגיה בע"מ".
- Geotechnical report by Dr. Avraham Zur, 02-1979. " אשל הנשיא, מיכלים חפורים – חקירה גיאוטכנית".
- Site visits.
- The findings of the site investigation program (see attached appendix).

2 Description of the site and the tanks

6 oil tanks are designed, each with a capacity of 50,000 m^3. The diameter of the tanks is 54 m and the height of the liquid is 22 m.

The general plan is presented in Figure 1. Photos of the site are attached.

The tanks are designed in an excavation below natural ground surface. The tanks walls will be based on a reinforced concrete ring. Loads of the oil in the tanks would be transferred to the ground at the base of the tanks. The peripheral concrete ring would support the loads of the walls and the lateral loads.

An oil spill containment is designed for each tank. The 6 m high walls of the containment would be constructed of reinforced concrete.

The general plan, cross sections of the site and typical cross-sections of the walls are presented in Figure 2 and Figure 3.

The ground surface level descends from the north-east corner of the site at an elevation of +229 m to the south-west at an elevation of +214 m.

Table 2 and Table 3 presents the levels of the tanks and their spill containments, surface elevation, depth of excavations to the designed levels, a short description of the earthworks, and the expected subsoil at the level of the foundations.

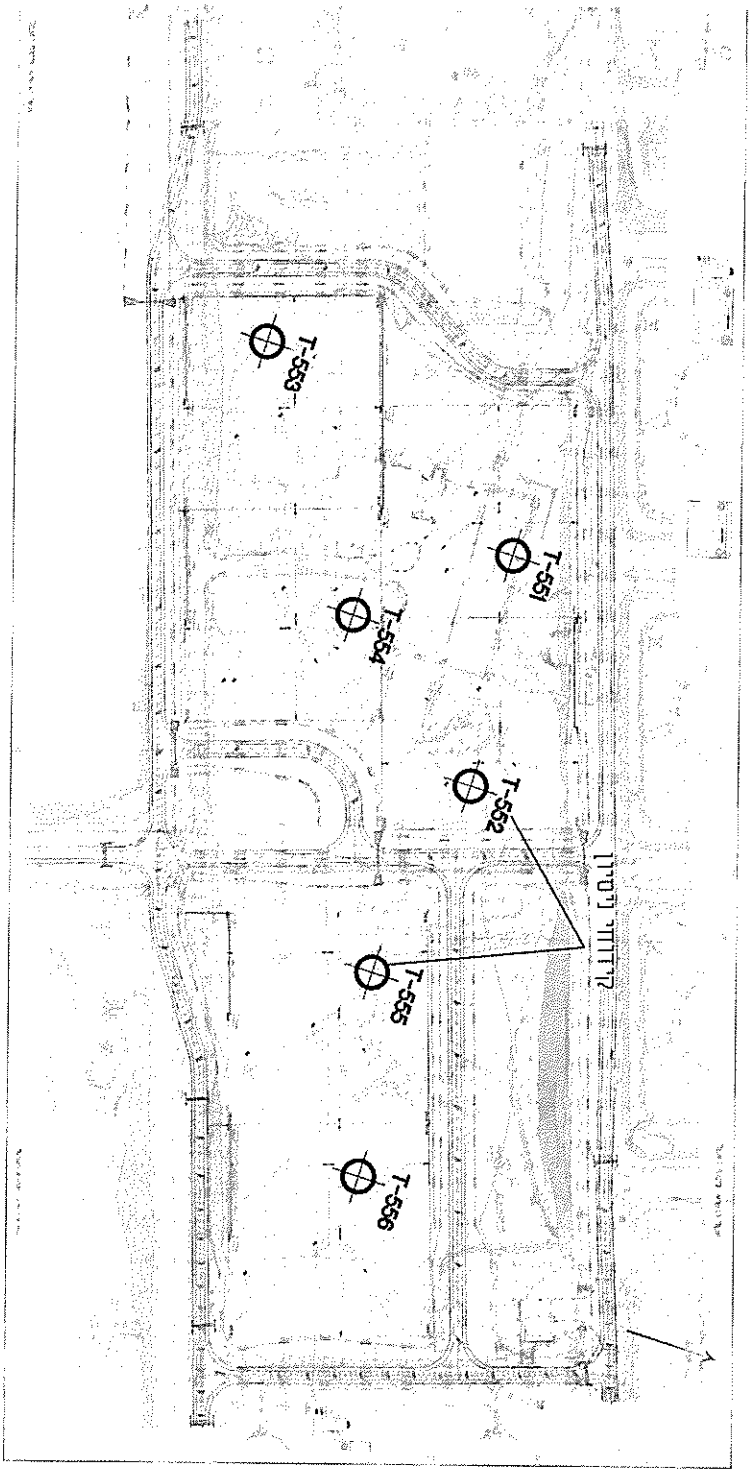


Figure 1 - General plan of the tanks and boreholes location.

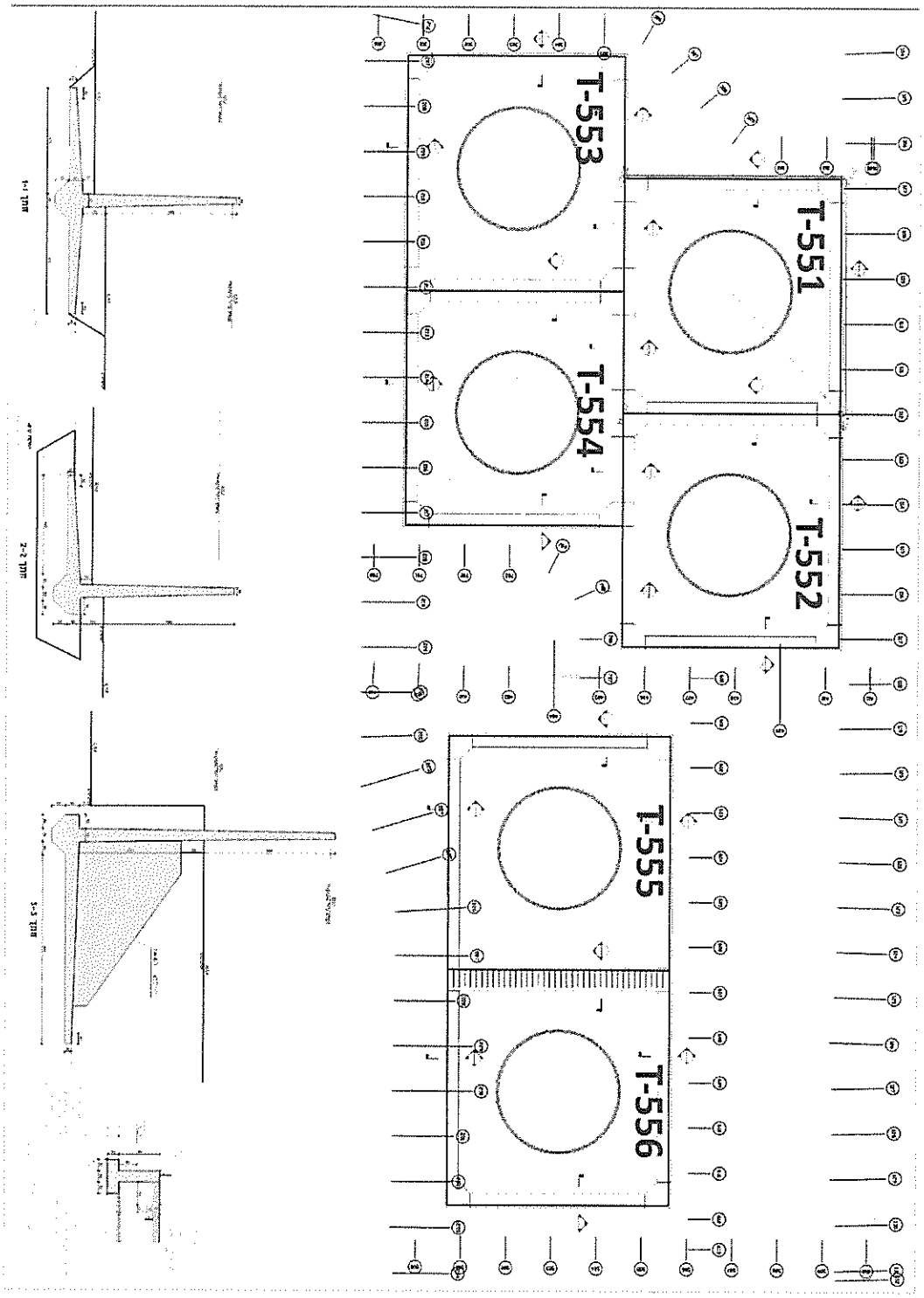


Figure 2 - General plan of the wall of the containment and cross-sections of the walls.

Figure 3 - Cross-sections of the walls of the spill containments.

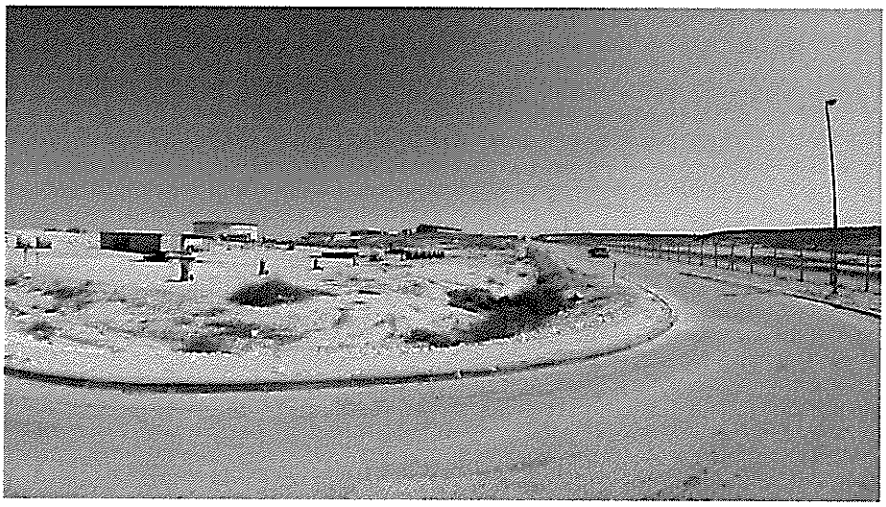


Photo 1 - The lower part of the site, at the south-west corner.

Photo 2 - The higher part, at the north-east part of the site.

3 The geology of the area and the expected soil and rock layers

3.1 Boreholes and the soil profile

Six boreholes were drilled at the site, one for each designed tank (Table 1 and Figure 1).
The boreholes were drilled by Geotechnology., under the supervision of a geologist from the geotechnical laboratory of SII.
The drilling logs are attached as an appendix. The logs include a description of the soil and rock profile, SPT results, core recovery (TCR) and rock core quality (RQD).

Table 1 - Boreholes list.

Tank	Excavation elevation	The depth of excavation (m)	Location	Borehole depth (m)
T-551	+215.0	0 – 3	579250 / 174884	28
T-552	+215.5	0 – 1.5	579266 / 174998	26
T-553	+213.0	0 – 5	579103 / 174822	30
T-554	+213.5	0 – 5.5	579185 / 174936	30
T-555	+219.5	0 – 6	579249 / 175100	30
T-556	+224.5	0.5 – 9	579274 / 175197	34

According to boreholes findings, the site can be divided into two main domains.
The upper eastern domain is composed of layers of massive chalk or cherty chalk, with lenses of chert. Rock exposures on both sides of the area reveal high cliffs of this chalk (Photo 3).
The lower western part the ground profile is composed of an up to 8 m cover of loess, clay with sand and gravels (Photo 4), overlays marly chalk or chalk.

Groundwater – the groundwater level below the surface is deeper than the zone of influence of the tanks.

The soil profile is presented in the following figures:

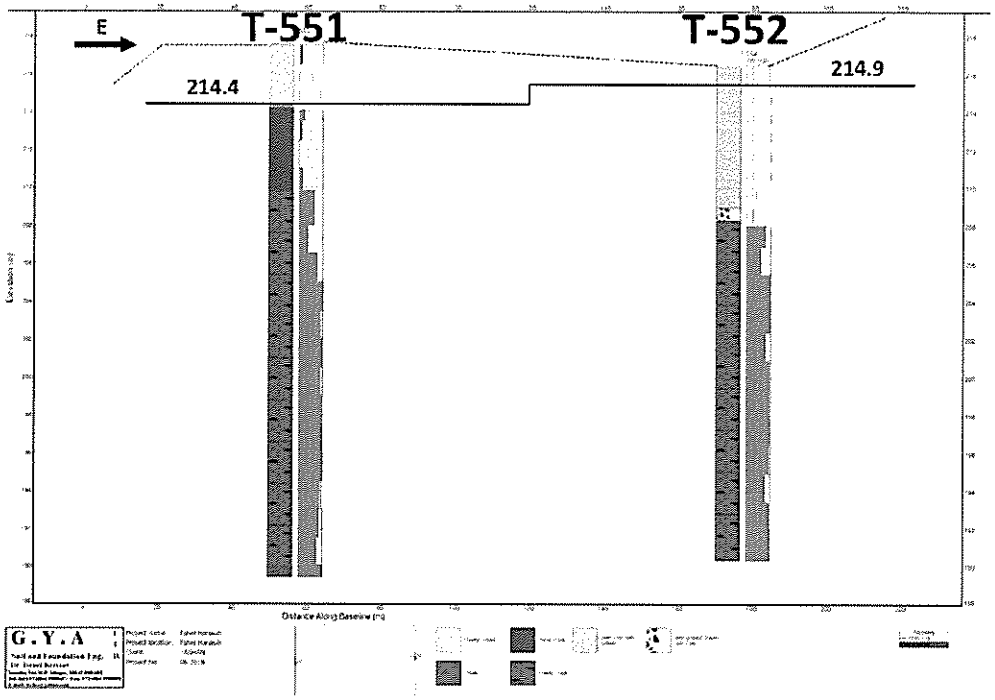


Figure 4 - Ground profile in boreholes T-551 and T-552.

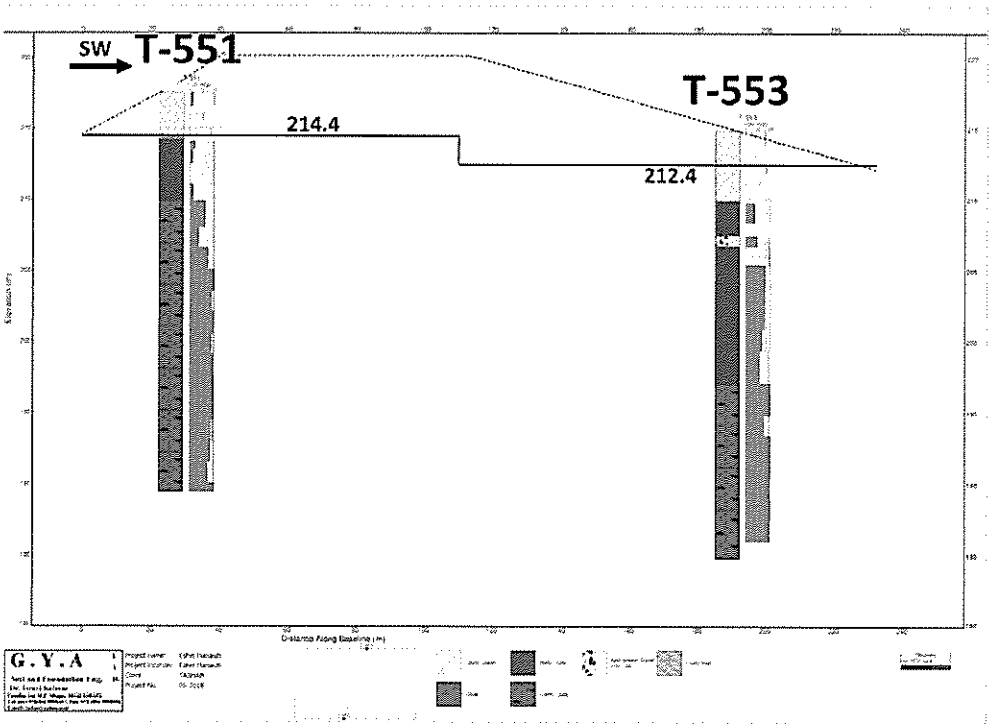


Figure 5 - Soil profile in boreholes T-551 and T-553.

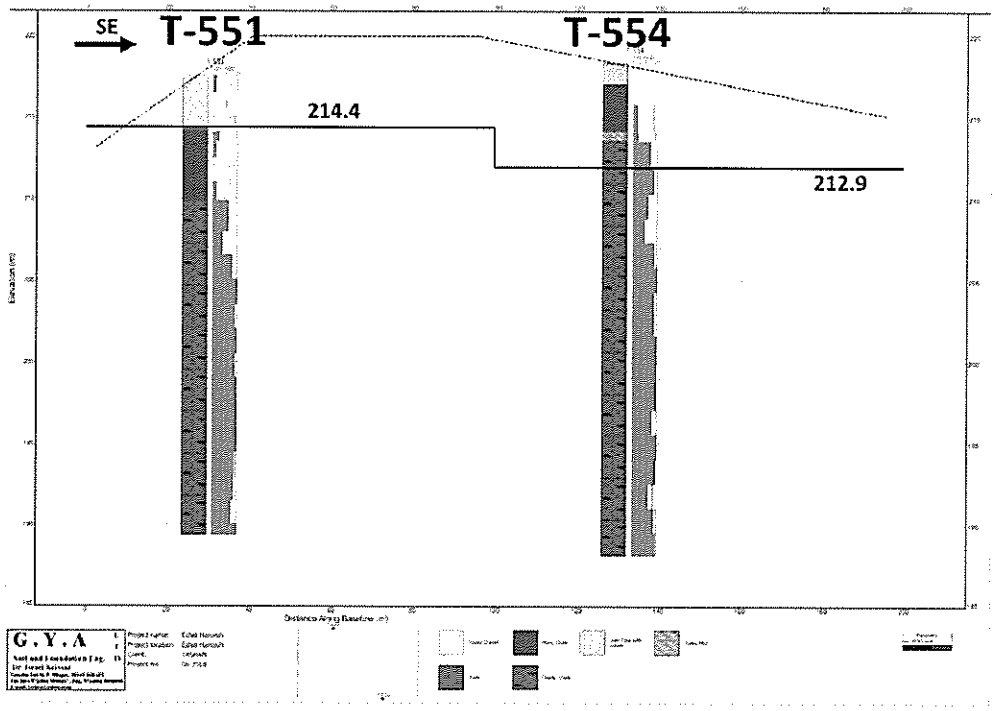


Figure 6 - Ground profile in boreholes T-551 and T-554.

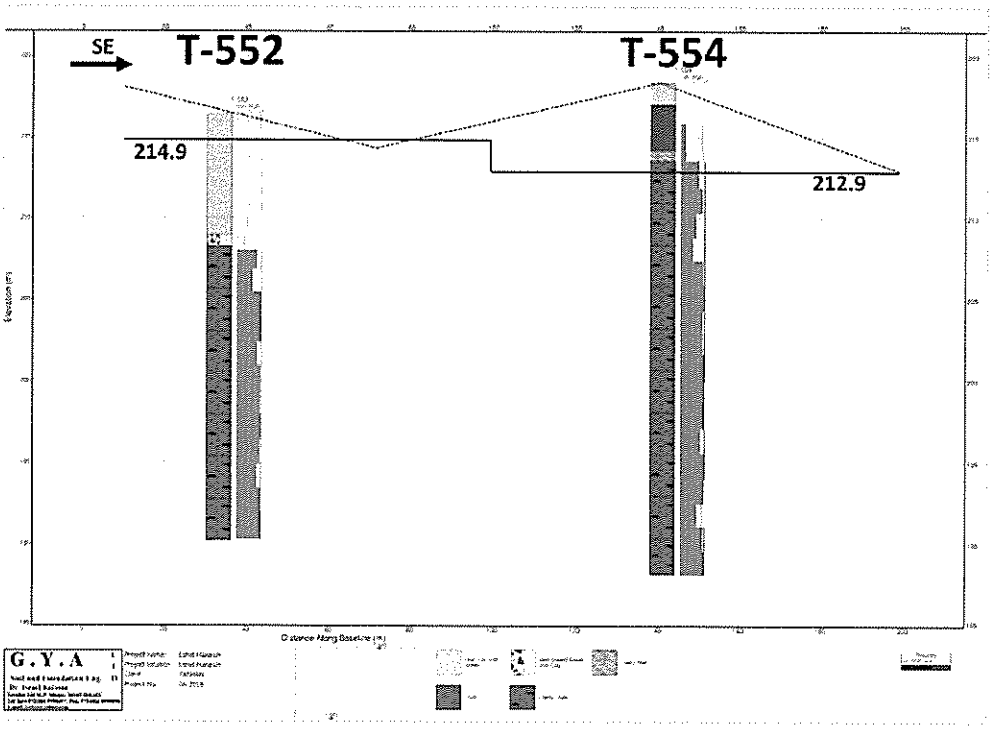


Figure 7 - Soil profile in boreholes T-552 and T-554.

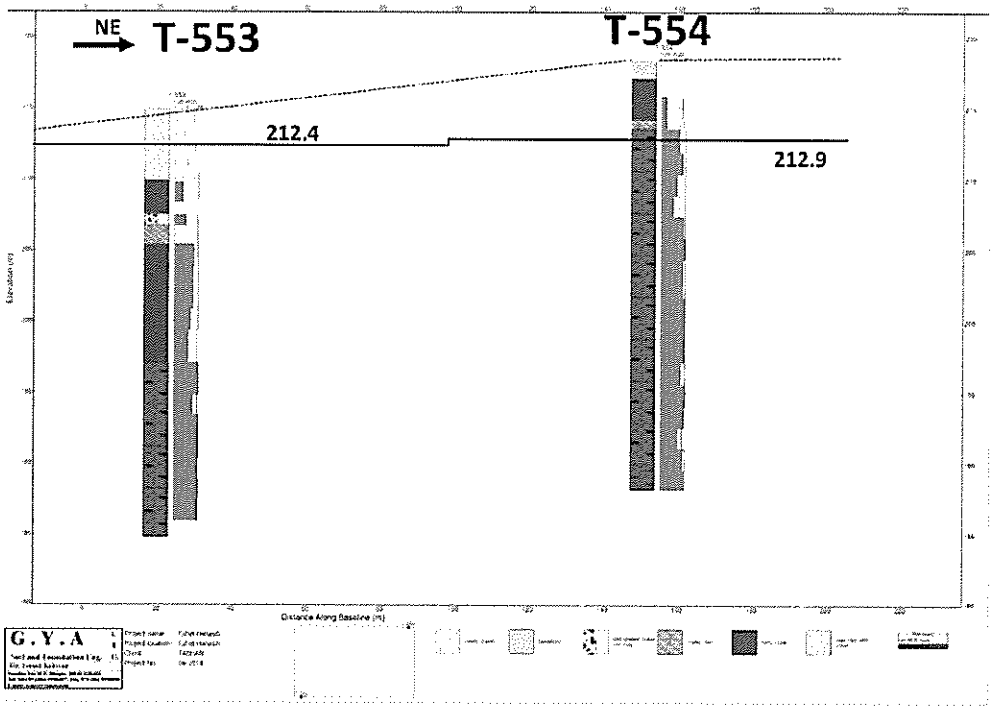


Figure 8 - Soil profile in boreholes T-553 and T-554.

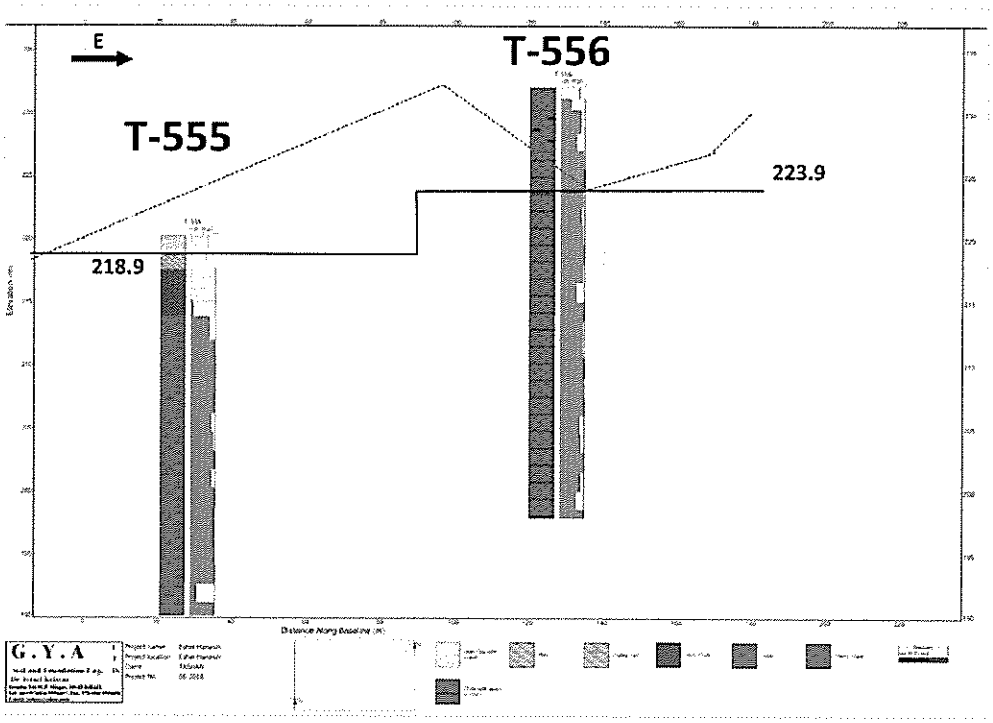


Figure 9 - Soil profile in boreholes T-555 and T-556.

The following tables present the ground surface elevation, the designed levels of the tanks and the walls, and the expected subsoil in the level of development.

Table 2 – Ground profile and the expected subsoil at the level of the foundations.

Tank \ Borehole (development level)	Ground profile	Expected subsoil at the level of development	Rock layer depth beneath the level of foundation
T-551 (+214.4)	3 m thick layer loess in the surface, overlays a 4 m thick layer of week marly chalk. From a depth of 8 m to 28 m (borehole depth) – chalk and cherty chalk.	Marly chalk	0
T-552 (+214.9)	8 m thick layer loess layer (low SPT values). At depth of 8 to 26 m (borehole depth) – chalk and cherty chalk.	Gravels with thin clay	5 – 6
T-553 (+212.4)	5 m thick layer loess in the surface, overlays a 10 m thick layer of week marly chalk. From a depth of 18 m to 30 m (borehole depth) – chalk and cherty chalk.	Gravels with thin clay	0 – 3
T-554 (+212.9)	A thin cover layer of loess (up to 1.5 m thick). At depth of 2 m to 30 m (borehole depth) – chalk and cherty chalk.	Chalk	0
T-555 (+218.9)	3 m thick layer of loess and marl in the surface, overlays a 3.5 m thick layer of marly chalk. From a depth of 7 m to 30 m (borehole depth) – chalk and cherty chalk.	Marl – marly chalk	0-1.5
T-556 (223.9)	A thin layer of chalky fragments (<2m) overlays a thick layer of chalk with lenses of chert. No SPT tests were performed in this borehole.	Chalk with lenses of chert	0-2

Table 3 - Oil spill containments wall and expected subsoil.

Tank	Supporting structure	Surface elevation	Development elevation	The depth of excavation to the foundation of the wall	The height of excavation support	Expected subsoil at the foundation of the wall
T-551	North wall	214.5	214.3-214.5	0	0	Gravels with thin clay (1 m thick) overlays marly chalk
	Eastern wall (shared with T-552)	215	214.4	2	0.5	Marly chalk or gravels with thin clay
	Western wall	214-217.5	214	0-3.5	0	Marly chalk
T-552	Eastern wall	214-217	215	0-2	0	Gravels with thin clay (7 m thick)
	Western wall (shared with T-553)	211.5-220	212	0-8	1.1	Cherty chalk or marly chalk
T-553	Northern wall (shared with T-551)	217.5-220	212	0-8	2	Marly chalk or gravels with thin clay (up to 2 m thick)
	Eastern wall (shared with T-554)	212-220	212	0-8	0.5	Chalk or gravels with thin clay (up to 2 m thick)
	Southern wall	210	210	0	0	Chalk
	Western wall	210-213	211	0-2	0	Chalk or gravels with thin clay (up to 1 m thick)
T-554	Northern wall (shared with T-552)	217.5-220	213	3-7	2	Chalk or gravels with thin clay (up to 4 m thick)
	Eastern wall	213-217	212	1-5	0-1	Chalk
	Southern wall	211.5-215	210	1-5	0-2.5	Chalk
T-555	Northern wall	218-232	219	2-3	0	Marl or marly chalk or lithified sandstone
	Eastern wall (shared with T-556)	220-224	219	1-5	5	Chalk
	Southern wall	220	220	0-1	0	Chalky marl
	Western wall	217.5-219	217.5-218.5	0-2	0	Chalky marl
T-556	Northern wall	223-232	223-224	0-9	0	Chalk
	Eastern wall	224-231	225	0-6	0-6	Chalk
	Southern wall	228-232	224	4-8	4	Chalk

3.2 Field tests

SPT tests were performed in 5 boreholes. These tests were performed in the upper part of each borehole, in relatively soft layers (Figure 10). SPT analysis provides an indication of the resistance of the soil to penetration.

According to the findings of these tests, the thickness of the soft soil below the surface is 0 to 8 m (in borehole T-552). These findings are in accordance with field observations and the boreholes logs.

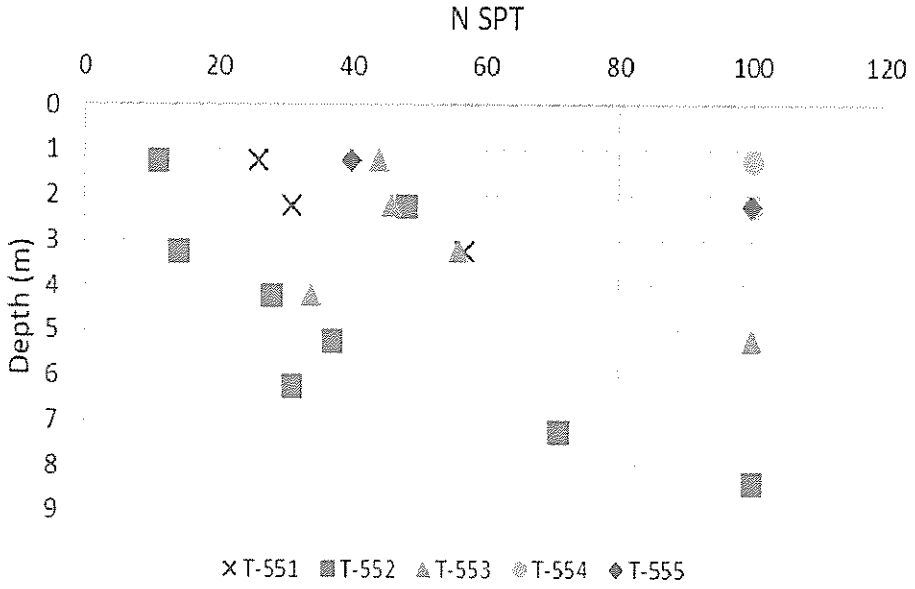


Figure 10 - SPT values in the boreholes.

3.3 Laboratory tests

3.3.1 Soil classification

Lab tests were performed on samples of soil and marl-chalk retrieved from the boreholes, including soil gradation, Atterberg limits, and carbonate content.

The results of the lab tests are presented in Figure 11and Table 4

According to the Unified Soil Classification System (USCS), the soil in the site is mainly classified as clayey gravel (GC) and lean clay with gravels (CL). The fact that core recovery is high along all boreholes, including in the soil layers, supports these findings.

Layers of marl classified as fat clay (CH).

Table 4 - Soil classification on marl and soil samples.

Borehole	Depth of sample (m)		Soil	Gravel	Sand	Fines	Plastic Limit	Liquid limit	Plasticity index	Carbonate content
	depth	bottom		(%)	(%)	(%)	(%)	(%)	(%)	(%)
T-552	1	1.45	Soft Soil				16	28	12	17.4
T-554	1	1.28					16	26	10	
T-553	1	1.45		48	27	25	17	29	12	45.2
T-552	3	3.45				92	17	40	23	
T-551	1	1.45		53	20	27	19	41	22	72.2
T-553	3	3.45		39	36	25				
T-553	6.5	4.45								59.2
T-555	1	1.45	Marl and Chalk	14	6	80	24	55	31	
T-555	2	2.36			7	93	33	69	36	
T-551	5	6.5					26	54	28	62.6

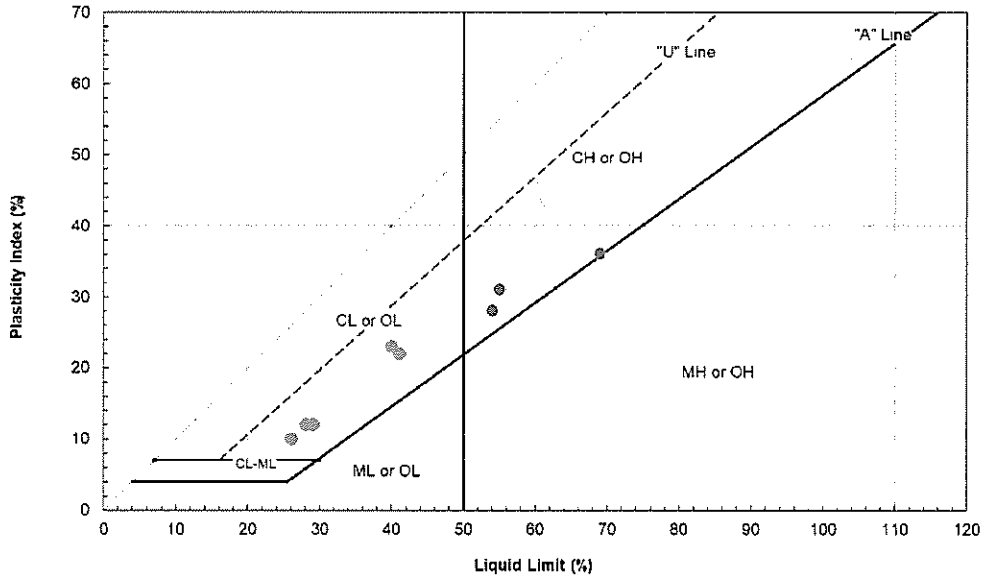


Figure 11 - Atterberg limits tests on soil samples. Blue dots denote marl samples, hence the high plasticity values.

3.3.2 **Rock mass characterization**

Lab tests were performed on rock core samples to determine the strength and stiffness of the rock.

The lab tests included uniaxial compressive strength, point load, carbonate content elastic modulus, and Poisson's ratio. Figure 12 provides a summary of the tests results.

The tests were performed on rock samples retrieved from shallow depths in the boreholes, as well as from deeper depth. It is important to keep in mind that these values represent the intact rock and not the fractured rock mass. The overall shear strength of the rock mass is lower than the strength of the intact rock. This issue was taken into consideration while defining soil and rock mass parameters suggested for the design.

The range of values for the intact rock is presented in the following table.

Rock unit	Unit weight (kN/m^3)	Poisson's ratio	Uniaxial compressive strength (MPa)	Elastic modulus (GPa)
Chalk	15-20	0.1 – 0.2	3-20	1-14

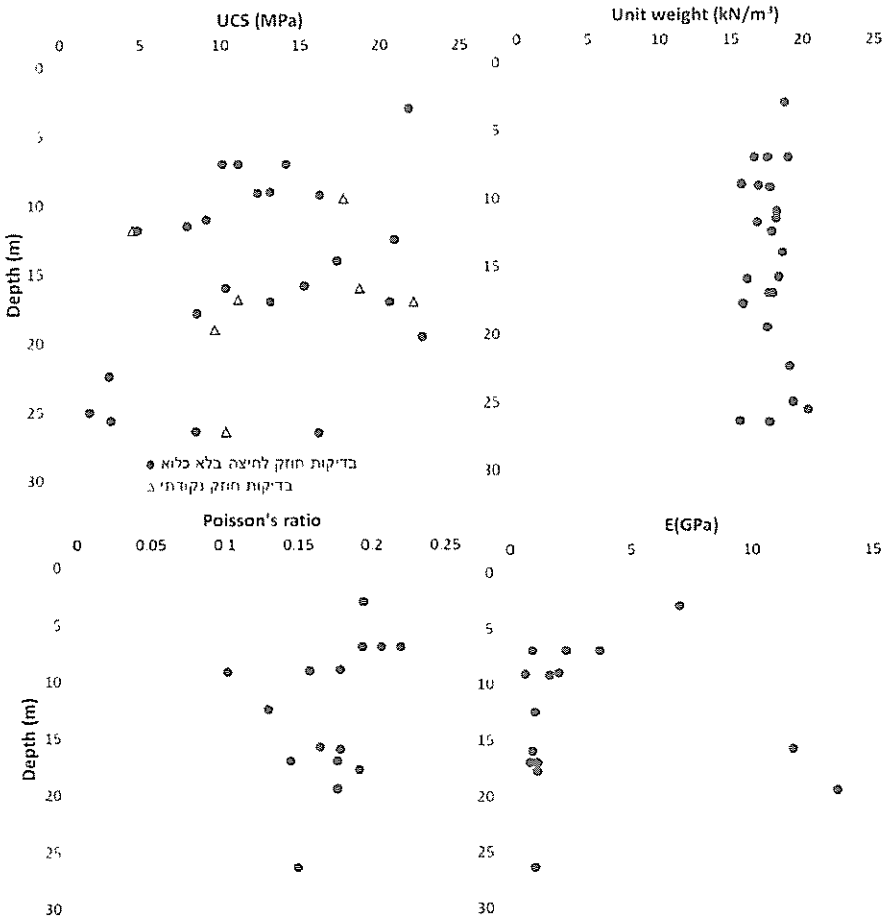


Figure 12 - Lab tests results: Uniaxial compressive strength; Point load; Elastic modulus; and Poisson's ratio.

3.4 Soil profile summary

- **Loess** composed of hard gravels and boulders of lithified sandstone and Chalk with variable concentration of thin clay. The thickness of this layer is 0 to 8 m.
- **Chalk** and chalk with lenses of chert. Generally, the rock is hard, bedded and fractured. The upper part of the rock is fractured and weathered. Pockets and veins of clay may be found in the rock mass. In some areas, chalky marl may be found.

The expected level of the rock is presented in the attached ground profiles.

A summary of the ground profile is presented in Table 2, Table 3, and Figures 4-9.

Ground parameters suggested for the design are presented in Table 5.

Table 5 - Rock\Soil parameters suggested for the design.

Soil type	γ_t	ϕ'	c'	Es
	kN/m^3	°	kN/m^2	kN/m^2
Loess	18	26°	0	20,000
Chalk	20	38°	70	250,000 – 500,000
Compacted granular fill	20	34°	0	30,000
Compacted type A material	21	38°	0	60,000
γ_t - unit weight. ϕ' - internal friction angle. c' - cohesion. Es - elastic modulus.				
Rock mass strength parameters were calculated using the local rock mass properties and using the correlations and parameters proposed by Professor Evert Hoek that are implemented in the software RocLab – Rocscience.				

4 Earthquakes and Seismicity

A specific site response analysis was conducted by The Geophysical Institute of Israel, dated in July 2018.
The ground at the site is classified as "B" (Chalk).

The acceleration spectrum according to site response analysis and according to the Israeli Standard 413 Amendment 5 is presented in Figure 13.
There is a significant difference between the spectrums. The Geophysical Institute of Israel predicts much greater accelerations.

According to "Active and potentially active faults for Israeli Standard 413, update 2017" of the Geological Survey of Israel, no active or potentially active faults are observed at the site.
The geological report by Dr. Polishuk also states that no faults were detected at the site.

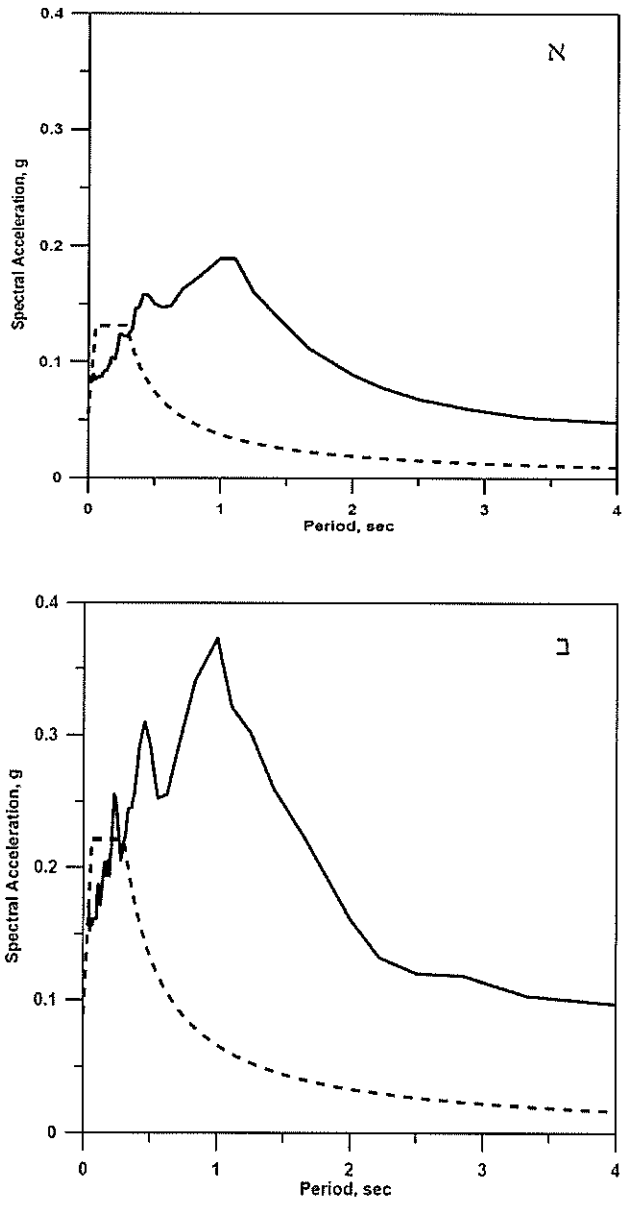


Figure 13 - Acceleration spectrum as presented in the Geophysical Institute of Israel report for probabilities of 10% and 2% (upper and lower panels, respectively). The dashed lines denote the acceleration spectrum according to the Israeli Standard 413 Amendment 5; solid lines denote the acceleration spectrum according to the site response analysis performed by The Geophysical Institute of Israel.

5 Geotechnical recommendations

5.1 Earthworks

Temporary excavations of up to 5 m in depth shall be executed according to the following instructions:

- Excavation slope in clayey layers, 1V:1.5H.
- Excavation slope in rock layers, 1.5V:1H.
- The upper part of the excavation shall be at least 2 m away from existing infrastructure.
- The excavated soil shall be placed at least 10 m away from the excavation head.
- If some of the instructions could not be implemented, the geotechnical engineer should be notified, and further instructions would be formulated. A piled wall may be required to support the excavation.

The safety of temporary excavations shall be made under the Israeli regulations for work safety:

המפרטים ותקנות הבטיחות בעבודה (עבודות בנייה), התשמ"ח – 1988, פרק ט': חפירות ועבודות עפר.

The safety of the works, including traffic safety, is under the sole responsibility of a specialist engineer appointed by the contractor.

5.2 Foundation of the spill containments' walls

The walls of the spill containments are designed as Cantilever reinforced concrete walls (RW), based on strip foundations. Most of the walls at the site would be based on rock, except for some areas where the wall's foundation are based in layers of gravel with clay (Table 3). The RW shall be designed according to the following instructions:

- The foundation depth of the RW shall satisfy the following criteria:
  - Minimum depth 1 m from the designed ground surface level in front of the wall.
  - The level of the bottom of the foundation shall be designed below an imaginary line that slopes 1V:2.5H from an existing slope, drainage channel, retaining wall etc.
  - The depth of the RW shall be designed in a way that the horizontal distance between the edge of the foundation and an existing slope is at least 2 m.
- The retaining wall shall be based on natural rock layer.

- If soft layer like marl or clay is revealed at the level of the foundation of the wall, the RW shall be based on compacted fill. The depth of ground replacement is 1 m below the RW foundation level, or up to the rock layer (the shallowest of the two). The width of the ground replacement is as the width of the RW base + 1 m from each side.

  The earth fill shall be done with granular fill material with at least 20% fines. The fill shall be compacted, with 20 cm thick layers, to density of 98% Modified Proctor.

  The bottom of the excavation shall be wetted and compacted until fully stabilized.

  Instructions for a ground replacement would be updated according to the findings at the site.
- Friction coefficient against sliding at the wall base is 0.55.
- The allowable contact pressure is 300 kN/m^2. In earthquake conditions, the allowable contact pressure is 450 kN/m^2.
- The maximum eccentricity of the stresses at the wall foundation is 1/6 of its width. In earthquake conditions, the maximum eccentricity of the stresses at the wall foundation is 1/3 of its width.
- The minimum factor of safety against sliding or overturning is 1.5. In earthquake conditions, 1.2.
- To increase the resistance of the wall to sliding, it is advised to reinforce the foundation with a 60 cm downward beam at the inside side of the foundation. Passive earth pressure may be considered in this state, with a factor of safety of at least 1.5.
- Differential settlements may develop in the RW where the soil type is changed from clay to rock; a flexible connection between the two parts of the wall on either side of the different units can be used to mitigate such settlements. The exact location of the connection would be determined once the excavations are completed.

Complementary instructions for RW that support excavation or fill

Such a wall shall be designed according to the above instructions, and:

- The fill at the back of the wall shall be done using the local chalk or lithified sandstone. The maximum particle size is 15 cm. The fill shall be compacted with 30 cm thick layers to a density of 96% Modified Proctor.
- Lateral earth pressures shall be calculated using the parameters presented in Table 5 for Compacted granular fill.
- Surcharge load and Vehicles loads shall be considered.

- The backfill should be drained, or alternatively, the wall shall be designed to withstand hydrostatic pressures.

5.3 Foundation of the tanks

According to the typical cross-sections of the foundation (Figure 14), the walls of the tanks would be based on a concrete ring in the natural ground layers. The floors of the tanks are based on 1 m thick layers of sand and Type A material; sealing sheet placed between two geotechnical sheets would be placed between the layers of the sand.

Concrete ring foundation:

- The foundation is designed as a strip foundation. The depth of the foundation shall satisfy the following criteria:
  Minimum penetration in intact rock, 0.5 m.
  Minimum depth from final development level, 0.8 m.
- If a soft rock like marl or clay is found at the level of the foundation, the ring shall be based on compacted fill. The depth of ground replacement is 1 m below the foundation or up to the depth of the rock (the shallowest of the two). The width of the ground replacement is as the width of the foundation, in addition to 1 m from each side.
  The earth fill shall be done with Type A sub-base material. The fill shall be compacted, with 20 cm thick layers, to density of 100% Modified Proctor.
  The bottom of the excavation shall be wet and compacted until fully stabilized.
  Instructions for a ground replacement would be updated according to the findings at the site.
- Temporary excavations during ground replacement shall be 1V:4H.
- The casting of the foundations shall be made against the excavated rock or ground replacement.
- The allowable contact pressure is 350 kN/m^2. In earthquake conditions, the allowable contact pressure is 500 kN/m^2.
- Compacted Type A sub-base shall be used as the fill in the inner part of the wall of the foundation (see following instructions).
- Lateral earth pressure on the face of the foundation as a result of the liquid load in the tank and the fill shall be calculated using the following parameters: unit weight – 21 kN/m^3; lateral earth pressure coefficient at rest – 0.45.

- The foundation shall be designed to vertical subgrade coefficient that can be calculated by the elastic modulus given in Table 5 divided by the width of the foundation.

Foundation of the floor of the tank:

The floor of the tank shall be designed in a structure of sand and Type A material layers (Figure 14).

Before placing the designed layered structure, the bottom of the excavation shall be plowed, wet, and compacted until fully stabilized.

If a soft rock like marl or clay is revealed at the level of the foundation, the floor shall be based on compacted fill. The depth of ground replacement is 1 m below the foundation or up to the depth of the rock (the shallowest of the two). The width of the ground replacement is as the width of the foundation, in addition to 1 m from each side.

The earth fill shall be done using Type A sub-base material. The fill shall be compacted, with 20 cm thick layers, to a density of 100% Modified Proctor.

Temporary excavations during ground replacement shall be 1V:4H.

Estimation of the tank settlements

The pressure applied to the ground by the oil tanks is 220 kN/m^2.

It is possible that settlements underneath the tank would develop, especially as a result from soft soil compression, mainly the gravel with clay unit that exists between the floor of the tank and the surface of the rock (Table 2).

Theoretically, the depth of influence of the tank equals its diameter. The increase in vertical stress in the soil layers equals the vertical stress at the floor of the tank, 220 kN/m^2.

The settlement magnitude can be calculated according to the theory of elasticity, the elastic modulus of the soil (Table 5), the thickness of the soil layer (Table 2), and the additional load.

The calculated elastic settlement for most of the tanks is about 2 cm.

In tanks T-552 and T-555, the estimated elastic settlement is about 5 cm.

It can be expected that most of these settlements will develop in the first fill of the tanks.

Settlements monitoring:

The settlements of the tanks shall be monitored as instructed in API STANDARD 653, November 2014. The measured settlements would be sent to the geotechnical engineer and the designers.

5.4 Foundation of the roads

Most of the roads at the site are designed close to the existing ground surface, on the clayey layer. In other parts, the roads are designed in excavations or on fill embankments,
The fill under the roads done using compacted granular material, compacted with 20 cm thick layers, to a density of 98% Modified Proctor.
Before laying the fill of roads structure, the bottom of the excavations shall be plowed, wetted, and compacted until fully stabilized.
If soft clay is exposed at the level of the foundation of the road, ground replacement would be required to a depth of 60 cm. The fill shall be made according to the aforementioned instructions.
Pavement design of the road shall be done with CBR of 5%.

Road fill embankments slope is 1V:2.5H or moderate.

6 Control and inspection

The design and plans should be submitted to the Geotechnical engineer for review.
All construction works should be performed under the inspection of a professional engineer.
The geotechnical engineer would be invited for inspection during the works. In situations of uncertainty or difficulties in the work process or when the soil layers found in the excavations are different from the above description, the Geotechnical engineer should be informed.
Temporary excavations, workers safety etc. shall be implemented according to the relevant codes and regulations.

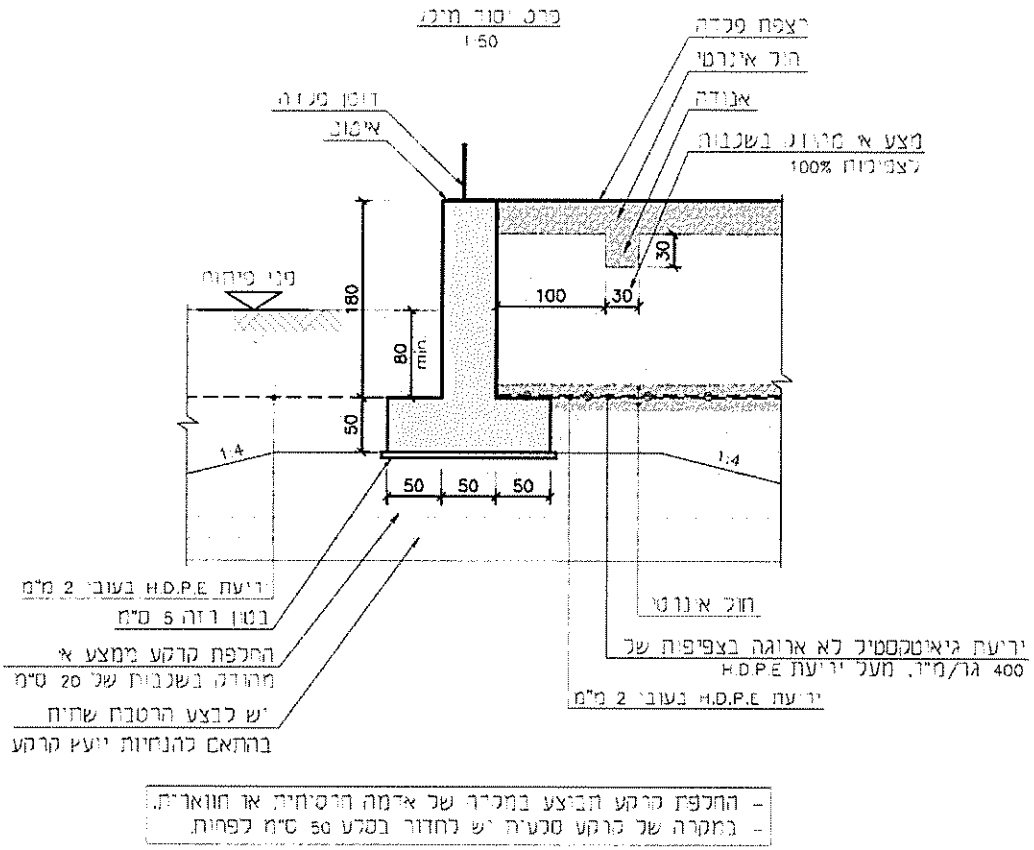


Figure 14 - Typical cross-section of the foundation of the tank.

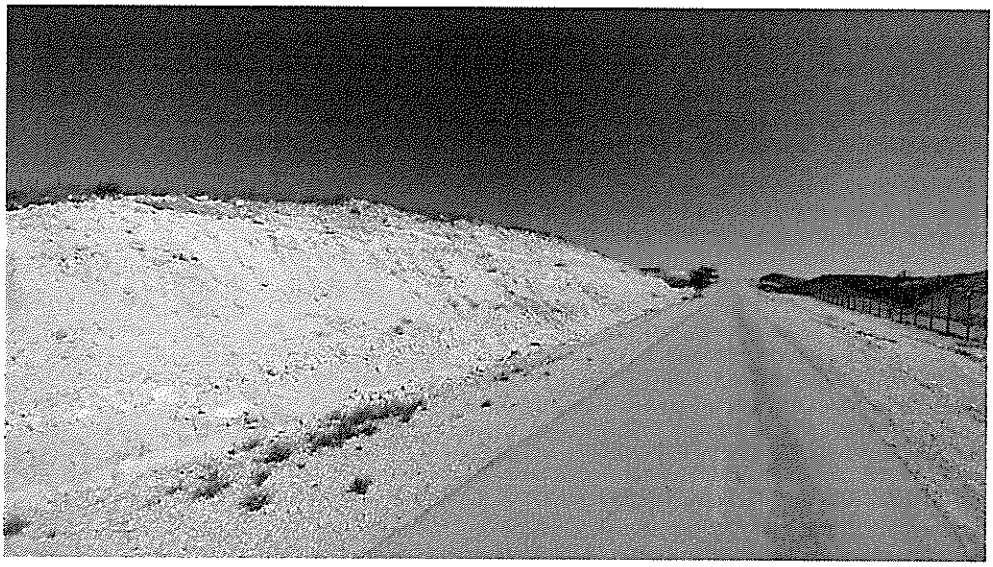


Photo 3 - Chalk at the northeast side of the site.

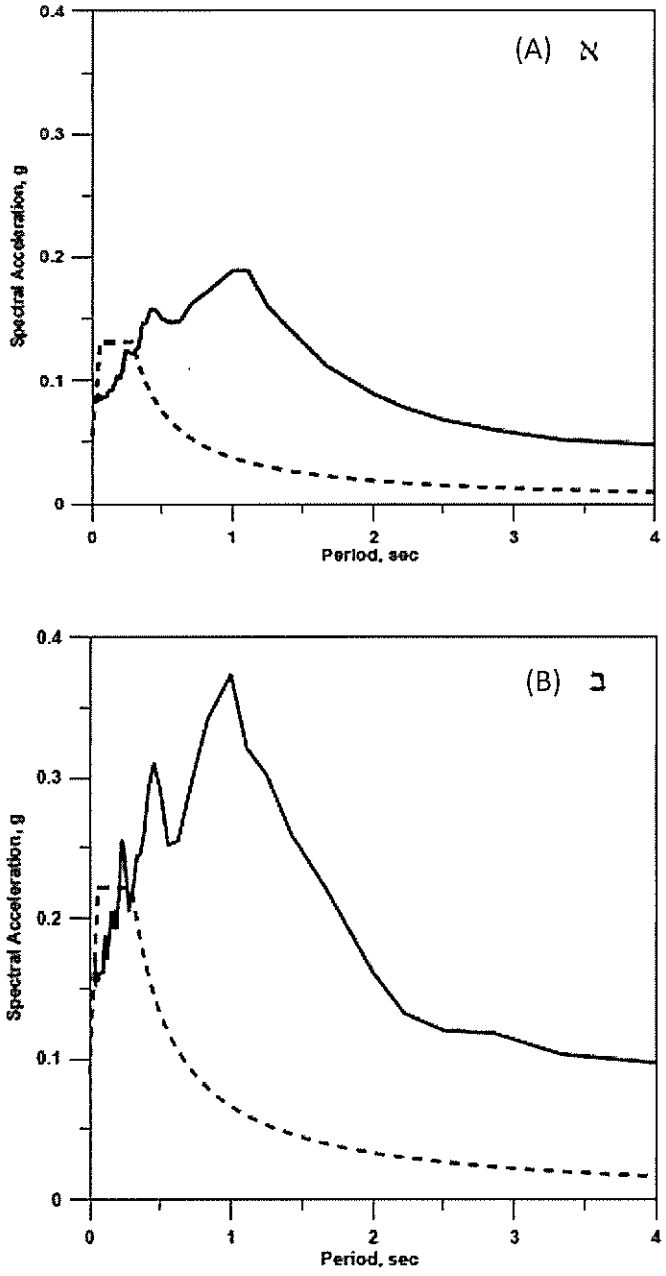
Photo 4 - Loess in the western part of the site.

Photo 5 - Lithified sandstone, south-west corner of the site.

The Design Response Spectrum

The Geophysical Institude of Israel

July 2018



Acceleration spectrum for linear design (5% damping coefficient) in the tanks farm site as assessed using the SEEH method considering site response. Dashed line presents the acceleration spectrum according to Israeli Standard IS 413 for site class B. The spectral functions are calculated for (A)–10% and (B)-2% of probability of exceedance with a 50 years period (return periods of 475 and 2475 respectively). Values are given in "g".
See also related tables below.
Prepared by The Geophysical Institute of Israel, July 2018.

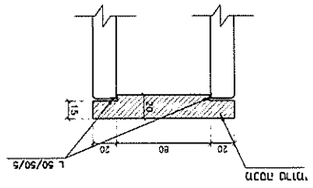
2% הסתברות	10% הסתברות	מחזור (שנייה)
0.171	0.090	0.040
0.158	0.087	0.042
0.152	0.084	0.044
0.158	0.085	0.046
0.158	0.086	0.048
0.161	0.087	0.050
0.161	0.087	0.053
0.156	0.086	0.056
0.159	0.086	0.059
0.156	0.085	0.063
0.161	0.086	0.067
0.161	0.086	0.071
0.161	0.087	0.077
0.161	0.087	0.083
0.161	0.087	0.091
0.161	0.088	0.095
0.176	0.087	0.100
0.185	0.088	0.105
0.187	0.090	0.111
0.176	0.091	0.118
0.171	0.092	0.125
0.181	0.092	0.133
0.189	0.093	0.143
0.204	0.096	0.154
0.199	0.099	0.167
0.193	0.102	0.172
0.205	0.104	0.179
0.204	0.104	0.185
0.193	0.103	0.192
0.211	0.102	0.200
0.214	0.105	0.208
0.236	0.110	0.217
0.255	0.117	0.227
0.252	0.124	0.238
0.240	0.124	0.250
0.224	0.123	0.263
0.205	0.122	0.278
0.217	0.122	0.294

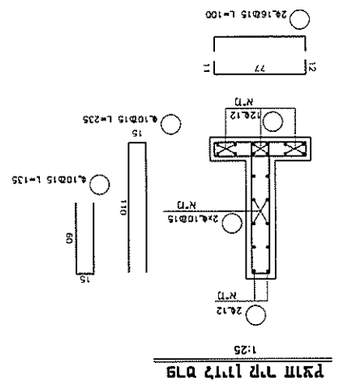
0.224	0.125	0.313
0.244	0.128	0.333
0.245	0.146	0.357
0.260	0.147	0.385
0.292	0.158	0.417
0.310	0.157	0.455
0.292	0.150	0.500
0.252	0.147	0.556
0.255	0.148	0.625
0.293	0.163	0.714
0.341	0.173	0.833
0.373	0.189	1.000
0.321	0.189	1.111
0.302	0.160	1.250
0.259	0.139	1.429
0.221	0.112	1.667
0.161	0.089	2.000
0.132	0.078	2.222
0.120	0.068	2.500
0.118	0.060	2.857
0.103	0.052	3.333
0.097	0.048	4.000
0.097	0.046	4.200
0.091	0.044	4.600
0.094	0.043	4.801
0.094	0.041	5.000

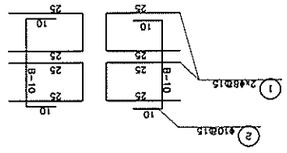
Civil Engineering Drawings:

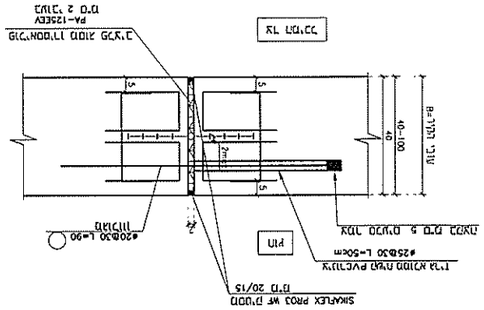
Drawing No. 208 – details of tank foundations in soft soil.

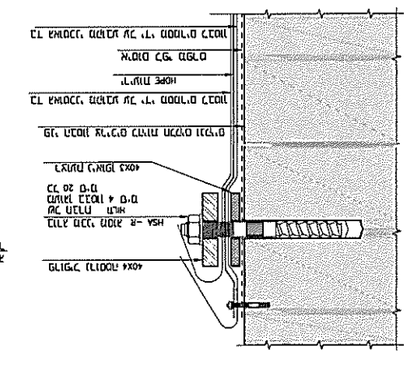
Drawing No. 209 – details of tank foundations in rock.

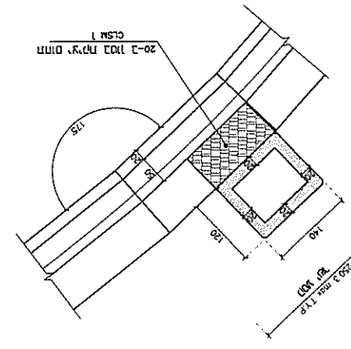


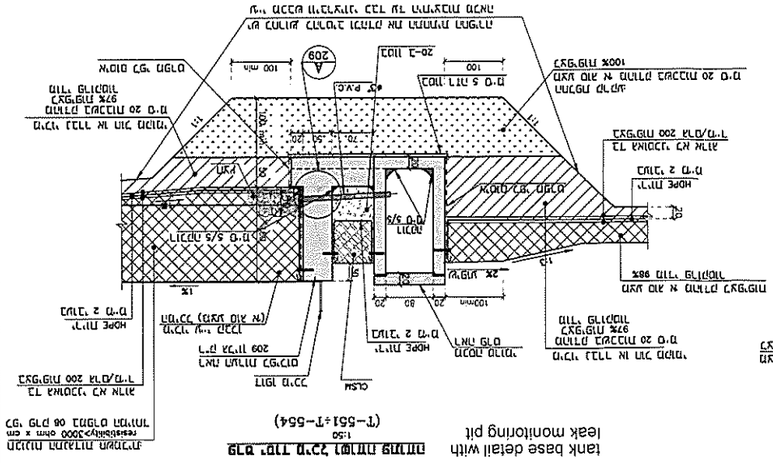


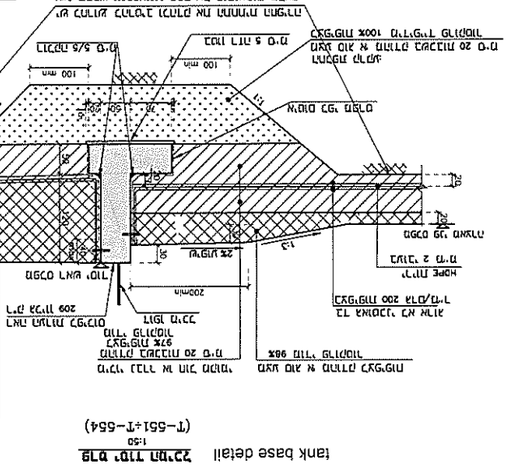












פרט תנוחת יסוד
1:50

tank base detail **פרט יסוד המיכל**
1:50
(T-551÷T-554)

מפלס ראש יסוד
1:25

מאצרה	מפלס
T-551	214.7
T-552	215.2
T-553	212.7
T-554	213.2
T-555	219.2
T-556	224.2

tank base detail with leak monitoring pit **פרט יסוד מיכל ושוחה פתוחה**
1:50
(T-551÷T-554)

חתך B
1:20

פרט חיבור מכאני לבטון

פרט לקיר חוצץ
1:50

פרט לקיר חוצץ באיזור מילוי
1:50

פרט מחסום מים בקירות
1:10

פרט לזיון קיר חוצץ
1:25

פרט מכסה
1:25

- תכנית זאת נערכה על- ידי מהנדס המאוגד בארגון האקדמאים העצמאיים שליד לשכת המהנדסים האדריכלים והאקדמאים במקצועות הטכנולוגיות בישראל. חבר ארגון מספר 112
- אין בשליחת התכנית כקובץ DWG משום הרשאה לכל מאן דהו, לעשות שינויים ו/או הוספות כלשהן בתכניות המצ"ב ללא רשות המפורשת ובכתב
- תוכן הקבצים שנשלחו הם רשות המתכנן וכל הזכויות בתכניות המצורפות הינן של המתכנן ושלו בלבד.

מס הוצאה	תאריך	עדכון (תכנון מוקדם, לעיון, למכרז, לביצוע)	שרטט	תכנן	בדק	אישר
P2	17.07.19	למכרז	מריאנה	אביעד	ערן	בוריס ב
P1	05.05.19	למכרז	מרטה	אביעד	אנטון	בוריס ב

תשתיות נפט ואנרגיה בע"מ

מספר הפרויקט : 17D097

שם פרויקט :
מסוף האשל
הקמת מיכלים חדשים

קובץ ראשי	17D097-205
תת קובץ	
תת קובץ	A1
מידות הגליון	1:50
קנה מידה	

שם התכנית :
פרטים I

מספר תכנית : 208

STAR סטאר
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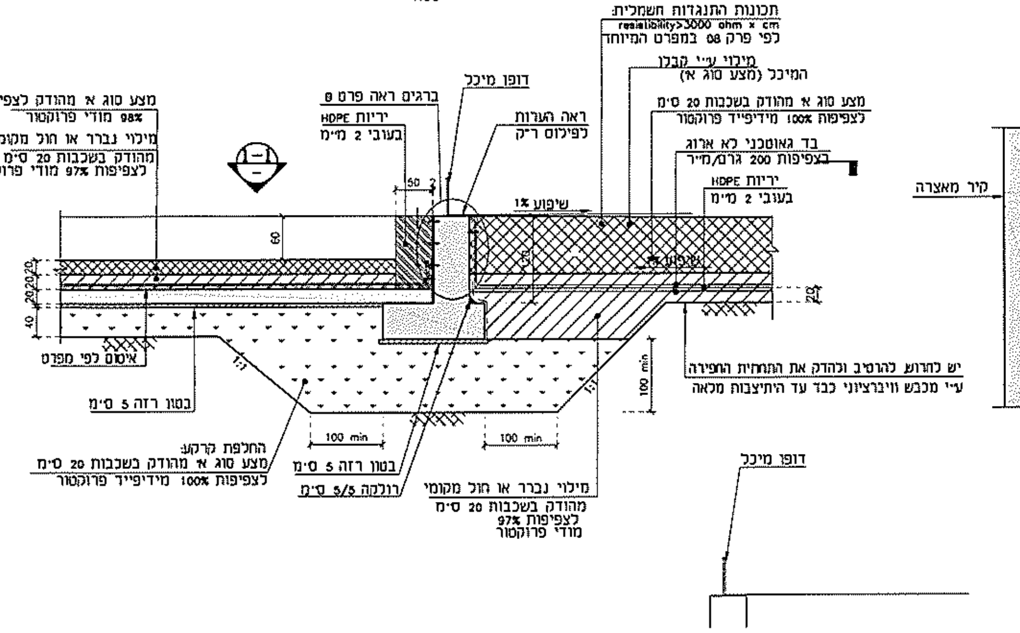
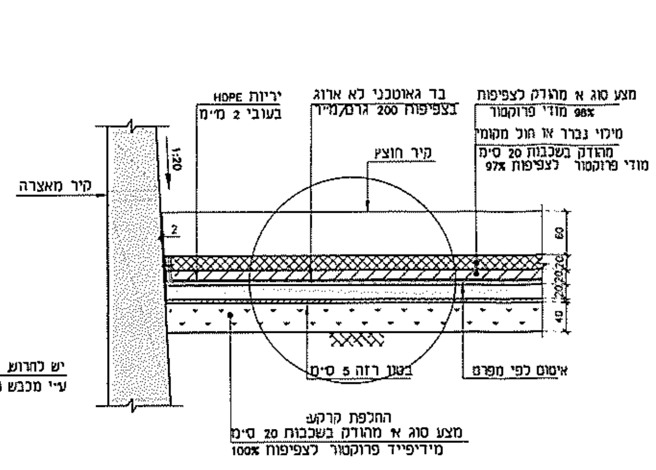
רח' התעשיה 16
ת.ד. 367
נשר 36602
טל. 04-8202120
פקס. 04-8202127

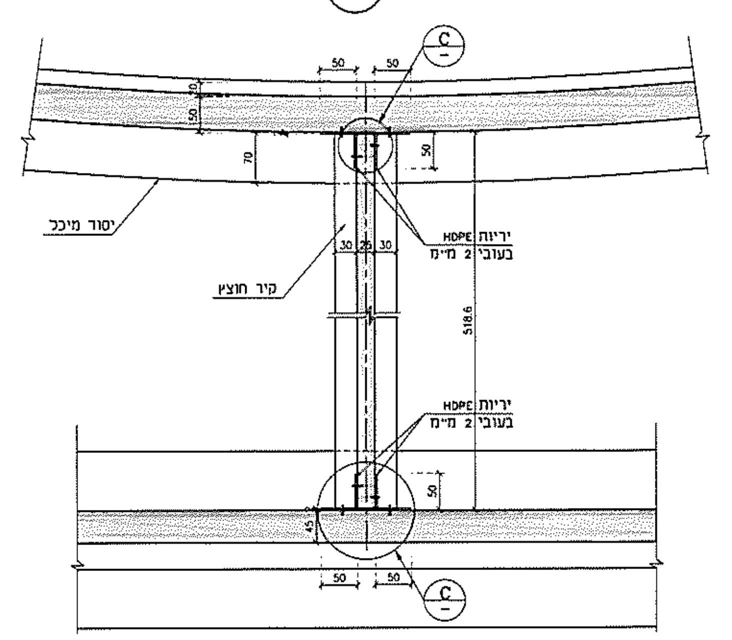
פרט לחיבור קיר חוצץ עם בסיס המיכל
1:50



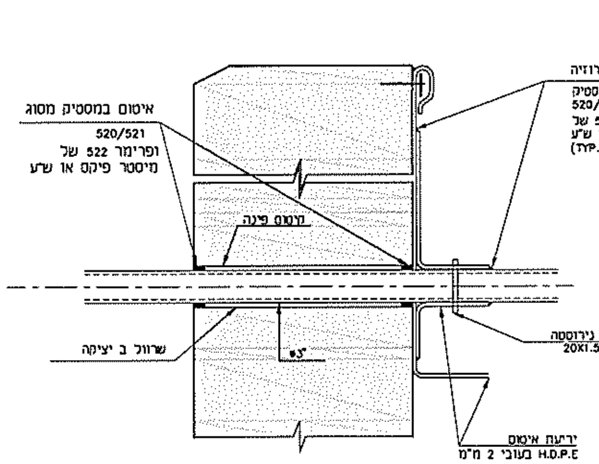
פרט לחיבור קיר חוצץ עם קיר מאצרה
1:50



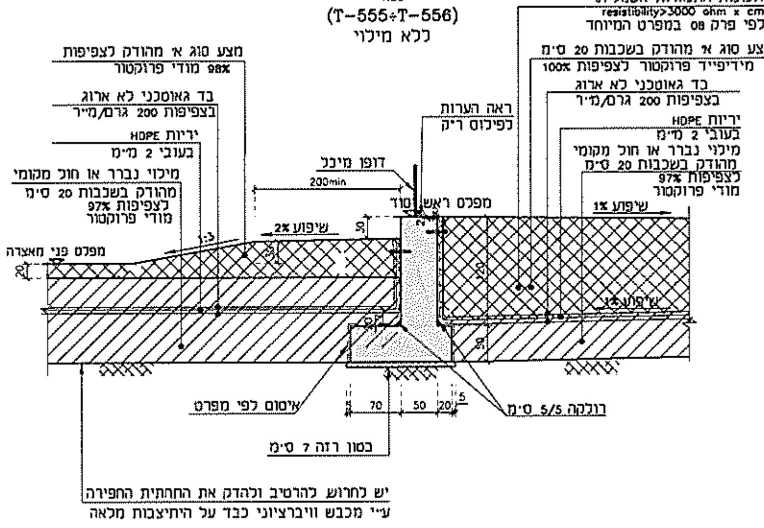
חתך 1-1
1:50



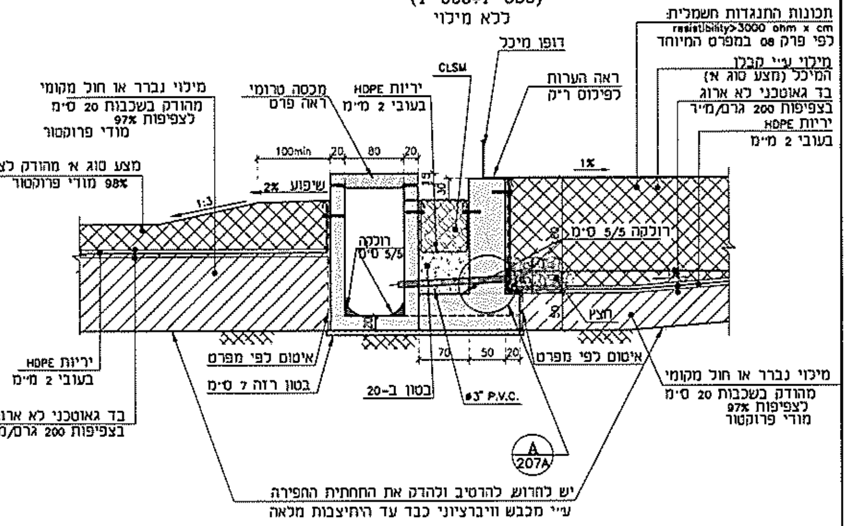
פרט A
1:10
פרט אטימת בשרוולים



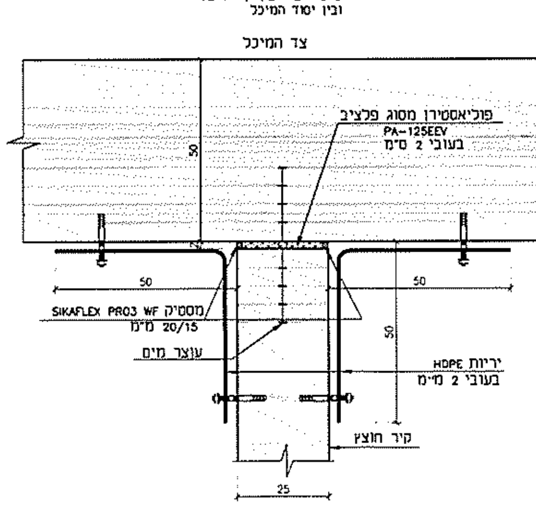
detail of tank base **פרט יסוד המיכל**
1:50
(T-555÷T-556)
ללא מילוי



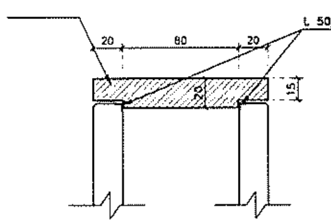
detail of tank base with leak monitoring pit **פרט יסוד מיכל ושוחה פתוחה**
1:50
(T-555÷T-556)
ללא מילוי



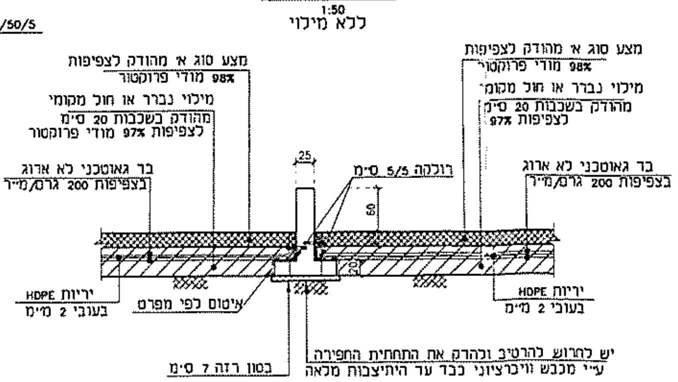
פרט C
1:10
פרט חיבור בין קיר חוצץ ובין יסוד המיכל



פרט מכסה
1:25



פרט לקיר חוצץ
1:50
ללא מילוי



תנאים לפילוס ראש קיר יסוד למכלי דלק מפלדה

1. ראש קיר יסוד להנחת תחתית מיכל הדלק מפלדה יבוצע בדיוק ±3 מ"מ מדוד לאורך 9 מ' (פריסה) בכל מקום ובדיוק ±6 מ"מ מדוד מהמפלס הממוצע לאורך (פרוס) של כל הקיר. פני הבטון יוחלקו במכונה סיבובית הדומה להליקופטר.
2. הקבלן יבוצע מדידה ע"י מודד מוסמך מטעמו ויכין תכנית ממוחשבת להוכחת עמידתו בדרישות סעיף 1 לעיל. המדידה תבוצע במרחק של 4 ס"מ מהקו הפנימי של הקיר במרחקים של 0.5 מ' ומיקום המדידה יסומן בצבע לא מחיק על ראש הקיר.
3. אם יתברר שדיוק פילוס הקיר לא עמוד בדרישות סעיף 1 לעיל, הקבלן יבצע השחזת פני הקיר במכונת השחזה בהתאמה.
4. אחרי התאמת מפלסי הבטון כאמור, הקבלן יבצע מדידה ו/או מדידות מוצלחות נוספות כמוגדר בסעיף 2 לעיל.

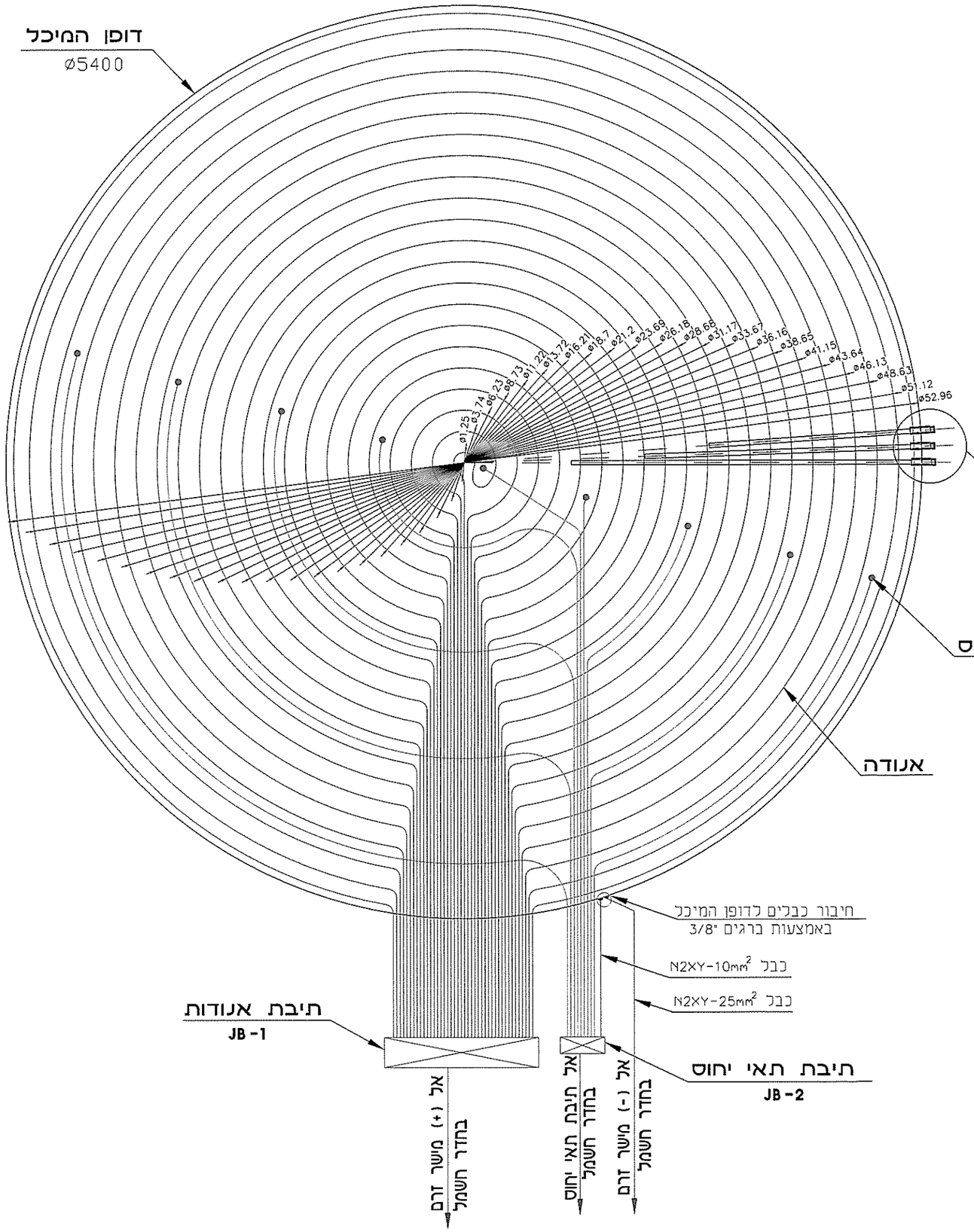
אישר	בדק	תכנן	שרטט	עדכון (תכנון מוקדם, לעיון, למכרז, לביצוע)	תאריך	מס הוצאה
בוריס ב	ערן	אביעד	מריאנה	למכרז	17.07.19	P2
בוריס	אנטון	אביעד	מרסה	למכרז	05.05.19	P1

תשתיות נפט ואנרגיה בע"מ	מספר הפרויקט : 17D097
שם פרויקט : מסוף האשל הקמת מיכלים חדשים	קובץ ראשי 17D097-205; תת קובץ; תת קובץ; מידות הגליון A1; קנה מידה 1:50
שם התכנית : גליון פרטים II	מספר תכנית : 209

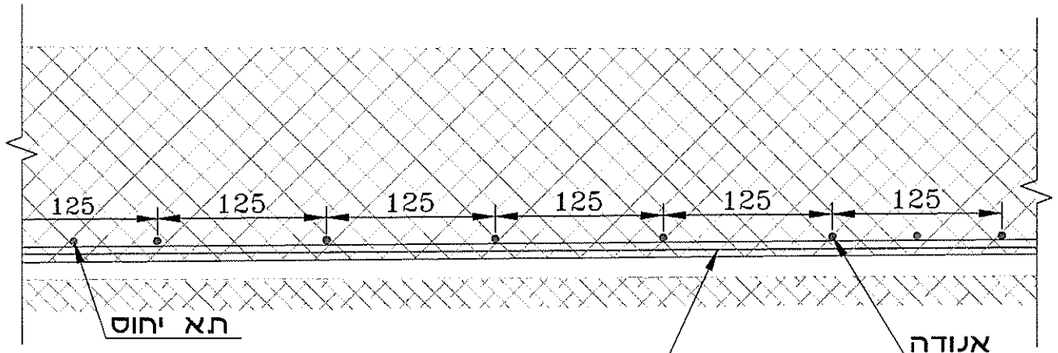
STAR סטאר
ENGINEERS LTD. מהנדסים בע"מ
16 TAASIA St. P.O.B. 367 NESHER 36602 TEL. 04-8202120 FAX. 04-8202127
רח' התעשיה 16 ת.ד. 367 נשר 36602 טל. 04-8202120 פקס. 04-8202127
E-Mail : Office@storeng.co.il

Annex 8 – Cathodic Protection System

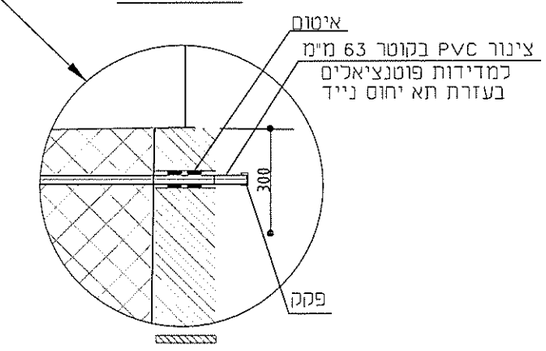
תוכנית פריסה של אנודות ותאי יחוס



תוכנית פריסה של אנודות ותאי יחוס



VIEW A

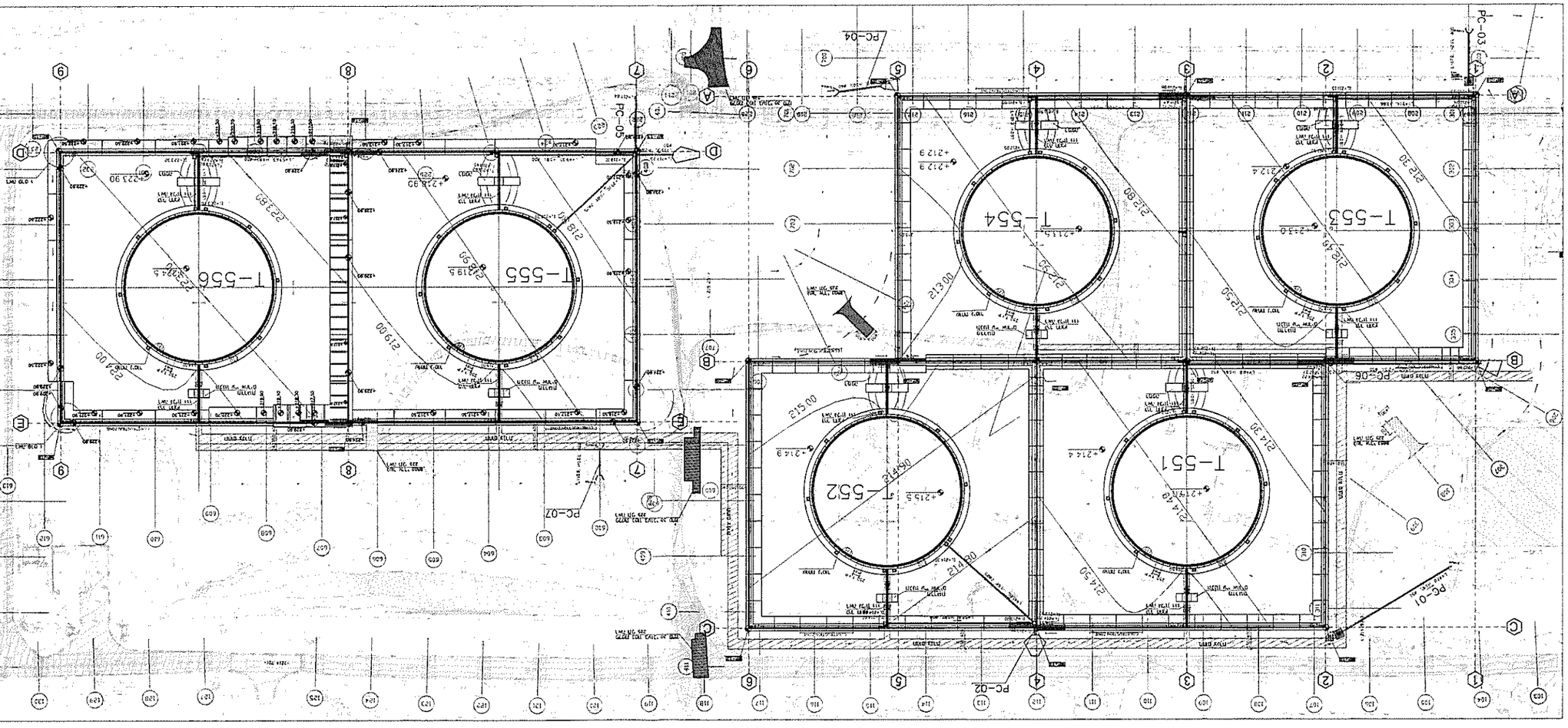


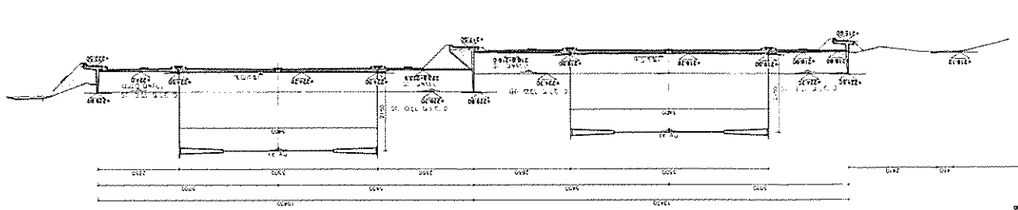
פריסת אנודות				
מס' טבעת	מספר אנודה	קוטר אנודה (מטר)	אורך אנודה מטר)	מרחק בין אנודות (מטר)
1	1	1.25	-	1.25
2	1	3.75	58	1.25
3	2	6.25	64	1.25
4	3	8.75	90	1.25
5	4	11.25	116	1.25
6	5	13.75	142	1.25
7	6	16.25	167	1.25
8	7	18.75	193	1.25
9	8	21.25	219	1.25
10	9	23.75	245	1.25
11	10	26.25	271	1.25
12	11	28.75	296	1.25
13	12	31.25	322	1.25
14	13	33.75	348	1.25
15	14	36.25	374	1.25
16	15	38.75	399	1.25
17	16	41.25	425	1.25
18	17	43.75	451	1.25
19	18	46.25	477	1.25
20	19	48.75	502	1.25
21	20	51.25	528	1.25
22	21	53.09	547	0.92
מרחק בין האנודה האחרונה ודופן המיכל				0.3

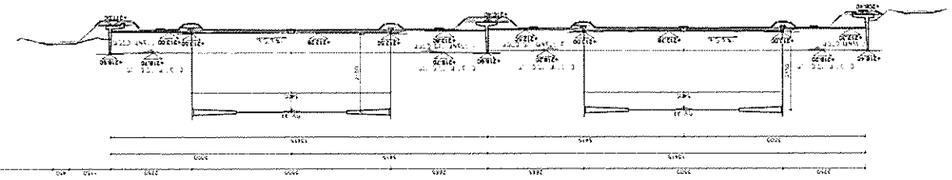
*המידות במטרים אם לא צויין אחרת

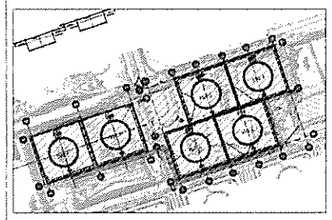
ניקא הנדסה בע"מ	17D097-501	מסוף האשל	
	17D097	הקמת מיכלים חדשים	
סטאר מהנדסים בע"מ	01.01.2021 תכנון כללי	הגנה קתודית	

Annex 9 - Preliminary Layout









מספר	X	Y
PC-01	179056.85	579931.60
PC-02	179061.31	579923.31
PC-03	179067.96	579912.06
PC-04	179073.76	579902.30
PC-05	179079.27	579892.97
PC-06	179084.77	579883.64
PC-07	179090.27	579874.31

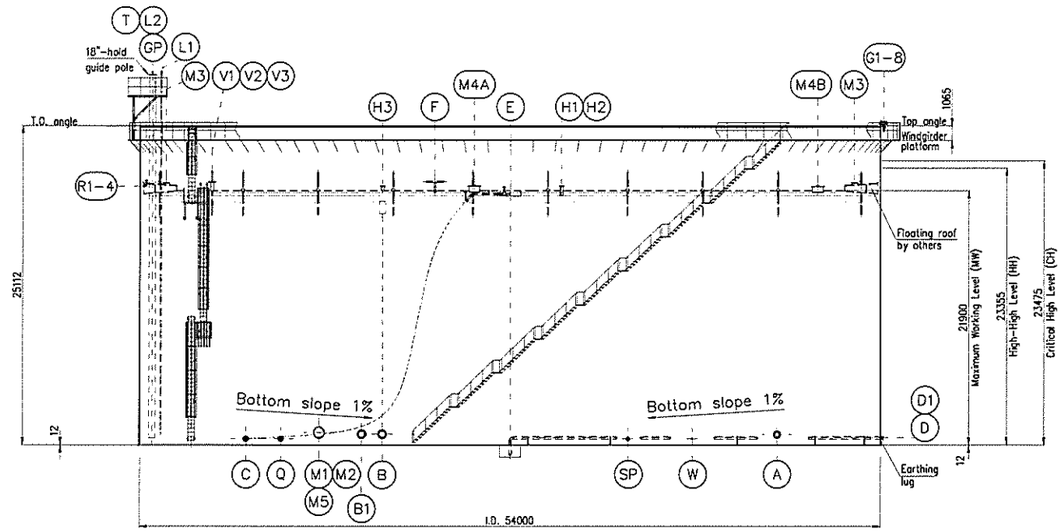
מספר	X	Y
WP-01	179095.68	579865.12
WP-02	179101.18	579855.79
WP-03	179106.68	579846.46
WP-04	179112.18	579837.13
WP-05	179117.69	579827.80
WP-06	179123.19	579818.47
WP-07	179128.69	579809.14
WP-08	179134.19	579799.81
WP-09	179139.70	579790.48
WP-10	179145.20	579781.15
WP-11	179150.71	579771.82
WP-12	179156.21	579762.49
WP-13	179161.71	579753.16
WP-14	179167.21	579743.83
WP-15	179172.72	579734.50
WP-16	179178.22	579725.17
WP-17	179183.72	579715.84
WP-18	179189.23	579706.51

CONSTRUCTION ZONE - אזור עבודות בניה

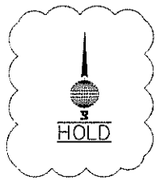
Annex 10 – Tanks Drawings

Drawing list:

- 07-2462-DRG-001 – General Arrangement
- 07-2462-DRG-002 – Bottom Arrangement
- 07-2462-DRG-003 – Shell Details
- 07-2462-DRG-004 – Nozzle Details
- 07-2462-DRG-005 – Floating roof Arrangement
- 07-2462-DRG-010 – Firefighting and Foam General Arrangement
- 07-2462-DRG-011 – Firefighting and Foam details



Elevation – not For Orientation
hold for Nozzles Elevation
N.T.S.



Plan
(hold for orientation)
N.T.S.

General notes

1. All openings connections with reinforcement in shell plate shall be prefabricated into the shell plate, and the prefabricated assembly shall be thermally stress relieved within temperature range of 600°C–650°C for 1(one) hour per 25mm of thickness prior to installation. special shell plates for this heat treatment are shown at drawing 07-2462-DRG-003.
2. Tank is designed according to API 650, last edition.
3. In addition to N.D.T. test verify all nozzles 6" and above by M.T.
4. All welds to be full size continuous, except where otherwise shown, free from slag, porosity and other defects.
5. Inside tank welds to be ground smooth flush to shell surface and curved smooth at angular joints.
6. Leave gap between plates for welding: 3mm max., 1mm min.
7. Bolt holes to straddle main centerlines.
8. Shell plates must be designed so that weld seams do not intersect nozzles or manways.
9. The manufacturer must check final cutting dimensions before tank fabrication (because different plate tolerances) to fit final tank dimensions.
10. Tank fabrication will furnish all bolts and nuts for test pressure.
11. Approximate steel weight:
    - shell 618 t;
    - bottom 193 t;
    - floating roof 175 t.
12. The purpose of the drawing is for bids only. Contractor to issue detail design.
13. * – To be confirmed by contractor.
14. Material of construction – A 537 Cl1.
15. Contractor shall supply the floating suction for outlet nozzle "B" acc. to latest requirement in BAT doc.(BREF).
16. Pontoon manhole shall be designed with 2" vent for vacuum prevention.
17. Contractor shall supply appropriate spacers to be install between tank shell and floating roof for roof centering acc. to latest requirement in B.A.T. doc.(BREF).
18. Nozzle 'E' (Roof sump drain) to be supplied with a check valve, a block valve and a 4" Neoprene flexible hose.

Construction data			reference
Code			API 650 – last edition
Tolerances		API SECT. 7.5	
Inspection		YES	
Radiography		YES	acc. to API 650 8.1.2
Magnetic particles inspection for nozzle welds		YES API 8.2	all nozzles
Post weld heat treatment		YES	for tier #1
Hydrostatic test pressure at grade bar g		full of water	
Impact test specimens required			
Painting inside/outside		YES	
Insulation mm		NO	
Weight ton	Bare & empty	~986	
	Ladder & platform *	~500	Note 13
	Test water	~54000	
	Insulation	~	
	Test without fl. roof	~54810	
	Operating *	1533	Note 13
Max. weight ton		BY VENDOR	

	Mark	Quant	Nom. dia.	Flanges face	Flanges rat.#	Service	Stand out	Drawing
	W	1	1"	RF	150#	Floating suction filling		07-2462-DRG-004
	V1-V3	3	8"	–	–	Bleeder vent / vacuum breaker		07-2462-DRG-004
	T	1	2"	RF	150#	Temperature element		07-2462-DRG-004
	SP	1	8"	RF	150#	Spare		07-2462-DRG-004
	R1÷R4	4	4"	TBC BY VENDOR		Rim vent		07-2462-DRG-004
	M4A/B	2	30"	RF	API 650	Roof manhole – deck		07-2462-DRG-004
Note 16	M3	28	24"	RF	–	Roof manhole – pontoon		BY CONTRACTOR
	M1,M2,M5	3	36"	RF	API 650	Shell manhole		07-2462-DRG-004
	L2	1	8"	RF	150#	Level gauge system		07-2462-DRG-004
	L1	1	3"	RF	300#	Electromechanical level switch		07-2462-DRG-004
	H3	1	8"	RF	150#	Floating suction inspection hatch w/blind		07-2462-DRG-004
	H2	1	8"	RF	150#	Hatch sampling (w/special cover)		07-2462-DRG-004
	H1	1	8"	RF	150#	Hatch sampling (w/special cover)		07-2462-DRG-004
	G1-G8	8	4"	RF	150#	Foam generator OFG-100		07-2462-DRG-0011
	GP	1	18"	RF	150#	Guide pole		07-2462-DRG-004
	F	1	4"	NPT		Out-of-service supplementary drain		07-2462-DRG-004
Note 18	E	1	4"	RF	150#	Roof sump drain		07-2462-DRG-004
	D1	1	1 1/4"	RF	150#	Water drain w/blind		07-2462-DRG-004
	D	1	6"	RF	150#	Water drain		07-2462-DRG-004
	C	1	4"	RF	150#	Floating roof drain with flexibility neoprene hose 4		07-2462-DRG-004
	B1	1	18"	RF	150#	Outlet w/blind		07-2462-DRG-004
Note 15	B	1	18"	RF	150#	Outlet w/floating suction		07-2462-DRG-004
	A	1	16"	RF	150# SO	Inlet (filling) w/diffusor		07-2462-DRG-004

Nozzles schedule

6 (SIX) VESSELS REQUIRED

Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.

Design: LUDAN Engineering Israel Ltd
NORTH BRANCH 4 Hatnufa St., High Tech Park, P.O.B. 508, Yokneam 20692 ISRAEL Tel +972-4-8509000, Fax +972-4-8509010 Email: North@ludan.co.il www.ludan.co.il
Project No: 165151

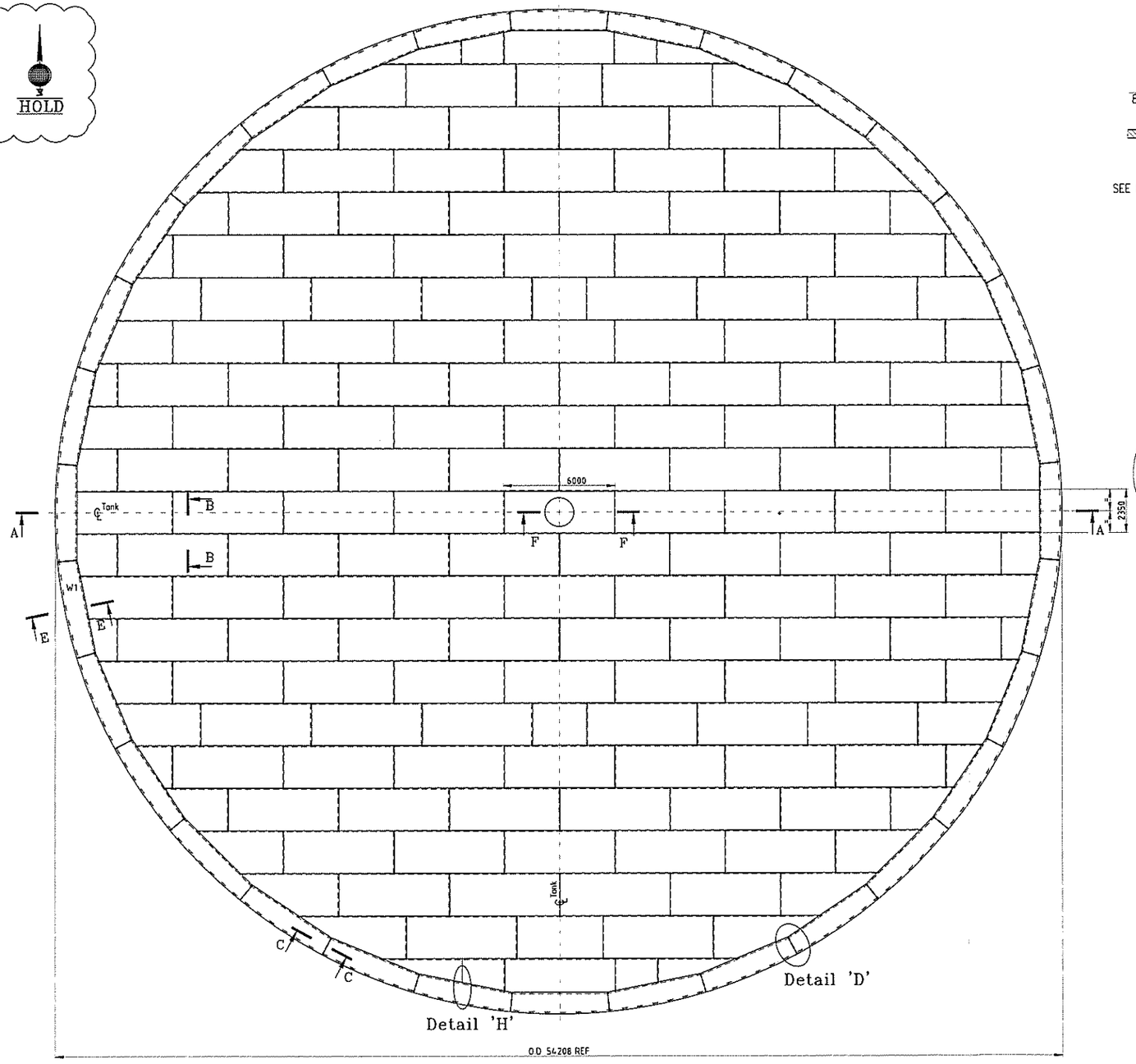
Drawing Name: GENERAL ARRANGEMENT
Unit: Eshel Tank Farm
Subject: T-661-666
Drawing No. 07-2462-DRG-001
File No. מס' קובץ 07-2462-DRG-001.dwg
Scale N.T.S.

Sign	App.	By	Description	Date	No.
	M.SH.	G.K.	Revised for bids	20.06.22	P1
	S.R.	G.K.	For bids only	26.03.19	P0

REVISIONS

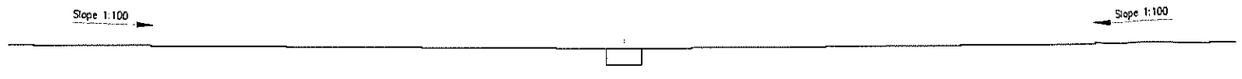
	By	Sign	Date
Designed	K.V.		12.02.19
Drawn	G.K.		13.02.19
Checked	S.R.		21.03.19
Approved	M.SH.		21.03.19

HOLD

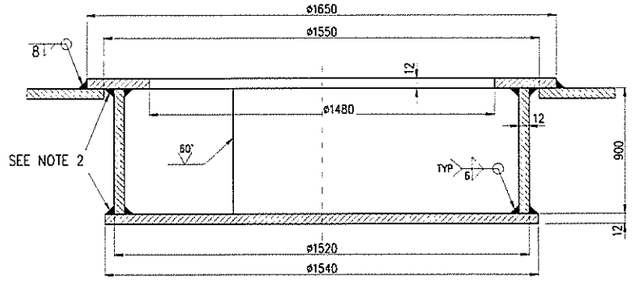


Plan
NTS

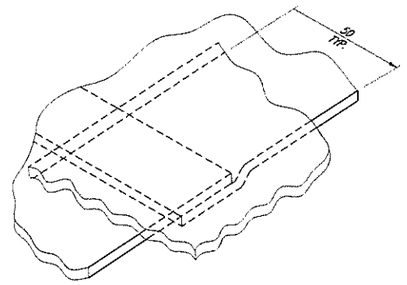
Section A-A
NTS



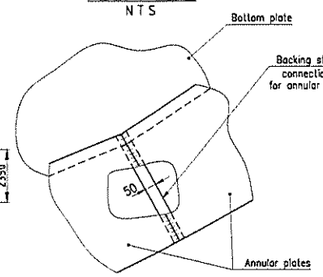
Section F-F
NTS



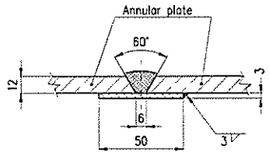
Typical detail
for three plates connection
NTS



Detail 'D'
NTS



Section C-C
annular plates connection
NTS



Special detail
for three plates connection
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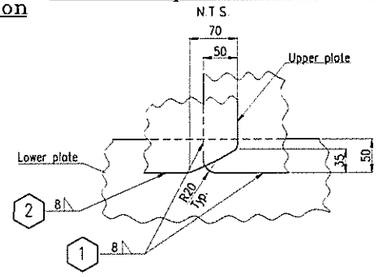
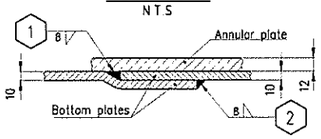
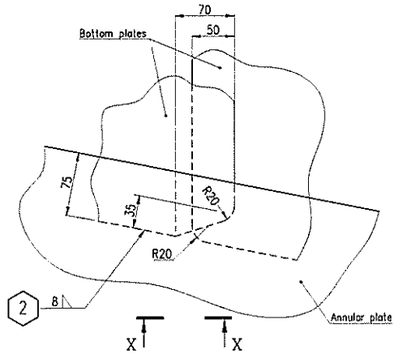


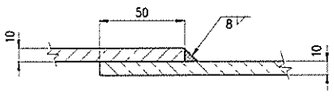
View X-X
NTS



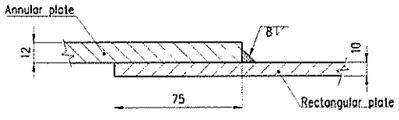
Detail 'H'
NTS



Section B-B
Rectangular plates connection
NTS



Section E-E
Annular and rectangular plates connection
NTS



Notes

1. Development bottom based on plates 2400 x 6000 mm.
   Material of construction – A 537 Cl1.
2. Fabrication and surface finish practices for tank to be lined for immersion service acc. NACE PRO 178.
3. Penetrant or magnetic test tested before plate welding.
4. Radial welds will be tested at radiographic testing.
5. Vacuum testing should be performed for all bottom plate welds according to API 650 para 8.6.
6. The purpose of the drawing is for bids only.
   Contractor to issue detail design.

Total weight : 193t.

Sign	App.	By	Description	Date	No.
	S.R.	G.K.	For bids only	26.03.19	P0

REVISIONS

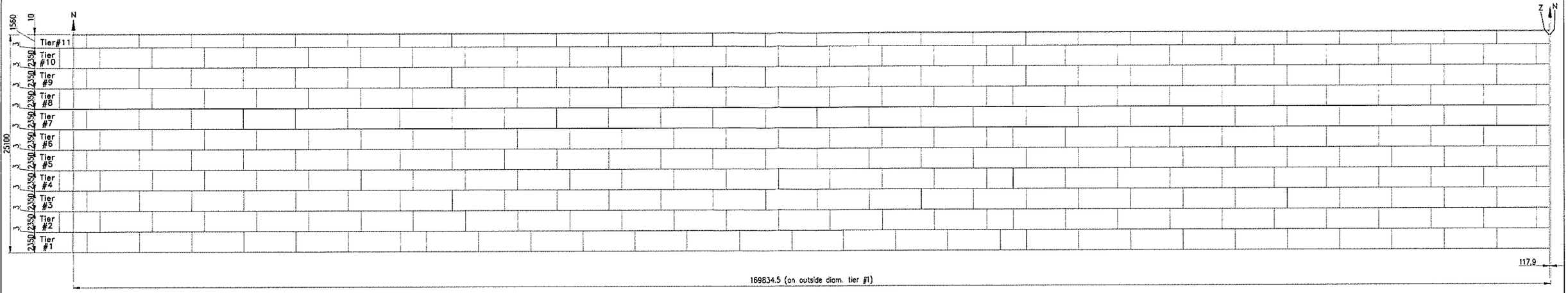
Petroleum & Energy Infrastructures Ltd
Oil Production Pipelines Unit

Design: LUDAN Engineering Israel Ltd
Project No: 165151

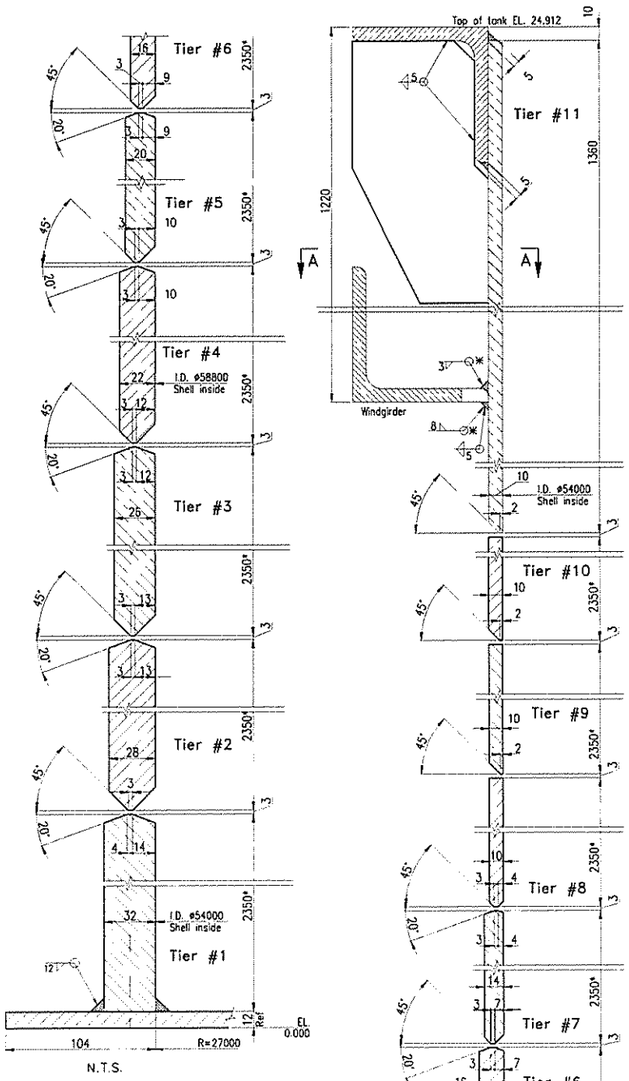
NORTH BRANCH
4 Hatnufa St., High Tech Park,
P.O.B. 508, Yokneam 20692 ISRAEL
Tel +972-4-9599888, Fax +972-4-9599880
Email: North@Ludan.co.il www.ludan.co.il

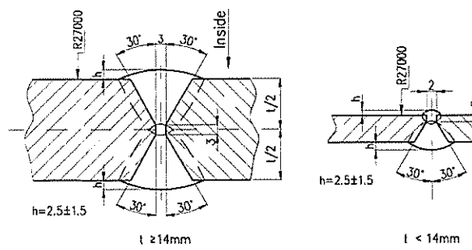
Drawing Name:	BOTTOM ARRANGEMENT	Unit:	Eshel Tank Form
		Subject:	T-551-556
Drawing No.	07-2462-DRG-002		
File No.	07-2462-DRG-002.dwg	Scale:	N.T.S.

	By	Sign	Date
Designed	K.V		12.02.19
Drawn	G.K.		24.02.19
Checked	S.R.		21.03.19
Approved	M.SH.		21.03.19

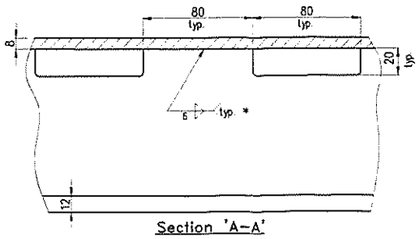


Shell development
N.T.S.

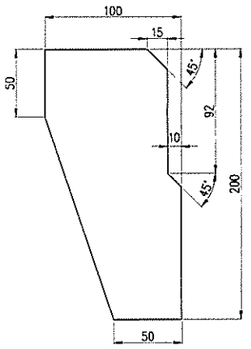




Typical vertical welding joint on tank shell
N.T.S.



Section 'A-A'
N.T.S.



Rib for top angle
Detail
N.T.S.

Notes

1. Before cutting plates the contractor shall consider excess dimensions due to tolerances as supplied.
2. The length on the material list are theoretical and the plates should not be cut according to these dimensions.
   The contractor shall add to length of plates the contractions of vertical welds.
3. Minimum dimensions between edges of reinforcing plate welds and main shell welds are :
   150 mm – for vertical welds, 75 mm – for horisontal welds.
4. * – to be confirmed by manufacturer.
5. Shell development is based on plate dimensions 2400x6000 mm.
   Material of construction – A 537 Cl1.
6. The purpose of the drawing is for bids only.
   Contractor to issue detail design.

Sign	App.	By	Description	Date	No.
	S.R.	G.K.	For bids only	26.03.19	P0

REVISIONS

Petroleum & Energy Infrastructure Ltd
Oil Products Pipeline Ltd

Design: LUDAN Engineering Israel Ltd
NORTH BRANCH
4 Hatnufa St., High Tech Park,
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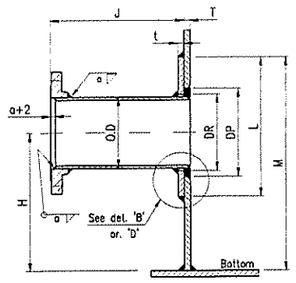
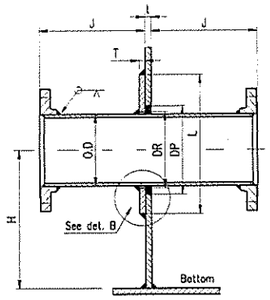
Tel +972-4-9539000, Fax +972-4-9539050
Email: North@ludan.co.il www.ludan.co.il

Project No: 165151

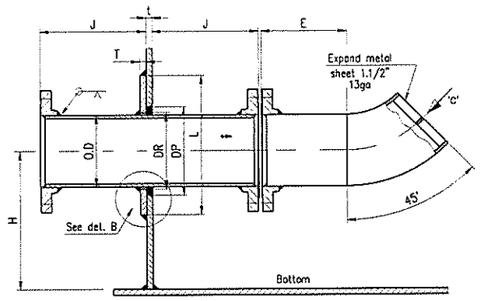
Drawing Name: SHELL DETAILS	Unit: Eshel Tank Farm		
	Subject: T-551-556		
Drawing No. 07-2462-DRG-003		By	Sign	Date
File No: 07-2462-DRG-003.dwg (תת' קובץ)	Designed	K.V.		12.02.19
	Drawn	G.K.		24.02.19
	Checked	S.R		21.03.19
Scale: N.T.S.	Approved	M.SH		21.03.19



Type I

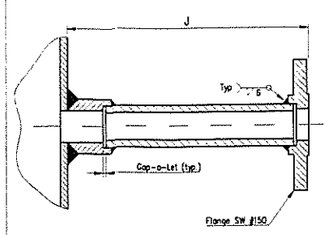


Type II

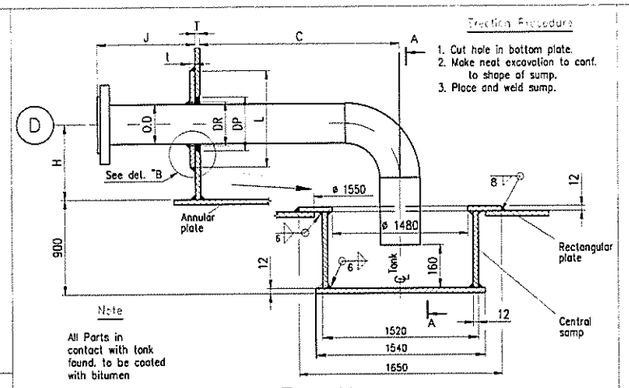


Bend reinf. plate to radius of tank

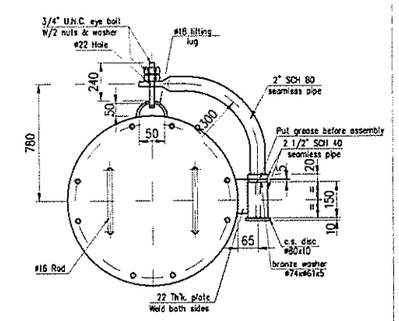
Type III (See note 6)

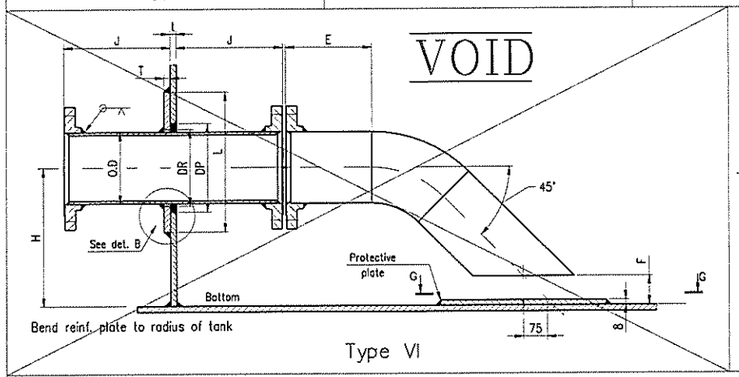


Type IV

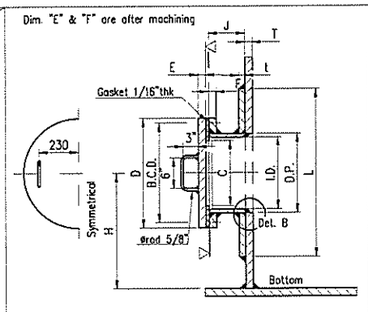


Type V

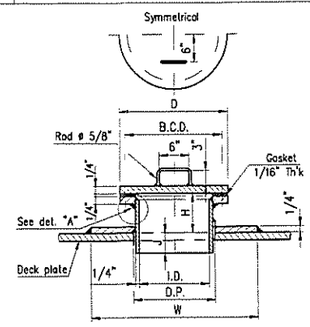




Type VI



Type VII



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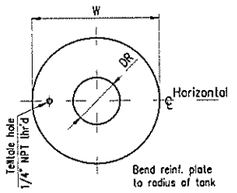
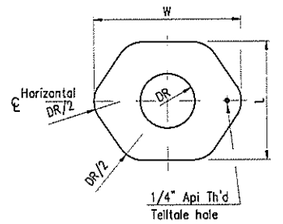
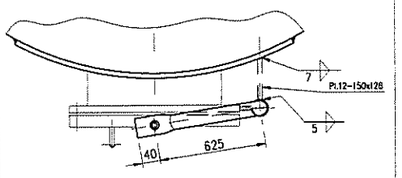


Type IX



Bend reinf. plate to radius of tank

Type X

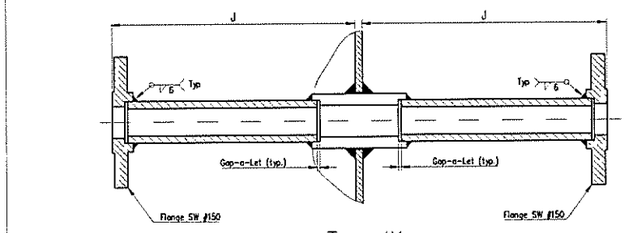


Swing davit for nozzles 'M1','M2','M3'

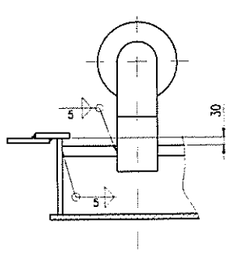
Mk	No's req'd	Type	Nom. dia.	Class	Flange	Pipe O.d.	Pipe SCH.	H	J	DH	C	D	E	F	I.D.	B.c.d.	Bolts No's	Bolts ø	Gasket
A	1	III	16"	150#	S.O., R.F.	406.4	XS	–	–										
B, B1	2	II	18"	150#	S.O., R.F.	457.0	XS	–	–										
C	1	II	4"	150#	S.O., R.F.	168.3	XS	–	–										
D	1	V	6"	150#	S.O., R.F.	168.3	XS	–	–		27000								
D1	1	IX	1.1/4"	150# 3000#	S.W., R.F. HALFCOUPL	42.2	160	–	–										
E	1		4"	150#	S.O., R.F.	168.3	XS	–	–										
F	1		4"	3000#	NPT	–	–	–	–										
G1÷G8	8		4"			–	–	–	–										
GP	1		18"			–	–	–	–										
H1,H2	2		8"	150#	S.O., R.F.	219.1	XS	–	–										
H3	1		8"	150#	S.O., R.F.	219.1	XS	–	–										
L1	1		3"	300#	S.O., R.F.	88.9	XS	–	–										
L2	1	I	8"			273	XS	–	–										
M1,M2,M5	3	VII	36"	API 650		914.4	–	–	–										
M3	28	–	24"	API 650		610	–	–	–										
M4A/B	2	VIII	30"	API 650		762	–	–	–										
R1÷R4	4		4"	–	–	168.3	XS	–	–										
SP	1	I	8"	150#	S.O., R.F.	219.1	XS	–	–										
T	1		2"	150#	–	–	–	–	–										
V1÷V3	3		8"			–	–	–	–										
W	1	IX	1"	150# 3000#	S.W., R.F. COUPLING	33.4	160	–	–										

Mk	∠'	Remarks
A		See note 6
B, B1		
C		
D		See det. 'E'
D1		See det. 'E', w/blind
E		See DWG 07-2462-DRG-005
F		
G1÷G8		See DWG 07-2462-DRG-011
GP		By contractor
H1,H2		By contractor
H3		By contractor
L1		
L2		By contractor
M1,M2,M5		Acc. API 650
M3		Acc. API 650
M4A/B		Acc. Api 650
R1÷R4		By contractor
SP		With blind flange
T		By contractor
V1÷V3		By contractor
W		

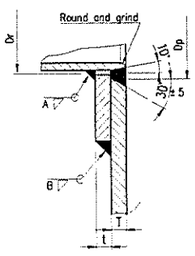
Mk	Type	T&t	Reinforcing Welds A	A	B	W	W1	W2	L	M	N	Dr	Dr1	Dr2	Dp
A	X	32	–	–	–	–			–			–			–
B, B1	X	32	–	–	–	–			–			–			–
C	X	32	–	–	–	–			–			–			–
D	X	32	–	–	–	–			–			–			–
D1	–	–	–	–	–	–			–			–			–
E			–	–	–	–			–			–			–
F			–	–	–	–			–			–			–
G1÷G8			–	–	–	–			–			–			–
GP	–	–	–	–	–	–			–			–			–
H1,H2	–	–	–	–	–	–			–			–			–
H3	–	–	–	–	–	–			–			–			–
L1	–	–	–	–	–	–			–			–			–
L2	–	–	–	–	–	–			–			–			–
M1,M2,M5	X	32	–	–	–	–			–			–			–
M3	IX	6	–	–	–	–			–			–			–
M4A/B	IX	6	–	–	–	–			–			–			–
R1÷R4	–	–	–	–	–	–			–			–			–
SP	X	32	–	–	–	–			–			–			–
T	–	–	–	–	–	–			–			–			–
V1÷V3	–	–	–	–	–	–			–			–			–
W	–	–	–	–	–	–			–			–			–



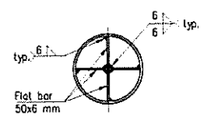
Type IX



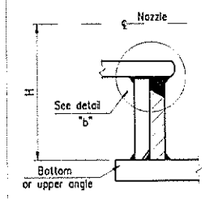
View 'A'



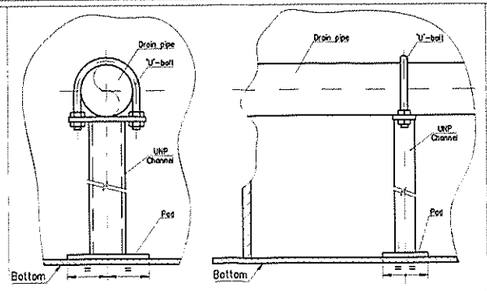
Detail "B"



View 'C'



Detail "D"



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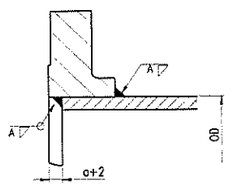

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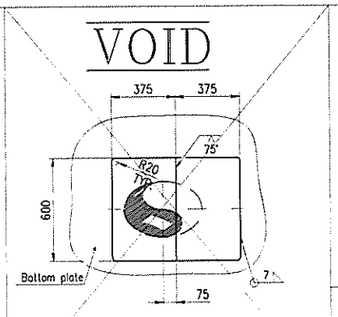

Section 'G'

Notes

1. Nozzles design according to A.P.I. 650.
2. All bolt holes on flanges shall straddle to ℄'s.
3. See table for elevation of nozzles S1÷5.
4. For nozzles M1,M2,M3 – dimensions are after machining.
5. The purpose of the drawing is for bids only. Contractor to issue detail design.
6. Contractor shall design the inlet distributor for nozzle 'A' according to latest requirement in B.A.T. documents(BREF).

Petroleum & Energy Infrastructures Ltd
Oil Products Pipelines Ltd

Design: LUDAN Engineering Israel Ltd
Project No. 165151

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Tel.+972-4-8509888, Fax.+972-4-8509880
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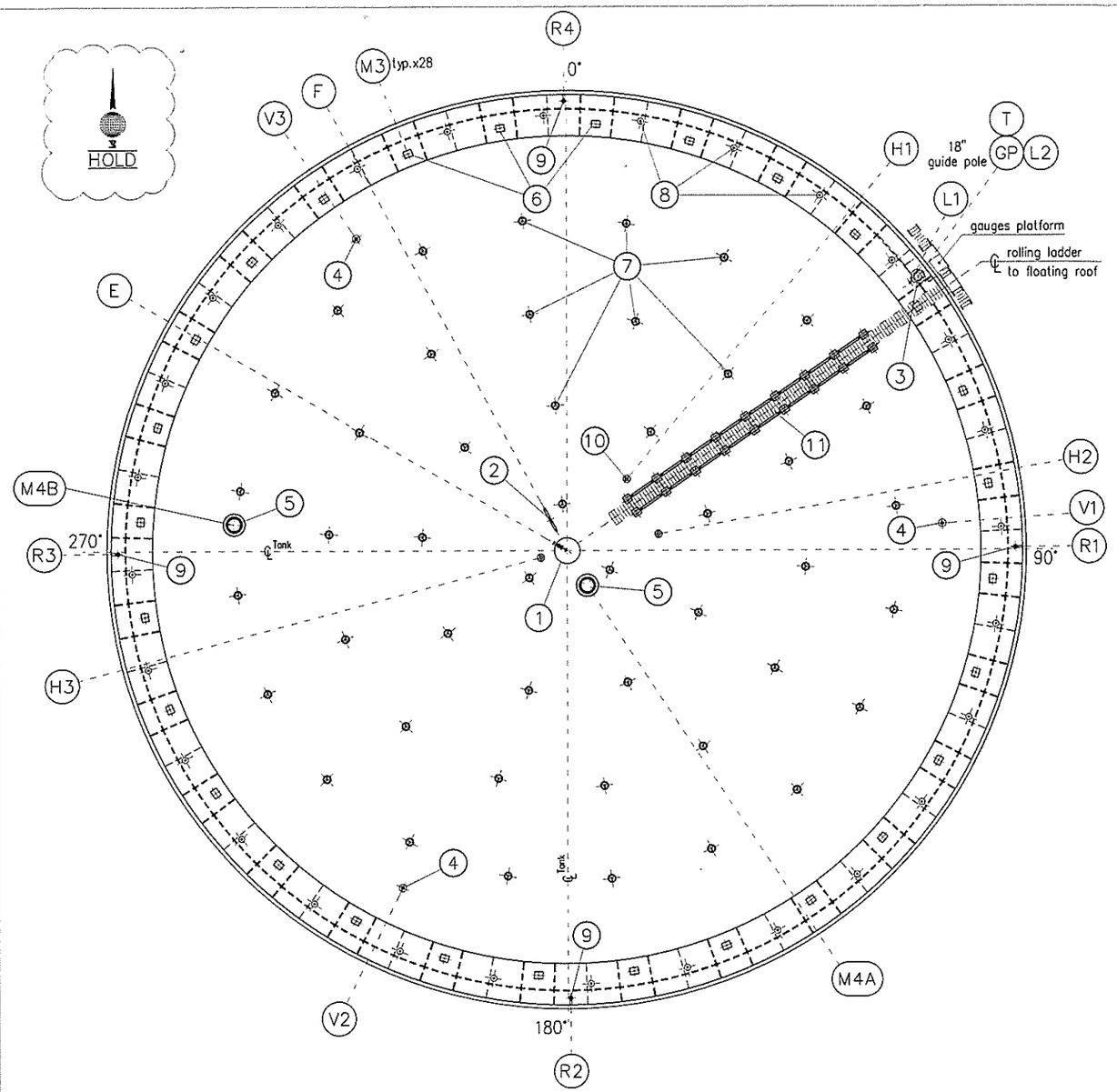
Drawing Name: NOZZLE DETAILS
Unit: Eshel Tank Farm
Subject: T-667-BBE

Sign	App.	By	Description	Date	No.
	M.SH.	G.K.	Revised for bids	20.06.22	P1
	S.R.	G.K.	For bids only	26.03.19	P0

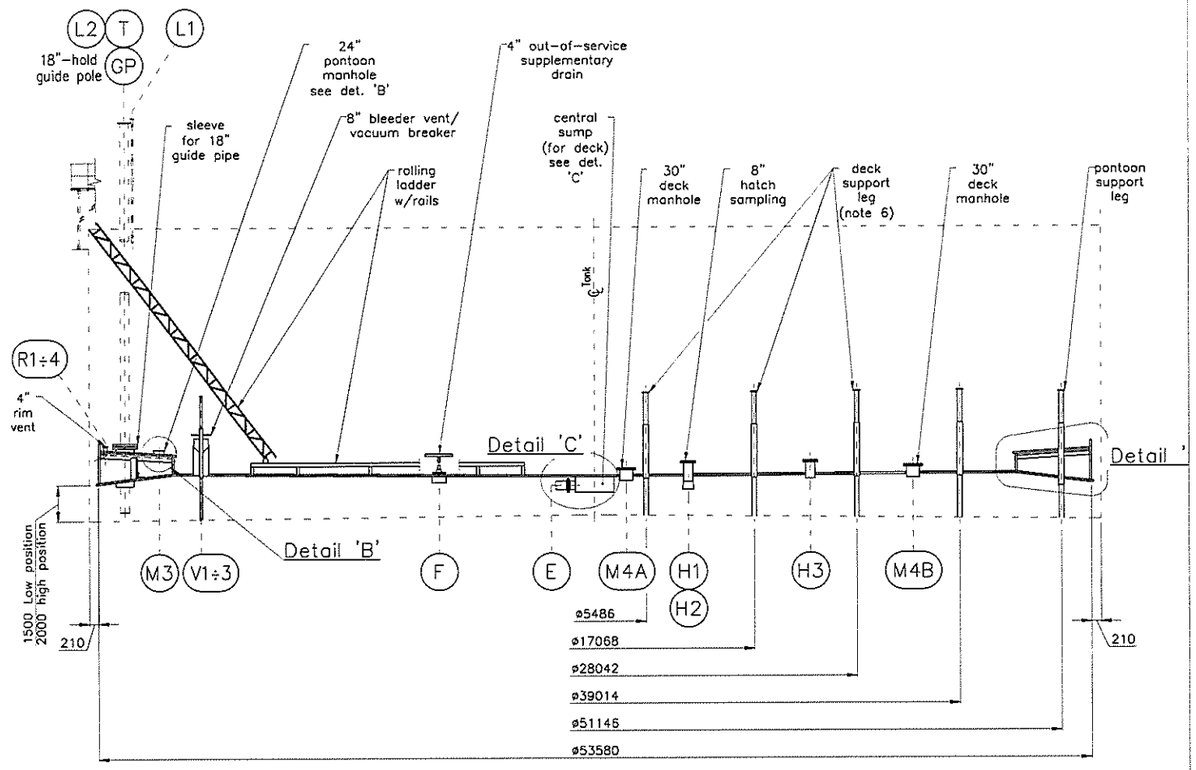
REVISIONS

Drawing No. 07-2462-DRG-004
File No: P:\07-2462-DRG-004.dwg
Scale: N.T.S.

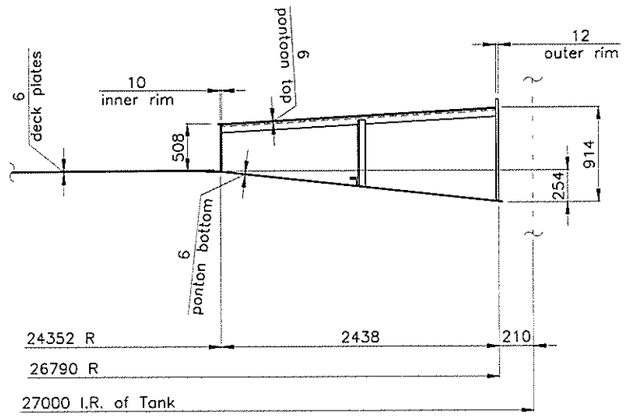
	By	Sign	Date
Designed	K.V.		12.02.19
Drawn	G.K.		20.02.19
Checked	S.R.		21.03.19
Approved	M.SH.		21.03.19



Plan
(hold for orientation)
N.T.S.



Elevation
(hold for elevation)
N.T.S.



Detail 'A'
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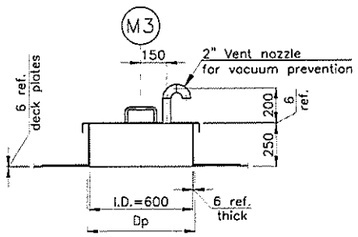
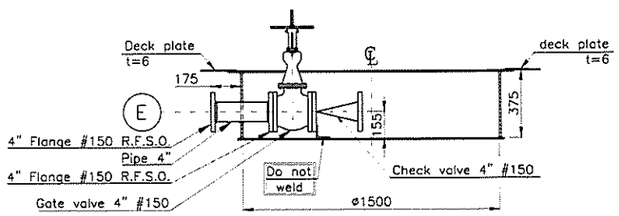


Detail 'B'
Pontoon manhole
(typ.x28)
Scale 1:20



Detail 'C'
Floating roof sump
Scale: 1:20

Notes

1. Material: A-36 or equivalent.
2. -Pontoon legs – 28 pc's
   -Deck legs – 46 pc's
3. Total floating roof weight – 175 t
4. Nozzles schedule see drawing 07-2462-DRG-001.
5. The purpose of the drawing is for bids only. Contractor to issue detail design.
6. Contractor shall supply deck and pontoon support legs.
   Each leg shall be equipped with a leg cap for prevention of abrasion due to metal to metal contact at roof lower level.

M.SH.	G.K	Revised for bids	20.06.22	P1
S.R.	G.K.	For bids only	26.03.19	P0
Sign	App.	By	Description	Date	No.

REVISIONS

Petroleum & Energy Infrastructures Ltd
Oil Products Pipelines Ltd

Design: LUDAN Engineering Israel Ltd
Project No: 165151

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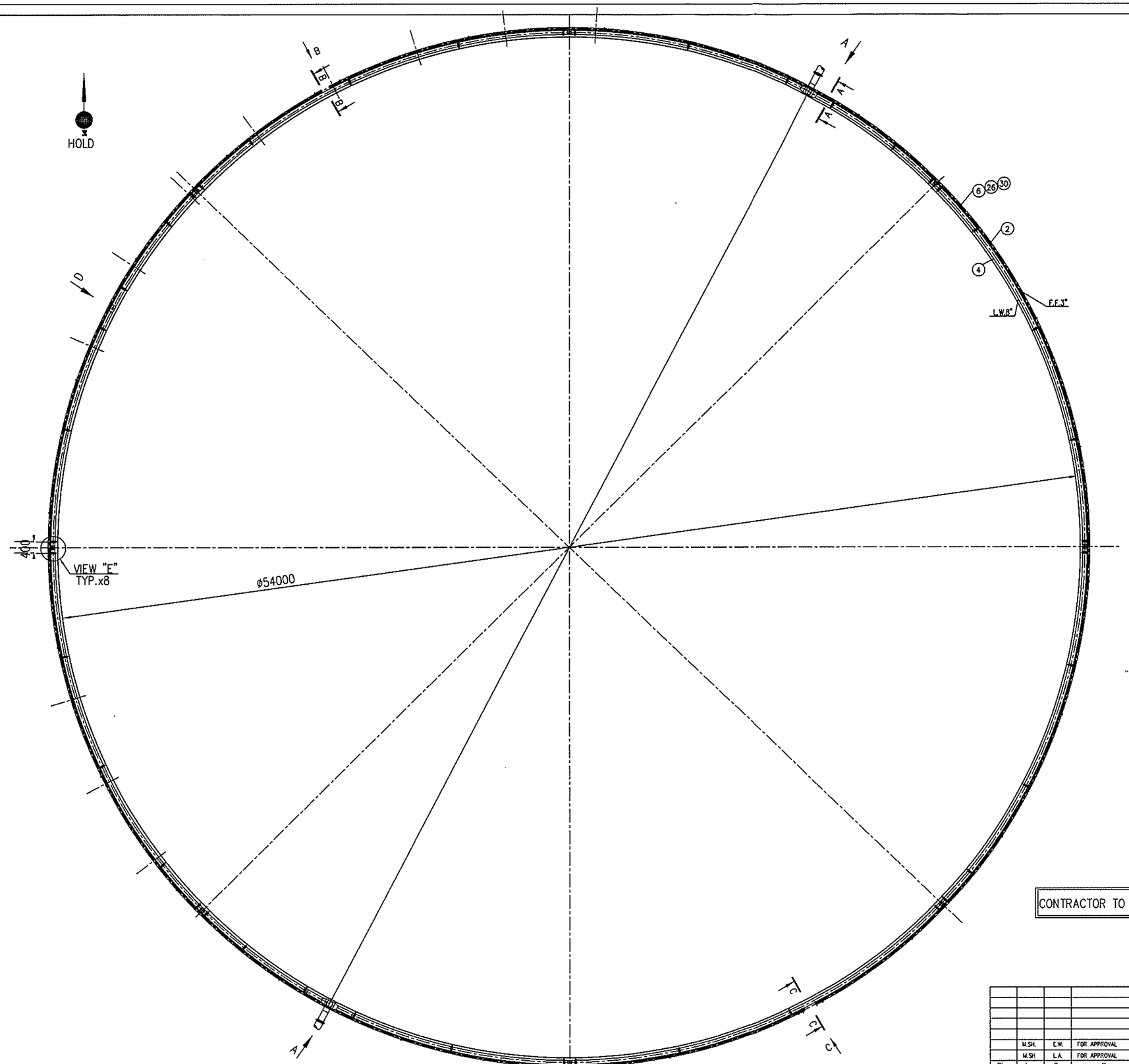
Drawing Name:	FLOATING ROOF ARRANGEMENT
Unit:	Eshel Tank Farm
Subject:	[illegible]
Drawing No.	07-2462-DRG-005
File No.	07-2462-DRG-005.dwg
Scale	N.T.S.

	By	Sign	Date
Designed	K.V.		18.03.19
Drawn	G.K.		19.03.19
Checked	S.R		25.03.19
Approved	M.SH.		25.03.19



LIST OF MATERIALS

No.	SIZE	DESCRIPTION	MATERIAL	UNIT	QUANT.
1	1"	PIPE SEAMLESS TE, SCH.80	A106-GR.B GALV.	M	60
2	3	PIPE SEAMLESS BE, SCH.40	A106-GR.B	M	172
3	4"	PIPE SEAMLESS BE, SCH.40	A106-GR.B	M	110
4	8"	PIPE SEAMLESS BE, SCH.40	A106-GR.B	M	172
5	12"	PIPE SEAMLESS BE, SCH.40	A106-GR.B	M	48
6	3"	SO FLANGE 150#RF	A105	No'S	60
7	4"	SO FLANGE 150#RF	A105	No'S	64
8	8"	SO FLANGE 150#RF	A105	No'S	84
9	12"	SO FLANGE 150#RF	A105	No'S	20
10	3"	WN FLANGE SCH.40 150#RF	A105	No'S	2
11	3"	45 LR ELBOW BW, SCH.40	A234-WPB	No'S	1
12	4"	90 LR ELBOW BW, SCH.40	A234-WPB	No'S	8
14	12"	90 LR ELBOW BW, SCH.40	A234-WPB	No'S	2
15	4"x3"	TEE REDUCER BW, SCH.40	A234-WPB	No'S	1
16	8"X4"	TEE REDUCER BW, SCH.40	A234-WPB	No'S	1
17	4"X3"	CONCENTRIC REDUCER BW, SCH.40	A234-WPB	No'S	4
18	1"x1/2"	REDUCING COUPLING SCR'D BSPF/F 3000#	A105 GALV.	No'S	122
19	1"	HALF COUPLING SCR'D NPT 3000#	A234-WPB	No'S	124
20	1/2"	SPRINKLER B1/2 k-40, SCR'D 1/2" BSPM	-	No'S	122
21	3"	GATE VALVE 150#RF	CS	No'S	1
22	4"	GATE VALVE 150#RF	CS	No'S	1
23	4"	BUTTERFLY VALVE WAFER TYPE 150# RF	CS	No'S	2
26	3"	GASKET 150# RF 1.5mm	KLINGERsil C-4400	No'S	30
27	4"	GASKET 150# RF 1.5mm	KLINGERsil C-4400	No'S	34
28	8"	GASKET 150# RF 1.5mm	KLINGERsil C-4400	No'S	42
29	12"	GASKET 150# RF 1.5mm	KLINGERsil C-4400	No'S	10
30	5/8"x3.1/2"	STUD BOLTS UNC w/2 NUTS	A193-B7 / A194-2H	No'S	400
31	3/4"x4.1/2"	STUD BOLTS UNC w/2 NUTS	A193-B7 / A194-2H	No'S	350
32	7/8"x5"	STUD BOLTS UNC w/2 NUTS	A193-B7 / A194-2H	No'S	120
33	1"	BALL VALVE SCR'D NPT 800#	CS	No'S	2
34	1.5"	BALL VALVE SCR'D NPT 800#	CS	No'S	2
35	1"	PLUG SCR'D 3000#	A105	No'S	2
36	1.5"	PLUG SCR'D 3000#	A105	No'S	2
37	4"	WN FLANGE SCH.40 150#RF	A105	No'S	2
38	4"	45 LR ELBOW BW, SCH.40	A234-WPB	No'S	1
39	12"X8"	CONCENTRIC REDUCER BW, SCH.40	A234-WPB	No'S	4
40	1.5"	HALF COUPLING SCR'D NPT 3000#	A234-WPB	No'S	2
41	12"	TEE EQUAL BW SCH 40	A234-WPB	No'S	1

WALKWAY AND PIPING SUPPORTS BY CONTRACTOR *

ALL PIPING SHALL BE GALVANIZED *

CONTRACTOR TO VERIFY AND UPDATE THIS DESIGN ACCORDING TO TANK DETAIL DESIGN

Sign	App.	By	Description	Date	No.
	M.SH.	E.W.	FOR APPROVAL	03.19	P1
	M.SH.	L.A.	FOR APPROVAL	03.19	P0

REVISIONS

Design: LUDAN Engineering Israel Ltd

Project No: 165151

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Drawing Name: FIRE FIGHTING AND FOAM-G.A

Unit: Eshel

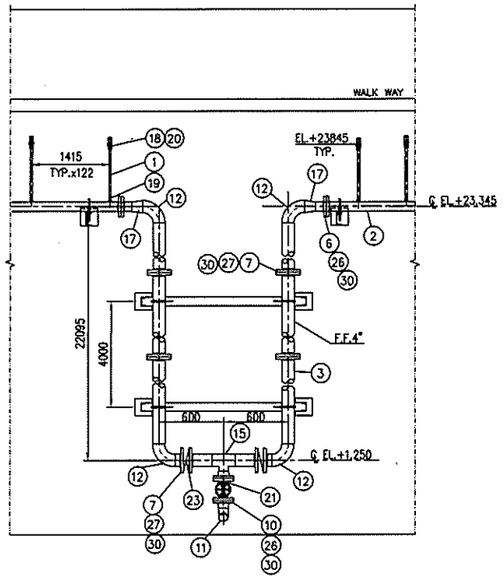
Subject: T-551-556

Drawing No.: 07-2462-DRG-010

File No: [illegible] 07-2462-DRG-010

Scale: 1:100

	By	Sign	Date
Designed	E.W.		03.19
Drawn	L.A.		03.19
Checked	Z.S.		03.19
Approved			



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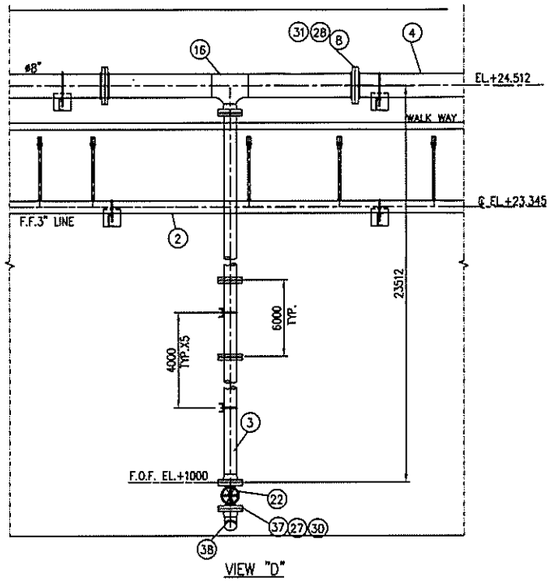
SC. 1:30



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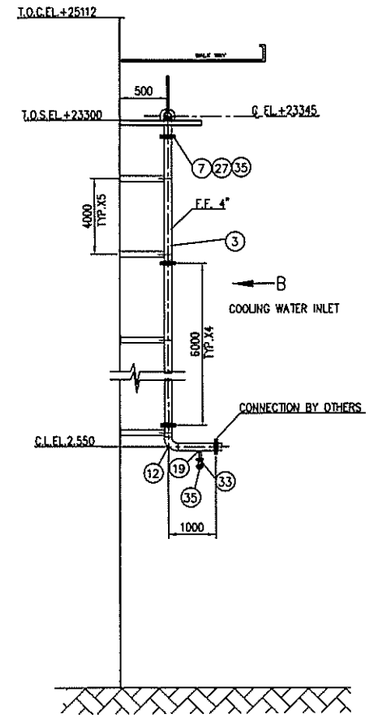

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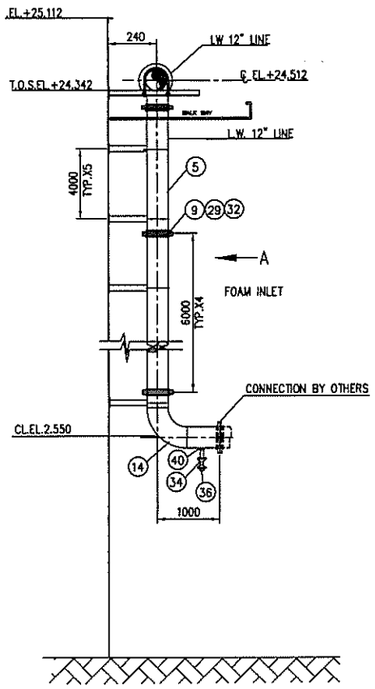
SC. 1:50



SECTION A-A
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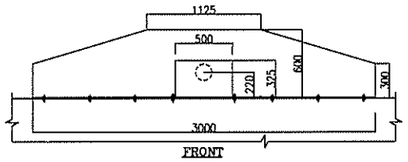
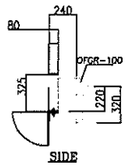
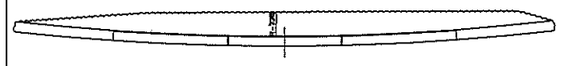
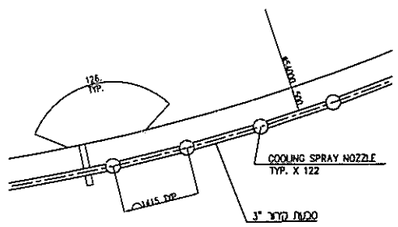


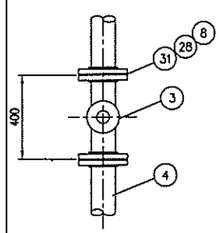




PLAN
DETAIL 3



DETAIL 1



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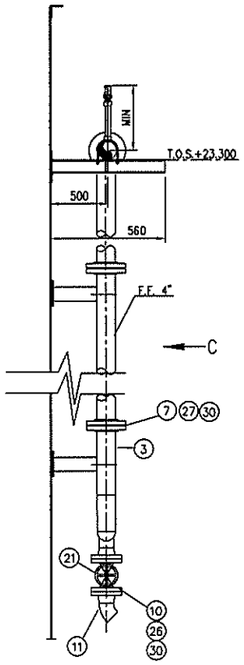
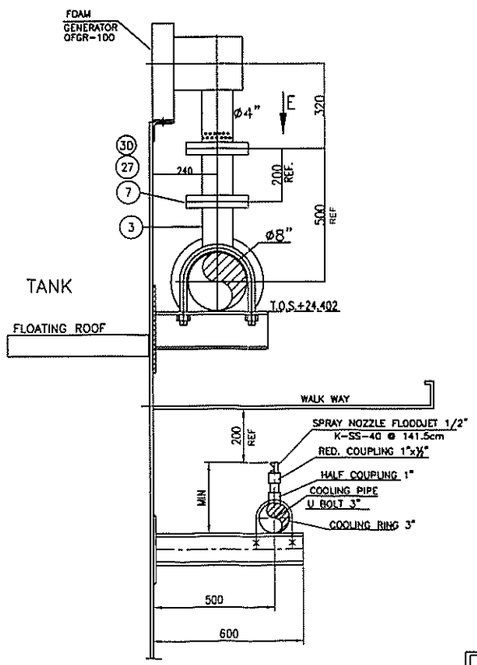
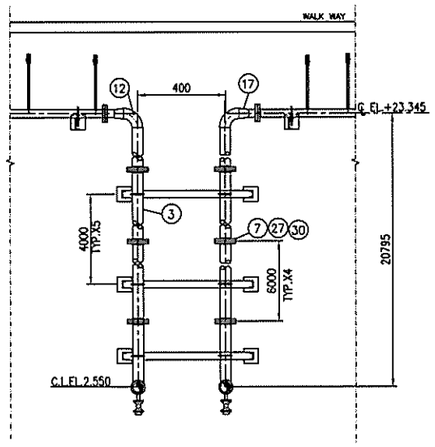
TYPE.X8



SECTION C-C
SC. 1:20



DETAIL 2



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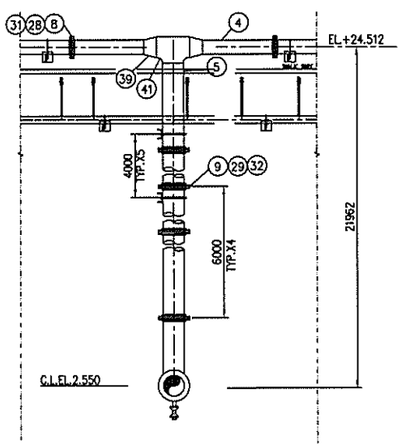

VIEW "A"

WALKWAY AND PIPING SUPPORTS BY CONTRACTOR *

ALL PIPING SHALL BE GALVANIZED *

0.000=HOLD

CONTRACTOR TO VERIFY AND UPDATE THIS DESIGN ACCORDING TO TANK DETAIL DESIGN

Sign	App.	By	Description	Date	No.
	M.SH.	E.W.	FOR APPROVAL	03.19	P1
	M.SH.	L.A.	FOR APPROVAL	03.19	P0

REVISIONS

Petroleum & Energy Infrastructures Ltd.
A subsidiary of Israel Corporation Group

Design: LUDAN Engineering Israel Ltd.
Project No: 165151

NORTH BRANCH
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Drawing Name: FIRE FIGHTING AND FOAM DETAILS
Unit: Eshel
Subject: T-551-556
Drawing No.: 07-2462-DRG-011
File No: 07-2462-DRG-010 :מס' קובץ

	By	Sign	Date
Designed	E.W.		03.19
Drawn	L.A.		03.19
Checked	Z.S.		03.19
Approved			

Scale: