LEBANESE REPUBLIC

MINISTRY OF PUBLIC WORKS AND TRANSPORT

PORT OF TRIPOLI

GRAIN SILO AT THE PORT OF TRIPOLI

DBOT (Design, Build, Operate, Transfer)

Tender Document – Conditions of Tendering

SEATEC

ST-2030-TD-V001-J
February 2023

GRAIN SILO AT THE PORT OF TRIPOLI

Tender Document – Conditions of Tendering

Prepared for

LEBANON – Tripoli
El Mina
Ph : 00961 6 60 04 13
Fax : 00961 6 22 01 80
E-mail : info@oept.gov.lb

Prepared by

SEATEC sarl

Lebanon, Byblos, Down Town, 31 Ernest Renan S^{t}, Beayni Center, 1st Floor
Ph : 00961 9 55 00 22
Fax : 00961 9 55 00 44
Mob : 00961 3 29 10 30
Web : www.seatec-sarl.com
E-mail : seatec@seatec-sarl.com

January 2023

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Grain Silo at the Port of Tripoli
Tender Document

Quality Information

Client Port of Tripoli	**Contract Nbr**
Project Grain Silo at the Port of Tripoli	**Project Nbr** ST-2030
Document reference ST-2030-TD-001-J	**Controlled Nbr**
Document Title Tender Document	
Cover letter / Transmittal ref. Nbr	**Date** 08-02-2023

Revision, review and approval records

J	Tender Document	GS 06-02-2023	MG 06-02-2023	PS 07-02-2023
Revision	**Description**	**Prepared by / date**	**Reviewed by / date**	**Approved by / date**

Document Revision Register

Issue Nbr	Date of issue	Section	Revision Details	Revision by Name & Position
001-J	08-02-2023			

SEATEC sarl **Tender Document**

Table of Contents

1. INSTRUCTIONS TO TENDERERS

1.1. OBJECT OF THE TENDER

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tel: 961 6 220180
Tripoli, El Mina
LEBANON

Hereinafter called the "Conceding Authority" or the "Employer" wishes to supplement the Port of Tripoli's facilities by implementing and operating silo for grain storage within the Port Terminal, in the location specified in the attached drawings.
The Ministry of Economy and Trade shall have the full right to control and supervise all grain silo operations related to food security as per the Lebanese regulations.
The required installations are:

- Grain silo with the following minimum characteristics, dimensions and capacities:
  - 120,000T total capacity
  - 5,000T capacity per steel bin with a flat bottom
  - Possibility for storage of wheat, corn, barley, sunflower and other

  The grain silo must be completely operational and ready for use, according to international rules and standards and fully classified by recognized classification societies.
- Two ship unloaders (Minimum unloading capacity 200T/hr each)
- One ship loader (Minimum loading capacity 400T/hr)
- 9 flat bottom bins (1,500T each)
- Several loading truck stations
- One unloading truck station
- Necessary mooring and quay accessories for ship berthing in front of the mentioned silo
- Auxiliary civil and building works that must be executed on the same land area of the silo, which will be occupied by the Concessionaire and supplied by the Port Authority.

These new installations will be accomplished under a Concession Agreement (DBOT contract).
The Concessionaire, who will be both investor and developer, will develop the site by fitting out and installing the silo, executing all necessary auxiliary civil works and will then operate it for a predetermined time, on expiry of which all equipment, facilities, structures and constructions used and occupied by the Concessionaire will be transferred to the Port authority knowing that all operations related to food security shall remain under the control and supervision of the Ministry of Economy and Trade as per Lebanese regulations.
All design, construction, operation and maintenance works related to this tender shall be executed according to international standards and regulations and following the Port requirements and guidelines.

1.2. DEFINITIONS, LAW AND LANGUAGE

1.2.1. DEFINITIONS

The following words and expressions shall have the meanings stated in the Concession Agreement and as stated hereafter, except where in the context another meaning is obviously required:

"Approved" and "Approval" means approved in writing, including subsequent written confirmation of previous verbal approval.

"Certificate of completion" means with respect to the Permanent Works, the certificate issued when the entire Permanent Works are complete, and the issuance of such certificate

shall constitute evidence of the Employer's acceptance or "reception" of the Permanent Works.

"Completion" or "Complete(d)" means the full execution and performance of the design, supply, execution, construction and testing of the entire Permanent Works, in strict conformity in all respects with the Contract.

"Conceding Authority" or the "Employer" means the "Office d'Exploitation du Port de Tripoli" named as Conceding Authority or Employer in the Concession Agreement.

"Concessionaire" means the company named as Concessionaire in the Concession Agreement.

"Consultant Engineer" or "Engineer" means the entity notified or which will be notified to the Concessionaire by the Employer, appointed by the Employer to act as the Consultant Engineer in connection with the performance and completion of the Works and whose principal duties will be to act as a technical advisor to the Employer, to review contract submittals to the extent deemed necessary by the Employer and to verify that the Concessionaire's design, construction methods, construction, operation and maintenance of the Works are in accordance with the requirements and with all applicable norms, standards and specifications.

"Contract" means the Concession Agreement, the Employer's Requirements, the Tender, and the further Documents (if any) which are listed in the Contract Agreement.

"Concessionaire staff" means those directors, officers, employees, agents and servants employed by the Concessionaire for time to time in the performance of its duties and obligations in relation to the Works, including, without limitation, the Engineer, and Project Superintendents.

"Construction Materials" means the equipment, fixtures, goods, building systems, building materials and other thing to form part of or to be incorporated into any part of the Permanent Works.

"Contract Submittal" means any submittal if any kind which the Concessionaire is required under the Contract to submit to the Employer's and/or Construction Manager's review and Approval, including, without limitation, material samples, drawings and specifications during the development of the design, working drawings and final specifications, shop drawings, coordination drawings, other drawings, catalog cuts design calculations. Test results, as-built Documentation, schedules, method statements, Detailed Program and the like as required under any of the Contract Documents.

"Drawings" means the drawings forming part of the Tender and any additions or modifications to, or clarifications of, such drawings made by the Employer and / or the Concessionaire and Approved by the Employer or on its behalf by the Consultant Engineer.

"Letter of Guarantee" means any letter of guarantee provided or to be provided by the Concessionaire under and/or in connection with the Contract in favor of the Employer, including, without limitation, the Advance Payment Letter of Guarantee (if existing). Any of the Performance Letters of Guarantee, any of the Conditional Letters of Guarantee, the

Interim Letter Guarantee and any of the Retention Letters of Guarantee, may be modified from time to time in accordance with Contract.

"Notice to Proceed" means the notice to be issued by the Employer to the Concessionaire, instructing the Concessionaire to commence performance of all, or, such part only, of the Works, as shall be specified in such notice.

"OEPT" means Office d'Exploitation du Port de Tripoli.

"Permanent Works" means everything of a permanent nature, including, without limitation, the Construction Materials, to be designed, supplied, executed, constructed, completed, tested and guaranteed under the Contract.

"Public Authority" means any governmental, regional, or municipal entity or agency or any individual representing any such entity or agency.

"Requirements" means any and all design and/or technical criteria and/or descriptions and/or requirements set forth in the Tender Documents or elsewhere in the Contract, including, without limitation, those relating to the Works, Construction Materials, equipment, design, design systems and/or methods, construction, construction systems, construction methods and all other information describing and/or required for the Completion and guarantee of the Works and forming part of the Contract and any modification thereof or addition thereto as may from time to time be furnished by the Employer and/or the Concessionaire and Approved by the Employer, or, which may be agreed by the parties.

"Scope of Works" means the scope of Works and the Drawings set forth in the Tender Documents.

"Site" means the land and/or sea-bed and/or reclaimed land in, on or through which the Permanent Works are to be constructed, the boundaries of which are identified on the attached Drawings, and/or any other land and places which may be from time to time provided in writing or Approved at its entire discretion by the Employer to the Concessionaire for working space.

"Subcontractor" means any person, firm or legal entity (other than a Supplier or an individual who is a member of the Concessionaire's staff or any Supplier's staff), at any time, retained or employed by the Concessionaire to perform any part of the Works.

"Supplier" means any person, firm or legal entity which sells or otherwise provides Construction Materials to the Concessionaire or any Subcontractor or otherwise undertakes to assist the Concessionaire or any Subcontractor in the performance of any part of the Works, but which, in each such case, does not perform other than incidental or immaterial services on the Site with respect thereto.

"Temporary Works" means all Temporary Works of every kind required in or about the performance of the Works.

"Tender" or "Bid" means the Tenderer's signed offer for the Employer's Requirements and all other Documents which the Employer submitted there with as included in the Contract.

"Works" means the Permanent Works and everything whether of a temporary nature (including the Temporary Works and Construction Plant) or of a permanent nature required in or for the Completion and guarantee of the Permanent Works, so far as the necessity thereof is specified in or may reasonably be inferred from the Contract or is otherwise required for the Completion and guarantee of any part of the Permanent Works.

1.2.2. LANGUAGE

English language shall be the language used for all correspondence and Tender Documents. Language shall be as stated in the Concession Agreement. In all cases and at any time, the Concessionaire must supply to the Employer, in reasonable time, at the Employer verbal or writing request, an Arabic translation, of any document previously prepared and submitted by the Concessionaire, whatever nature or destination is. In the event of any dispute as to the meaning between the Arabic and English texts, the Arabic version shall prevail.

1.2.3. LAW

The Contract shall be governed by and construed in all respects in accordance with the laws of the Republic of Lebanon.
This Document, entitled "Instructions to Tenderers" shall be considered as a part of the Concession Agreement.

1.3. ELIGIBITY

1.3.1. ELIGIBLE TENDERERS

This invitation to Tender is open to all eligible firms.
Tenderers shall provide evidence of their eligibility to the satisfaction of the Employer as requested.
The Tenderers, including all members of a Joint Venture and all subcontractors shall not be affiliated with a firm or entity:

(1) That has provided consulting services related to the Works to the Employer during the preparatory stages of the Works,
(2) That has been hired (or is proposed to be hired) by the Employer as Engineer or Consultant for the Contract.

1.3.2. ELIGIBLE MATERIALS, EQUIPMENT AND PLANT

All materials, Plant and Concessionaire's Equipment, other supplies, and services to be supplied under the Contract, shall have their origin in eligible source countries as defined in the Lebanese regulations, and all expenditures made under the Contract will be limited to such materials, Plant or Concessionaire's Equipment, other supplies, and services.

1.4. QUALIFICATION OF THE TENDERER

1.4.1. APPROVED TENDERERS

To be qualified for award of the Contract, Tenderers shall provide the following information and Documents within their Tender. Foreign companies shall not submit information and/or Documents mentioned in items (c) and (f) of this Clause.
All certificates should be originals or legally certified copies of the originals, otherwise the Tenderers' Tender will be rejected.

a) Legally certified copies of original Documents defining the constitution or legal status, place of registration and principal place of business
b) Legally certified copy of the firm registration at the registry of Commerce
c) Legally certified copy of the firm registration at the VAT; A wining foreign company of this bid shall register a company in Lebanon, according to Lebanese regulations and accomplish all its work regarding this Tender through this company
   Furthermore, all related administrative papers, including VAT registration, shall be submitted to the Client
d) A written power of attorney authorizing the signatory of the Tender to commit the Tender
e) Receipt for purchase of the Tender Documents
f) Certificate of quittance issued by the National Social security Fund. Its validity extending beyond the Tender opening date; Similar for foreign companies in their countries of origin.
g) List of silos projects executed and operated by the Tenderer, in Lebanon and/or abroad, with duly certified copies of support Documents (Works starting and handing over certificates, operation time…), to be provided by the Clients, listing in minimum the above-mentioned works nature and amount, in addition to silos operation
   These latest works will be taken in account by the evaluation committee
h) In any case, the Tenderer must show his capacity to undertake the execution and operation of all civil works and silos, either through his own team or through a nominated subcontractor, which experience is to be shown by certificates mentioning at least the following, within the past 15 years (year 2022 included):
   - Construction and implementation of at least one steel grain silo plant with a minimum capacity of 150,000T with all auxiliary civil and MEP works
   - Operating and managing one or several grain silos with a minimum total capacity of 1,000,000T over these fifteen years
i) Statement of non-exclusion to participate in biddings from Tripoli Port Authority
j) Major items of Construction equipment proposed for carrying out this Contract
k) The names and CVs of key personnel proposed for the administration and execution of this Contract, both on and off site. If the Concessionaire is awarded the Contract, he shall obtain the Employer approval on the CVs and key personnel list and all remaining employees prior to begin working on site.
   Every Lebanese engineer, whether he is a Contractor or an Engineer employed by a company, or establishment classified on the basis of his employment thereby, shall enclose in his Tender a certificate confirming his membership to any one of the two Orders of Engineers in Lebanon for the year in which the Tender is submitted.
l) Proposals for subcontracting any elements of the Works. Tenderers should refer to related Sub-clauses of the Conditions of Contract
m) Manufacturers list
n) Bank certificate for access to liquid assets and/or evidence of access to or availability of credit facilities
o) Information regarding any current litigation in which the Tenderer is involved
p) Program of Work and Method Statement in sufficient detail to demonstrate the adequacy of the Tenderer's proposals to meet the Technical Specifications and the completion time. No alterations or changes can be made to the Specifications
q) Contractual commitment completed, stamped and signed according to the forms of Tender
r) Certificate indicating the permanent address of the Tenderer
s) Any Additional Documents for qualification of the Tenderer that may be required

For foreign companies, all the above required Documents must be duly certified at their Countries Embassies in Lebanon.
The Employer have the full power and right to reject any Tender, proposal, Document, information…
In all cases, The Tenderer will have no right for any objection and/or request of any claim whatever nature is.

1.4.2. EVIDENCE OF QUALIFICATION

All information and Documents required under the Sub-section 1.4.1 shall serve as evidence of qualification and of the Tender's capability to carry out the Contract.
Unless specifically listed in the Letter of Acceptance or in the Contract Agreement, these information and Documents shall not from a Contract Document, but the Tenderer will remain responsible for the validity, authenticity, and correctness of the information provided. Any Incorrect or fraud Document will lead to the direct rejection of the Tender.

1.4.3. JOINT VENTURES

Tenders submitted by a Joint Venture of two or more firms as partners shall comply with the following requirements:

a) Only eligible firms are allowed to form a Joint Venture;
b) The Joint Venture Agreement shall include all the information listed in Sub-Clause 1.4.1 above
c) The Joint Venture Agreement shall be in the form of the sample Agreement attached and shall be completed, entered into, and signed by the Joint Venture partners and submitted with the Tender
d) One of the partners shall be nominated as being in charge and this authorization shall be evidence by submitting a power of attorney signed by legally authorized signatories of all the partners
e) The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the Joint Venture and the entire execution of the Contract including payment shall be done exclusively with the partner in charge
f) In case of a successful Tender, the Tenderers shall sign the Form of Agreement as to be legally binding on all partners.
   All partners of the Joint Venture shall be liable jointly and severally from the execution of the Contract in accordance with the Contract items

1.4.4. NUMBER OF TENDERS

A firm shall submit one Tender in the same Tendering process, either individually as a Tenderer or as a partner in a Joint Venture.
No firm can be a Subcontractor while submitting a Tender individually or as a partner of a Joint Venture in the same Tendering process.
A firm, if acting in the capacity of Subcontractor in the Tender, may not participate in more than one Tender.
A Tenderer or a subcontractor who submits or participates in more than one Tender cause all the proposals in which the Tenderer has participated to be disqualified.

1.5. TENDER DOCUMENTS

1.5.1. CONTENT

The Tender Documents are those stated below, and should be read in conjunction with any Addendum issued in accordance with related Clauses.

1- INSTRCUTIONS TO TENDEREERS
2- FORMS OF TENDERS
3- CONCESSION AGREEMENT
4- DRAWINGS
5- TECHNICAL SPECIFICATIONS

1.5.2. CONFIDENTIALLY AND EXAMINATION OF TENDER DOCUMENTS

The Tenderer shall treat the Tender Documents as private and confidential and shall not publish or disclose the same or any parts thereof in any trade or technical paper or elsewhere. The Tender Documents shall not be used for any purpose other than that for which they are intended.
The Tenderer shall examine carefully all Documents for completeness and clarity.
If any part is missing or indistinct, he shall inform Employer.
Failure to comply with the requirements of the Tender submission will be at the Tenderer/s own risk.
Pursuant to Clause 1.4.1, Tenders which are not substantially responsive to the requirements of the Tender Documents will be rejected.

1.5.3. DISCREPANCIES AND CLARIFICATIONS

If the Tenderer finds any ambiguities in the Documents or discrepancies between Documents or any other matters that are unclear, or if he is requiring any clarification of the Tender Documents, he shall inform in writing and by hand the Employer, in a minimum of (20) days prior to the date for submission of Tenders, who will respond with an addendum (10) days prior to the date for submission of Tenders.
Copies of the Employer's addendum will be forwarded to all Tenderers, including a description of the inquiry but without identifying its source.
Except as provided for in this Clause no representation, explanation or statement made to a Tenderer prior to the Employer’s written acceptance of his Tender whether by the Engineer or any of his assistants or by any officer or member of the Employer’s staff or by anyone as to the meaning of any of the Documents forming the Contract or as to anything to be done or not to be done by the Tenderer shall bind the Employer or bind the judgment or powers of the Engineer in the exercise by him of his duties under the Contract.

1.5.4. AMENDMENT

At any time prior to the original or extended date for submission of Tenders, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a Tenderer(s), modify the Tender Documents by the issue of an addendum.
Any addendum thus issued shall be part of the Tender Documents, and shall be communicated in writing by Email or by facsimile to all purchasers of the Tender Documents. Prospective Tenderers shall acknowledge receipt of each addendum in writing by hand or facsimile to the Employer.

To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their Tenders, the Employer can, if deemed necessary, extend the deadline for submission of Tenders.

1.5.5. COMMUNICATIONS

All notes, requests for information and other communications from the Tenderer shall be sent by letter to the Employer, duly registered at the Employer headquarter, at the following address:

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tel: 00961 6 220180
Tripoli, El Mina
LEBANON

1.5.6. LANGUAGE OF TENDER

With reference to sub-Clause 1.2.2, stating that all Tender correspondences, supporting Documents and printed literature supplied by the Tenderer must be in English, and for special cases where these mentioned Documents and literature are to be supplied in a language other than English, an accurate English translation of the relevant passages must be attached to the initial supplied Documents, in which case, for purposes of interpretation of the Tender, the translation shall prevail.

1.5.7. INFORMATION

All information provided in the Tender Documents concerning the site, levels related to topographic and bathymetric surveys, environmental conditions (waves, wind and tidal data…), means of access, availability, of services, history, is given in good faith, without any responsibility on the part of the Employer.
The Tenderer shall verify and interpret all information given, at his own responsibility and expense, to enable himself to submit a complete Tender, and shall make therefore necessary and adequate investigation and research in order to obtain accurate information which will be him to prepare his offer.

1.6. SITE VISIT

The Tenderer shall visit and examine the Port, the Site and the surroundings and obtain for himself all details required for preparing and submitting his Tender.
The Employer shall not be responsible for any loss, damage or injury, whatsoever, caused to the Tenderer during the site visit.
The costs of visiting the Site shall be at the Tenderer's own expense and his sole responsibility.

1.7. APPOINTMENT

Site visits and request for information must be made by prior appointment with the Employer.
The Tenderer or his official representative may be invited to attend a pre-tender meeting which will take place on the date stated in the letter of invitation.
The purpose of the pre-tender meeting will be to clarify issues and to answer questions on any matters that may be raised at that stage.

The Tenderer is requested to submit any questions in writing or by fax, to the Employer not later than one week before the pre-tender meeting.
Minutes of meeting, including the text of the questions raised and the responses given, will be transmitted without delay to all purchasers of the Tender Documents.
Any modification of the Tender Documents that may become necessary as a result of the pre-tender meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 1.5.4 and not through the minutes of the pre-tender meeting.
Non-attendance at the pre-tender meeting will not be a cause for disqualification of a Tenderer.

1.8. COST OF TENDERING

The Tenderer shall bear all costs associated with the preparation and submission of his Tender and the Employer will in no way be responsible for those costs, or the conduct or outcome of the Tendering process, nor will then Employer bear any liability in respect thereof.

1.9. COMPLETION OF TENDER DOCUMENTS

The Tender must be for the whole of the Works, fully in accordance with the Tender Documents.
A partial Tender will not be considered.
The originals of all Tender Documents and all copies required to be submitted, shall be completed in indelible ink or type writing. All forms of Tender any other Document requiring completion shall be filled in.

1.10. SIGNING OF TENDER

The Tenderer shall prepare one original and one copy of the Documents comprising the Tender.
The Documents shall be clearly marked “ORIGINAL” and “COPY” as appropriate.
In the event of discrepancy between them, the original shall prevail.
The original and the copy of the Tender shall be returned duly completed by writing in indelible ink in the space provided for unit rates and totals.
In the case of copies, photocopies are acceptable. All originals and copies shall be signed by a person or persons duly authorized to sign on behalf of the Tenderer, as the case may be.
All pages of the Tender, where entries or amendments have been made, shall be signed by the person or persons signing the Tender and stamped.
The originals of all other Documents shall be stamped and initiated by the person or persons signing the Tender.
In all cases, the form of Tender shall be signed by a person duly authorized to bind the Tenderer to the Contract.
Proof of authorization shall be provided in the form of a power of attorney, which shall accompany the Tender.

1.11. ALTERATIONS AND CORRECTION OF ERRORS

The completed Tender Documents shall contain no alterations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Tenderer, in which case such corrections shall be initiated by the person or persons signing the Tender.
Errors shall be corrected by striking out the original text and inserting the correction by hand using indelible ink.
The correction of errors by overtyping with or without the use of correction fluid shall not be permitted and any Tender so corrected shall be rejected by the Employer.

1.12. CURRENCY

All financial information and all Tender prices and rates shall be stated in United States Dollars (USD), which will be the currency for all transactions under the Contract.

1.13. DUTIES, TAXES, ETC.

The capital cost for Equipment and costs for operations and management shall include levied customs duties and all other duty payable in Lebanon and elsewhere.
The Employer will not held responsible for paying any dues, taxes, or charges of any kind.

1.14. TENDER VALIDITY

The Tender shall remain valid and open for acceptance for a period of one hundred and eighty (180) days from the latest date fixed for receiving Tenders.
In exceptional circumstances, prior to expiry of the original Tender validity period, the Employer may request that the Tenderers extend the period of validity for a specified additional period.
The request and the responses thereto shall be made in writing or facsimile.
A Tenderer may refuse the request without forfeiting his Tender security.
A Tenderer agreeing to the request will not be required or permitted to modify his Tender, but will be required to extend the validity of his Tender security for the period of the extension, and in compliance with the Tender Clauses in all respects.

1.15. TENDER SECURITY

The Tenderer shall furnish, as part of his Tender, a Tender security in the amount of two hundred thousand US Dollars (200,000) USD.
In case of a Joint Venture, the Tender Security shall be in the name of the Joint Venture.
The Tender Security shall be in the form of a guarantee from a first-class Lebanese Bank, or a foreign Bank with a local branch / affiliate in Lebanon, or through a cash deposit of the whole amount (fresh) in the Port of Tripoli.
The format of the Bank guarantee shall be in accordance with the sample form of Tender Security included in the Tender Documents.
The Tender Security shall be valid for the period stated in the Tender.
Any Tender not accompanied by an acceptable Tender Security shall be rejected by the Employer and shall be considered as non-responsive.
The Tender Securities of unsuccessful Tenderers will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Tender validity.
The Tender Security of the successful Tenderer will be returned when the Tenderer has signed the Agreement and furnished the required Performance Security.
The Tender Security may be forfeited if:

(1) The Tenderer withdraws his Tender during the Period of Tender validity specified in the form of Tender, or
(2) The Tenderer, having been notified of the acceptance of his Tender by the Employer during the period of Tender validity:
    a- Fails or refuses to execute the Form of Agreement; or
    b- Fails or refuses to furnish or increase the Performance Security; or
    c- Refuses to accept the correction of errors in his Tender

1.16. TENDER SUBMISSION

1.16.1. SEALING AND MARKING OF TENDERS

All Documents shall be signed, dated, completed and returned as described in Tender Conditions and Procedures.
The Tenderer shall seal the Tender package and address it to:

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tel: 961 6 220180
Tripoli, El Mina
LEBANON

And shall mark the Tender package with ONLY the following identification:
"DBOT TENDER FOR INSTALLING GRAIN SILO AT THE PORT OF TRIPOLI: DO NOT OPEN WITHOUT AUTHORITY"

The package shall contain two separate and sealed inner envelopes marked as envelope N1 and envelope N2.
Each envelope shall contain one set of original Documents and one set of copies clearly marked "ORIGINAL" and "COPY".

The inner Envelope N1 shall bear the following clear identification:
"DBOT TENDER FOR INSTALLING GRAIN SILOS AT THE PORT OF TRIPOLI"
Envelope N1 "Administrative and Technical Offer"
Name of Tenderer / Address of the Tenderer

This envelope should contain one original and one copy of each of the following:

a) Statement of Tender in accordance with the form included in the Tender Documents, sealed and signed by the Tenderer
b) Tender Security
c) Certified operational and financial Documentation concerning Company structure and profile of the Tenderer
d) Details of the joint-venture Agreement or other commercial arrangements (if any), sealed and signed by the Tenderer
e) Power of attorney
f) Draft Concession Agreement stamped with the official seal of the Tenderer and initialed.
g) Employer's Requirements signed, stamped with the official seal of the Tenderer and initial
h) All information listed in Section 1.4: Qualification of the Tenderer
i) All Tender documents (including addendums, drawings…) signed and stamped by the Tenderer
j) A market study: will be used to identify potential clients, determine their demand, determine corresponding supply and tariffs in Lebanon area, adapt the supply of these new installations and determine the share of the market expected to be captured in function of services and tariffs proposed by these new installations.
   The final objective of this market study will be to determine grain import/export quantity and tariff forecast which will be then used in the business plan in order to determine the opportunity of these installations.
   Thus, for these new installations, a market study shall be submitted including:
   - demand: potential imported quantity, storage duration and type of services
   - supply: potential exported grain quantity, storage duration and type of services
   - present similar installations in Lebanon area and tariffs

k) Development program: This shall set out the installations that the Concessionaire undertakes to provide to the Concession in respect with the Employer's Requirements. Tenderers should keep in mind that the Evaluation Committee will pay particular attention to this part of Tender and any precisions, information about installations to be built, Equipment to be supplied, water and electrical power supplies, bins already in procession will have a major positive impact to the Tender value.
l) Time schedule for the initial development work. This should set out the phasing of the principal activities that will take place between the Commencement Date and the Commencement of Operations, showing especially the phasing for the execution of the civil and MEP infrastructure, till the installation of the silo and launching the operation phase.
m) Any addendum (if any) issued by the Employer, signed and stamped by the Tenderer.

The inner Envelope N2 shall bear the following clear identification:
"TENDERING DOCUMENTS FOR INSTALLING GRAIN SILO AT THE PORT OF TRIPOLI"
Envelope N2 "Financial Offer"
Name of Tenderer / Address of the Tenderer

This envelope should contain one original and one copy of each of the following:
a) Forms of Tender, completed, signed, stamped with the official seal of the Tenderer and initialed.
This shall indicate the Annual Rental Fee;
b) Business plan
A business plan for the operation of the Concession shall be submitted including:
- an import/export forecast
- investment costs
- Operating costs (maintenance, staff, electricity etc. ...)
- provisional revenues
- capital investment pan (equity and debt)
- cash flow
- financial indicators (Project IRR, ROE, Payback)

c) Example of performance security, Concession security, operating regulations and list of tariffs initialed by the Tenderer.

1.16.2. VARIANT SOLUTIONS

Alternatives being not required for the present Tender; the Employer is not obliged to evaluate any alternative.
This being said, tenderers wishing to offer alternatives to the building Documents must first prepare a Tender responding exactly to Employer's project, called the basic solution, as described in the Tendering Documents and shall further provide all information necessary for a complete evaluation of the variant by the Employer including all relevant details (in envelope N1).
In all cases, the Employer have the full right to reject any proposed variant by any of the Tenderers, who will not have to show any objection or claim for this action.

1.16.3. TIME LIMIT FOR SUBMISSION FOR TENDERS

The Tender must be received by the Employer at the address stated above not later than 12:00 hours on the date stated in the form of invitation to Tender.

Any Tender received after the specified time limit will be returned unopened to the Tenderers.
The Employer may, at his discretion, extend the time limit for the submission of Tender by issuing an amendment, in accordance with the Tender Clauses, in which case all rights and obligations of the Employer and the Tenderer previously subject to the original time limit deadline shall thereafter be subject to the new time limit as extended.
Any Tender received by the Employer after the time limit for submission of Tenderers will be returned unopened to the Tenderer.

1.16.4. MODIFICATION AND WITHDRAWAL OF TENDERS

The Tenders' modification or notice of withdrawal shall be written, sealed, marked and delivered prior to the prescribed time limit for submission of Tenders, and in accordance with provisions for the submission of Tenders, with the inner envelope marked "modification" or "withdrawal" as appropriate.
Withdrawal of a Tender during the interval between the time limit for submission of Tenders and the expiration of the period of validity may result in the forfeiture of the Tender security, pursuant to Tender Clauses.
No Tender may be modified by the Tenderer after the time limit for submission.

1.17. TENDER OPENING AND EVALUATION

1.17.1. UNSUCCESSFUL TENDERERS

The Tender securities of unsuccessful Tenderers will be returned as promptly as possible, in the twenty-eight (28) days after the expiration of the period of Tender validity.

1.17.2. TENDER OPENING

The Employer will open Envelope N1 in the presence of Tenderer's representatives who choose to attend, at the time and date stated in the Invitation of Tenders at the address given for return of Tenders.
The Tenderers representatives who are present shall sign a register evidencing their attendance.
The Tender opening committee will take necessary and needed time to study and evaluate all administrative and technical offers, and retain only satisfactory ones.
The committee will fix a date to proceed in the opening of Envelope N2 comprising the priced financial offers of successful Tenderers.
The Tender opening and evaluation procedures may include many sessions as it may be judged by the Tender opening committee and as stated in this Tender.

1.17.3. TENDERS EVALUATION

The Employer will appoint an Evaluation Committee, which will be in charge for controlling the Tender evaluation.
During the Tender opening session, the Evaluation Committee will open each Tender and list all Documents placed in the envelope.
If the Tender is not in conformity with Documents required in Clause 1.4, the Tender will not be considered for further evaluation, regardless of the circumstances.

After the Tender opening session opened to public, the Evaluation Committee will take necessary time to will lead and control the Tender evaluation session and ensure that all Tenders are fairly evaluated.
The Evaluation Committee will determine whether each Tender is of acceptable quality, complete and substantially responsive to the Tender Documents without material deviations, incoherencies, absurdities, objections, conditions or reservations.
Evaluation method will be an attentive analysis of each Document of the Tender.
If a Tender is not substantially responsive, it will be rejected by the Evaluation Committee and it may not subsequently be made responsive by the Tenderer by removal of the non-conformity.
The Evaluation Committee at his discretion, may ask any Tenderer for a clarification of his Tender.
This request and the response shall be in writing and shall not result in a change in the price or substance of the Tender.
Comparison of these criteria will lead to establish Tenders to be acceptable.
From the time of Tender opening to the time of Contract award, if any Tenderer wishes to contact the Employer on any matter related to the Tender, he should do so in writing.
Any effort by the Tenderer to influence the Employer in the Employer's Tender evaluation, Tender comparison, or Contract award decisions may result in the rejection of the Tenderer's tender.
Information relating to the examination, clarification, evaluation and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process even after the award to the successful Tenderer has been announced.
Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of the Tenderer's Tender.
The Employer will open Envelope N2 for Tenderers determined to be acceptable and which Envelopes N1 are substantially responsive.
After opening Envelope N2, the Employer will determine for each Tender the Evaluated Tender Price and make any correction for errors pursuant to related Clauses.
If the Tender of the successful Tenderer is seriously financially unbalanced in relation to the Employer's estimate of work to be performed under the Contract, the Employer may require the Tenderer to produce a detailed price analysis for any or all items of the Bill Of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.
In all cases and whatever situation is, the Employer have the right to reject any submitted offer, for the reason(s) that he might find suitable.
Tenderers will have no right for any objection or claim due to the mentioned rejection.

1.17.4. CORRECTION OF ERRORS

Tenders determined to be substantially responsive will be checked by the Employer for arithmetic errors.
Errors will be corrected by the Employer as follows:

a) Where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and
b) Where there is a discrepancy between the unit rate and the line item resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern; and
c) Where there is a discount applied to the total tender price including the contingency, the total tender price shall be retained and the discount applied to the unit prices of the Bill of Quantities items, excluding the contingency.

d) If the Tenderer does not accept the corrected amount of tender, his tender will be rejected, and the Tender Security will be forfeited in accordance the related Clause.

1.18. AWARD AND SIGNING OF CONTRACT

1.18.1. AWARD

The Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive and to provide the best conditions.
Tenderers won't have the right to submit any claim or objection regarding the awarding decision of the Employer.
The Employer have the right to evaluate any Tender the way he may find it suitable for the Port interest.
The Employer reserves the right to accept or reject any Tender and to cancel the Tendering process and reject all Tenders at any time prior to award of Contract or withdrawal without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform them on the grounds of the Employer's action.
After opening all the bids, in case two or more acceptable Tenderers have equal bid amount, the successful Tenderer will be chosen by a random draw.

1.18.2. NOTIFICATION OF AWARD

Prior to the expiry of the period of Tender validity, the Employer will notify the successful Tenderer in writing by registered letter or by facsimile to be confirmed in writing by registered mail, that his Tender has been accepted.
The notification of award will constitute the Contract, subject to the official rules and procedures of Lebanon.
The successful Tenderer shall immediately acknowledge receipt by registered letter.
Upon furnishing by the successful Tenderer of a performance security, the Employer will notify the other Tenderers that their Tenders have been unsuccessful and return their Tender Security.

1.18.3. SIGNING THE CONTRACT AGREEMENT

The Employer and the successful Tenderer shall sign the Contract Agreement as soon as, not exceeding 3 (three) months, award and all official approvals have been given.

1.18.4. PERFORMANCE AND CONCESSION SECURITY

The Tender Security of the successful Tenderer will be discharged not later than fifteen (15) days after the signing of the Contract and replaced by a Performance Security valid until the statement of reception of Concessionaire's installations in the amount of one million five hundred thousand US Dollars (1,500,000) USD.
The Performance Security will be discharged not later than fifteen (15) days after the signing of the statement of reception of Concessionaire's installations and replaced by a Concession Security valid for twenty-five (25) years in the amount of three million US Dollars (3,000,000) USD.

2. FORMS FOR TENDER

FORM OF STATEMENT OF TENDER

FORM OF STATEMENT OF TENDER

State the name of the Tenderer and his professional, financial, legal and engineering. If more than one corporate entity is involved in the Tender state the name of each of the members and the commercial relationship between them.

Name of the Tenderer :

Name of any other corporate entity :

Nature of commercial relationship between corporate entities :

Names of Consultants :

FORM OF INVITATION

FORM OF INVITATION

To

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, El Mina
LEBANON

We, the Concessionaire, …… acknowledged that we have been qualified in order to prepare a Tender for a Design, Build, Operate and Transfer contract for installing a grain silo at the Port of Tripoli, we have taken notice of and will comply with the information listed below:

Time limit for submission of Tender	
Date of the pre-Tender meeting	
Tender validity	180 Days
Amount of Tender Security	200,000 USD
Amount of Performance Security	1,500,000 USD
Amount of Concession Security	3,000,000 USD
Tender fees	2,000 USD
No of Employer receipt	

Signature by the Concessionaire

Signed

Name

Seal of the Concessionaire affixed below.

FORM FOR CONTRACTUAL COMMITMENT

FORM FOR CONTRACTUAL COMMITMENT

Name of Project:

To: Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, EI Mina
LEBANON

I the undersigned _____ dully authorized to sign

on behalf
of_____

having as permanent Address in Lebanon
_____

Telephone No: _____

Facsimile No: _____

Acknowledge my revision and examination of the Bid Documents and contract conditions and all other documents pertaining to the execution of the above-named project.

I proclaim that after reviewing and examining the Bid Documents and contract conditions which I may not claim to ignore and after visiting, inspecting and examining the Site of the Works and its surroundings and having obtained all required information and being aware of the Contract details, difficulties and obstacles if any, of the required Works.

I pledge, if any Bid is accepted, to execute and complete all the required Works and remedy any defects therein in conformity with the said Bid Documents and contract conditions within the Time for completion stated in the Contract Documents.

I also acknowledge that I have put the prices and accepted the stipulations stated in the Conditions of Contract, taking into consideration all the Bid Documents and contract conditions and difficulties that may be encountered, if any, during the execution of the Works.

Date :

Name of Bidder :

Name :

In the Capacity of :

Signature :

Address :

(Stamp 50,000 Lebanese Pounds)

Form of Tender Security (Bank Guarantee).

Form of Tender Security (Bank Guarantee).

WHEREAS, [name of Tenderer] (hereinafter called "the Tenderer") has submitted his Tender dated (date) for the **DBOT contract for installing a grain silo at the Port of Tripoli** (hereinafter called "the Tender").

KNOW ALL PEOPLE by these presents that We [name of Bank] of [name of country] having our registered office at [address] (hereinafter called "the Bank") are bound unto [name of Employer] (hereinafter called "the Employer") in the “fresh” sum of US $200 000 (two hundred thousand US dollars) for which payment well and truly to be made to the said Employer the Bank binds himself, his successors, and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ 20_____.

THE CONDITIONS of this obligation are:

1) if the Tenderer withdraws his Tender during the period of Tender validity specified in the Form of Tender; or
2) if the Tenderer refuses to accept the correction of errors in his Tender; or
3) if the Tenderer, having been notified of the acceptance of his Tender by the Employer during the period of Tender validity;
    a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Tenderers, if required; or
    b) fails or refuses to furnish the Performance Security, in accordance with the Instruction to Tenderers;

we undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date 28 days after the date of expiration of the Tender Validity, as stated in the Instructions to Tenderers, or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived.
Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____

SEAL _____

_____
[Signature, name, and address]

FORM OF PERFORMANCE SECURITY

(UNCONDITIONAL)

Performance Bank Guarantee (Unconditional)

To

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, El Mina
LEBANON

WHEREAS [name and address of Employer] (hereinafter called "the Employer") has undertaken, in pursuance of Contract No. ____ dated _____ to **execute the DBOT contract for installing a grain silo at the Port of Tripoli** (hereinafter called "the Contract.");

AND WHEREAS it has been stipulated by you in the said Contract that the Employer shall furnish you with a Bank Guarantee by a recognized bank for the “fresh” sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Employer such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Employer, up to a total of US$ 1,500,000 (one million five hundred thousand US dollars) such “fresh” sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of US $1,500,000 (one million five hundred thousand US dollars) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Employer before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract Documents that may be made between you and the Employer shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall be valid until a date 28 days from the date of issue of the statement of reception of Concessionaire's installations.

SIGNATURE AND SEAL OF THE GUARANTOR

_____

Name of Bank:
Address:
Date:

FORM OF CONCESSION SECURITY

(UNCONDITIONAL)

Concession Bank Guarantee (Unconditional)

To

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, El Mina
LEBANON

WHEREAS [name and address of Employer] (hereinafter called "the Employer") has undertaken, in pursuance of Contract No. ____ dated _____ to execute the **DBOT contract for installing a grain silo at the Port of Tripoli** (hereinafter called "the Contract.");

AND WHEREAS it has been stipulated by you in the said Contract that the Employer shall furnish you with a Bank Guarantee by a recognized bank for the “fresh” sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Employer such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Employer, up to a total of US$ 3,000,000 (three million US Dollars) such “fresh” sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of US$ 3,000,000 (three million US Dollars) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Employer before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract Documents that may be made between you and the Employer shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall be valid until ……. (Concession duration being 25 years.)

SIGNATURE AND SEAL OF THE GUARANTOR
_____

Name of Bank:
Address:
Date:

FORM OF TENDER

For Design, Build, Operate and Transfer Contract
for installing a grain silo at the Port of Tripoli

Address: Date:

Dear. Sir,

1. Having examined the Tender conditions, the Concession Agreement, the form of Tender, the Contract Agreement, the form of Tender security, the Employer's requirements and all Bid Documents forming part of the Contract Documents and having visited the site and having obtained all information necessary to submit a Tender, we the undersigned, hereby offer to Design, Build, Operate and Transfer a grain silo at the Port of Tripoli for a period of 25 (twenty five) years for the following conditions and remuneration to be paid by the Concessionaire under the Contract requirements:
   Annual rental Fee: ……% (of the storage and handling Fees)

2. We acknowledge receipt of, and have considered, the following addenda issued do Tenderers during the Tender period: ……

3. We agree to tender by this Tender for a period of one hundred and eighty (180) days from the latest date for receipt of Tender …… and it may be accepted by you at any time before the expiry of that period. As a guarantee of our Tender, we have submitted a Tender security issued by: …… for the sum of US$ 200,000 (Two hundred thousand US Dollars).

4. Until a formal Agreement is prepared and executed, this Tender, together with your written acceptance thereof, shall constitute a binding Contract between us, subject to the Law and procedures of the government of Lebanon.

5. We understand that you are not bound to accept the lowest of any Tender that you might receive.

Dated this ……
Signature …….

Name:
In the capacity of.
Daily authorized to sign Tenders on behalf of:
Witness signature…….
Name:
Address:

3. LETTER OF ACCEPTANCE

Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, El Mina
LEBANON

Dear Sirs,

Tender for Design, Build, Operate and Transfer Contract
for installing a grain silo at the Port of Tripoli

With reference to your submitted Tender dated…….. in respect of the above project and with reference to Tender conditions of the Tender Documents.

We hereby inform you by this LETTER OF ACCEPTANCE that your Tender for the above-named project is accepted.

Please acknowledge by signing the attached duplicate of this letter, the receipt of this LETTER OF ACCEPTANCE and your full agreement to its contents, without any reserve.

Yours faithfully,
For
Port of Tripoli
Office d'Exploitation du Port de Tripoli
Tripoli, El Mina
LEBANON

Port Director

We hereby acknowledge receipt for the LETTER OF ACCEPTANCE and accept the contents thereof without any reserve.

Named of Authorized Signatory
……..
Title: …….
Company: …….
Signature: …….
Date: ……

4. CONTRACT AGREEMENT

CONTRACT AGREEMENT
For Design, Build, Operate and Transfer contract
for installing a grain silo at the Port of Tripoli

THIS AGREEMENT is made the …… day
of……between……..whose offices are…… (herein after called "The Employer") on the one part, and (herein after called "The Concessionaire) the other part.

WHEREAS the Employer has accepted a Tender from the Concessionaire for the Design, Build, Operate and Transfer (DBOT) contract for installing a grain silo at the Port of Tripoli for a period of 25 (twenty-five) years (herein after called "The Concession duration").

NOW HE PARTIES HEREBY AGREE AS FOLLOWS:

1. In this Agreement, words and expressions shall have the respective meanings assigned to them in the Concession Agreement.
2. The following Documents shall be read and construed as forming part of this Contract Agreement.
    a) The Minutes of Meeting (if any)
    b) Letter of acceptance
    c) The Addendum (if any)
    d) The mentioned Tender document
    e) The Concession Agreement thereto
    f) The Employer's Requirements
3. The Concessionaire undertakes to **Design, Build, Operate and Transfer a grain silo at the Port of Tripoli** all in accordance with the Contract.
4. In consideration of the **Design, Build, Operate and Transfer contract for installing a grain silo at the Port of Tripoli,** the Employer undertakes to grant the Concessionaire the Contract for the Concession duration and the Concessionaire undertakes to pay the Employer the fees stipulated in the Contract.
5. IN, WITNESS WHEREOF, the Parties hereto have caused this Agreement to be made on the date first mentioned above.

SIGNED, SEALED AND DELIVERED

By the Employer	by the Concessionaire
Signed	Signed
Name	Name
In the capacity of	In the capacity of
Witness signature	Witness signature
Name	Name
Address	Address
Name	Name
SEAL OF EMPLOYER	SEAL OF EMPLOYER
AFFIXED BELOW	AFFIXED BELOW

5. CONCESSION AGREEMENT

Development and operation Agreement
for a grain silo in the port of Tripoli
(LEBANON)

CONCESSION AGREEMENT

PREAMBLE

PRIOR TO THIS CONCESSION AGREEMENT, THE FOLLOWING WAS EXPLAINED:

The Port of TRIPOLI wanted to supplement its facilities by installing a grain silo within the port domain for the storage of all sort of grains listed in this document.
The required installations should be a steel silo plant with all necessary and auxiliary equipment and infrastructure, able to ensure a safe and adequate storage of grains in conformity with local and international standards.

AFTER WHICH, THE PROVISIONS OF THIS AGREEMENT ARE GIVEN BELOW:

Between:

hereinafter called the “Employer” First part,

And:

hereinafter called the “Concessionaire” Second part

The following was agreed:

- # PART ONE

Subject and nature of the Concession

ARTICLE 1: **Subject of the Concession**

The subject of this Concession Agreement is to define the conditions for design, implementation and operation of the following installations, equipment and tools, assigned to grain storage using, in particular, a grain silo;

The below mentioned documents should be considered as a part of the Concession Agreement:

- INSTRCUTIONS TO TENDEREERS
- FORMS FOR TENDER
- LETTER OF ACCEPTANCE
- CONTRACT AGREEMENT
- CONCESSION AGREEMENT
- APPENDIX 1: DRAWINGS

Installations funded, designed, installed and maintained by the Concessionaire (refer to attached drawings in Appendix 1 and to technical specifications) are but not limited to:

1) A water body maintained dredged to a depth of -15.00m NGL in the silo location along 200m of the existing quaywall, ensuring an adequate berthing post for the grain ship
2) A quaywall maintained during the Concession period (200m length, 15.00m depth) for ships mooring and silo access
3) Grain silo, with the following minimum characteristics, dimensions and capacities:
    - 120,000T total capacity
    - 5,000T capacity per steel bin with flat bottom
    - Possibility for storage of wheat, corn, barley, sunflower and other

   The grain silo must be completely operational and ready for use, according to international rules and standards and fully classified by recognized classification societies
4) One ship loader (Minimum loading capacity 400T/hr)
5) Two ship unloaders (Minimum unloading capacity 200T/hr)
6) 9 flat bottom bins (1,500T each)
7) Several loading trucks stations
8) One unloading truck station
9) Auxiliary civil and building works that must be executed on the same land area of the silo, which will be occupied by the Concessionaire.
10) Water and electricity supply utilities
11) Environmental protection facilities
12) All equipment and tools needed to operate the silo according to international recognized standards.
    In this regard, it is not allowed the use of land-based cranes for ships loading/unloading operations
13) The Concessionaire will have the opportunity to occupy a land adjacent to the container terminal and the main quay wall for a total area of approximate 36,000m^2 (refer to Appendix N1) which will be used for installing the silo, storage of materials and equipment, construction of offices and workshop, in addition to miscellaneous buildings needed to operate the facility
    No fees for the above mentioned occupancy shall be asked from the Concessionaire during the concession period
14) Maintenance of all areas occupied by the Concessionaire, and all other Port facilities used by him

15) The Concessionaire shall make available at any time a strategic stock of wheat, for a minimum quantity up to 20% of the total silo capacity, within the bins, for the sole usage of the Public Authority at any time
16) The minimum unloaded quantity of grains shall be not be less than 250,000 T/year, with a minimum of 20% of this mentioned quantity stored within the silo
17) The Concessionaire shall receive all wheat cargo ships accessing the Port of Tripoli
18) The minimum DWT of grain cargo ships (other than wheat) received by the Concessionaire shall be greater than 10,000 DWT
19) The Concession period will be set for a period of 25 years, to be counted from the date of the Employer temporary reception of all executed works.

The maximum estimated duration to execute the above-mentioned works will be 24 months, counted from the date of the contract signature, and during which no fees are to be paid by the Concessionaire regarding the concession annual rental fee.

No fees for land occupation should be paid by the Concessionaire, except for using other miscellaneous facilities (Like electricity, water…) and which will be paid according to regulations.

Each of these installations will comply with the international recognized standards and the ones set by the Employer in the technical specifications enclosed with this Agreement. The initial development work for these installations will be performed in compliance with article 3 below.

The drawings showing the perimeter of the Concession is appended to this Concession Agreement (Appendix 1).

It includes a conceptual overall mass plan for the facility and the open areas and the water body which belong to the Employer and made available to the Concessionaire.

The water body shall be available for the temporary berth of ships for grains loading/unloading; nevertheless, the Employer can use this berth for general cargo handling operations.

The listed land, open spaces and water bodies, stating their surface area, the list of facilities, equipment and tools shall be confirmed by a statement produced jointly by the Employer and the Concessionaire.

Any modification will be confirmed by a statement produced in the same way.

ROLES AND AUTHORITIES OF DIFFERENT PARTIES

1- The Consultant Engineer is empowered to represent the Employer, to take all actions and give all instructions and Approvals in the Employer's name and on its behalf, under the Contract, following a close review and study with the Employer of all the mentioned instructions, except where otherwise provided under the Contract, or where the Employer find it appropriate: All communications of any kind between the Concessionaire and the Employer shall be addressed in writing through the Consultant Engineer, which will be responsible for making and/or obtaining the necessary reply.

2- All communications of any kind between the Concessionaire and the Consultant Engineer shall be addressed in writing, with a copy to the Employer.

3- The Concessionaire will appoint a representative, referred herein as "Concessionaire Representative" who is empowered to act at all times for and on behalf of and to bind the Concessionaire, in all matters relating to the Contract.

   Such appointment and any revocation thereof shall be notified in writing by the Concessionaire to the Employer.

   The Concessionaire shall submit for the Employer approval, the nomination of the "Concessionaire Representative" with all supported Documents (CV – experience…), within one week, following the Contract signature.

   The "Concessionaire Representative" shall be:

   - A qualified civil engineer with a maritime experience for not less than 20 years
   - Member of the Lebanese Order of Engineers (at Beirut of Tripoli)

The Employer can, at any time, ask for the revocation of the Concessionaire Representative without any objection of the Concessionaire.

4- No Approval or oral approval or commitment given by the Employer or on behalf of the Employer by the Consultant Engineer shall:
   - change, relieve, discharge or release the Concessionaire from any of his obligations, responsibilities and undertakings under the Contract, except by way of a Change Order signed by a duly authorized officer of the Employer;
   - constitute a representation, warranty or Agreement that the subject matter of any such Approval or oral approval or commitment (including without limitation, the Detailed Program, the Concessionaire's design, Construction Materials or construction methods), for which the Concessionaire alone shall at all times remain responsible, is feasible, appropriate or meets or complies with the design intent, purpose intended or other Requirements of the Contract.

5- The Concessionaire agrees that all disputes with the Employer relating to the Contract shall be resolved amicably, if not, by arbitration pursuant to Lebanese laws.

ARTICLE 2: Nature of the Concession

Use of the installations and equipment will always be optional for the public and subject to the needs of the general port services.

The Concessionaire will have no grounds for complaint should an invitation to Tenders be launched by the Employer for the creation and operation of additional silos or any other installations.

The Concession is granted on a strictly personal basis.

The Concessionaire is personally liable for the performance of all the obligations stipulated in these specifications and may not therefor subcontract all or part of these Concession or dispose of his company other than in the conditions stipulated in article 13 bellow.

The Concessionaire is required to ensure continuity of the public service licensed, equal treatment of the users of the public service licensed and to adapt the installations, equipment and tools under the Concession to the needs of said public service.

The Tenderers shall have to bid for an annual rental fee (as a % of the storage and handling operations fees set by the Port Authority).

The contract will be awarded to the highest acceptable bid.

The minimum bid value shall not be less than 15%.

- **PART TWO**

Performance of the work and maintenance of the facilities and installations of the Concession

ARTICLE 3: Execution plans

Before the beginning of any work, the Concessionaire is required to submit to the Employer all designs, stability calculation notes of miscellaneous facilities, of civil and MEP works and buildings, topographic surveys, bathymetric survey covering the ship berth, geotechnical investigations to be undertaken for all foundations and piling system and any other necessary data for design, plans for construction, execution, acquisition or modification of all the works, the silo detailed plans and characteristics, buildings and facilities, and all the equipment to be installed.

These plans will comprise all drawings, sketches and explanatory documents needed or which can be requested by the Engineer for complete determination of the constructions and installations to be build, along with the equipment operating conditions.

The Concessionaire cannot begin the execution of any work, installation of any equipment or machinery (including the bins), supplying of any material… before getting the writing approval of the Employer on the related stability calculation notes, structural and MEP design reports, drawings and technical specifications, method statements for execution, according to the Employer requirements.

All above mentioned documents are to be provided for the Employer in 3 copies (hard) and one soft copy.

In any way, the Concessionaire will be the only responsible regarding the stability and the right choice of any equipment, facility, and material… related to this Contract, even if he has obtained the approval of the Employer and/or the Engineer on the mentioned documents.

The Employer and/or the Engineer can request any document of any kind, and therefore can pause the launching of works or stop the works execution as much as it will be needed, without any right for the Concessionaire to submit any claim or objection of any nature.

If the Employer instructs that further construction Documents are necessary for caring out the relevant works, the Concessionaire shall, upon receiving the Employer instructions, prepare such construction Documents within requested details and time for submission set by the Employer.

The Employer will be entitled to specify any modifications it feels to be suitable to ensure the correct use and conservation of the public domain works and, in general, the correct running of all the services.

Exercise this power of supervision and specification of modifications will be granted to the Employer.

Approval or failure to approve by the Employer will neither imply its own liability nor relieve the Concessionaire of its liability with regard to users and third parties, the possible consequences of performance of the work or operation of the installations.

Errors, omissions, ambiguities, inconsistencies, inadequacies and other defects in the design and/or in the construction Documents shall be rectified both as to the Documents and, as the case may be, the relevant structures by the Concessionaire at its own cost notwithstanding that the same may have been approved by the Employer.

ARTICLE 4: Performance of work

All the work will be performed in accordance with the approved plans, using materials of good quality employed in compliance with the rules of professional good practice and international standards.

In addition to obtaining the Employer's consent regarding the subcontracting of any part of the Works, the Concessionaire shall, within 14 days of signing the Contract, and before commencing the Works on site, or any parts of the Works he intends to subcontract for which approval of the Employer is required, and for each subcontract, provide:

1) The name, address and telephone and fax numbers of the Subcontractor

2) The nature and scope of the Works to be subcontracted
3) Information of the Subcontractor's experience of similar works and details of the Subcontractor's site supervision, sources of labor, and Equipment, and financial capabilities, in sufficient detail to enable the Employer to determine of the subcontractor is able to undertake and complete the subcontract works within the time and to the standards required by the Contract
4) The approximate value of the subcontract works based on the Contact prices.
5) The percentage of (4) above and the overall percentage of subcontracted works as a proportion of the Contract price
6) Confirmation that the subcontract includes terms and conditions and all obligations and responsibilities contained in the Contract, in so far as these apply to the subcontract
7) Details of all subcontracts (Equipment, labor, names…) to be mentioned in monthly reports, in addition to any other information that might be asked by the Employer regarding subcontracting

Before beginning any work on site, the Concessionaire shall submit for the Employer's approval three (3) hard copies and one soft copy of the program of Works (works schedule).
This program shall indicate all the activities of the Contract in their correct sequence and order with a minimum detail at the Bill of Quantities level, and shall be computerized and prepared using a professional management software package approved by the Engineer.
A revised program, shall be submitted for approval by the Employer within 14 days of a request, at any time and for any reason that he sees it.
The Concessionaire shall promptly report in writing to the Employer the occurrence of any event or condition that might delay or prevent completion of the works in accordance with the program and indicate steps being taken to meet the situation.
The drawings, lines and levels in the original Tendering Documents shall be treated as baseline information and the Concessionaire shall, without any additional cost and time be responsible for verifications, surveys, preparation of revised drawings and obtaining approval of the Employer before the start of the works.
The Concessionaire shall also be responsible for the verification of the survey control points, benchmarks and such other information provided to him, and any errors or delays in the works caused by the Concessionaire's failure to verify the accuracy for such data will not be an acceptable cause for extension of time and additional cost to the Employer.
The Concessionaire shall protect the Works during inclement weather and shall use all reasonable means to proceed with performance of the Works during such weather and to prevent or minimize delays resulting there from.
The Concessionaire shall use reasonable efforts to keep the Site clear of unnecessary obstruction so as to avoid danger to persons and provide fencing, lighting, guarding and watching of the works until completion and taking over.
The Concessionaire shall comply with specific safety, health and environmental requirements as requested by the Employer.
Following the contract signature, which date is considered to be the starting date of works, the Concessionaire will have a maximum period of 24 months counted from the mentioned date, during which he must execute and deliver to the Employer all requested civil works, supply the silo equipment and install it, ready for operation.
In this respect, a temporary handing over certificate will be issued by the Employer at the delivery of these works, followed by a final handing over after one year, in case all works are executed in conformity with specifications.
No annual rental fee shall be paid by the Concessionaire at the contract signature, neither during the works execution period.

The Concessionaire will have a period of 25 years to operate the facility, during which he should pay the Tender annual rental fee according to payment modality as per Article 16.
The occupancy for the land area will be free of charge during all the concession period.

ARTICLE 5: Maintenance of works
All works executed by the Concessionaire will be maintained in good condition by him, so that they are at all times suitable for their intended purpose.
The work made available to the Concessionaire (if any) will be maintained in good condition by the Concessionaire, so that they are at all times suitable for their intended purpose.
The Concessionaire will take the necessary steps to ensure that the installations and equipment as well as their immediate vicinity, are kept clean.
In the event of negligence on its part, and no reply is received to formal notification, the necessary work will be performed by the Employer as it sees fit.
The amount of the sums advanced by the Employer will be recovered through statements made enforceable by the Employer's representative, in the conditions laid down in article 37.

ARTICLE 6: Construction and maintenance costs
The renovation, modification and renewal work on the installations, equipment and tools will be made available by the Concessionaire at his latter's expense.
They will be performed according to the procedures defined in a separate agreement.
All works will be at the expense of the Concessionaire and performed in the conditions laid down in article 3 above.
All maintenance costs will be at the expense of the Concessionaire.

ARTICLE 7: Performance times
Starting from the commencement date stated bellow, the Concessionaire will - within the time stipulated in the Letter of Tender complete the initial development work on the installations and equipment.
Confirmed by a statement, the commencement date of dock operating shall be the date of the handover of the installations made available by the Concessionaire mentioned in Article 1.
Prior to any operating activities, the initial development work on the installations and equipment has to be completed and confirmed.
A statement will be produced jointly by the Employer and the Concessionaire.

ARTICLE 8: Supervision of construction and maintenance
In the event of acquisition, prior technical inspections will be performed by the Concessionaire and the Employer.
The deeds of acquisition of equipment, installations and facilities may only be signed by the Concessionaire after approval by the Employer.
The initial design, development, execution, modification and maintenance work will be performed under the supervision of the Employer, through a nominated staff (the Engineer / Consultant).

ARTICLE 9: Additional installations and equipment
Whenever requested, the Concessionaire will be required to deploy additional installations and equipment as determined by the Employer, provided that this entails no fundamental change to the content of the Concession.

- # PART THREE

Operation

ARTICLE 10: Dock and port police

This Concession gives the Concessionaire no right to intervene, either to place (pilotage and towing) the ships and boats on the docks or the berth fitted out by itself or to move these ships and boats, or to police traffic and use of the roads.
Concessionaire, must all times, comply with the Port navigation requirements, schedules and plans, especially regarding ships navigation and berthing, and therefore make necessary adjustments to his own schedules and plans accordingly, so that Port navigation won't be affected in any way.

ARTICLE 11: Operation of licensed installations

The Concessionaire will be required to make the equipment and installations available to the public, in the conditions stipulated in the operating regulations.
Prior to any operating activities, the operating regulations have to be drawn up by the Concessionaire and approved by the Employer.
The Concessionaire performs technical and commercial operation of the installations, in particular the silo equipment.
In this respect:

a) It is responsible for all the operations performed on the installations, in particular the silo equipment.
   It is required to provide the appropriate personnel, equipment and technical resources. It is in charge of coordination with regard to the customers.
b) It constructs all facilities, buildings, equipment, tools and as applicable the open necessary spaces
c) It maintains during all the Concession period open areas, facilities, levels of water bodies, marine infrastructures, buildings, executed civil works, equipment and tools as stipulated above
d) It assumes responsibility as operator of the dock and its installations with respect to all legislative and regulatory provisions in force, in all areas and respects

ARTICLE 12: Port regulations and police measures

The Concessionaire will be subject to port regulations. It will in particular abide by the provisions of the regulations concerning use of the hangars, open areas and land of the port of Tripoli.
It will comply with any decisions made by the Employer, in the interests of public safety, and of port operations.
It will be required temporarily to move its equipment, whenever so asked by the port authorities, either for the purposes of the working of the port, or for repairs to be made to public works, or for any other reason given by the Employer.

ARTICLE 13: Assignment and Subletting

The Concessionaire shall not assign any part or the whole of the Concession to another party.
The Concessionaire shall not sublet all or any part of the Concession to others without approval by the Employer of the extent of the functions to be sublet and of the Subcontractor or sub-Concessionaire.
The provisions of the above-mentioned paragraph shall not apply to Sub-Contractors for minor day-to-day services required for the efficient management and operation of the Concession.
Prior to any activities, any Subcontractor shall be identified in the list of authorized Subcontractors, which has to be drawn up by the Concessionaire and approved by the Employer.

The Employer will be entitled to demand any modifications in the list it feels suitable for the proper and efficient operation of the Concession.

ARTICLE 14: Supervisor of operations

The installations and equipment of the Concession will be operated under the direct supervision of the Employer.

The Concessionaire will comply with all Employer's directives.

Exercise of this power of supervision granted to the Employer will however, remain optional and can in no case be considered binding upon it.

- PART FOUR

Fees

ARTICLE 15: Duties

The duties charged for miscellaneous services provided by the port like potable water, electricity…, are those applicable and in use by the Employer.
The Concessionaire cannot object on any modification made to the charges by the Employer.
Payment of these duties shall be done according to Employer regulations.

ARTICLE 16: Rights and obligations

- The Tender Annual Rental Fee for the silo installation and operation shall be a percentage of the storage and handling (loading and unloading) fees set by the Port Authority.
- The Concessionaire shall pay to the Port Authority all miscellaneous services provided by the Port as electricity, water, permits… in conformity with applicable charges.
- The Port Authority should be responsible to collect the whole fees amount as per set tariffs related to all the listed silo operations as per the Port regulations (Storage, handling…), whereas the Port Authority agrees that at all times during the Concession period, the Port Authority shall retain only the annual rental fee percentage as per the agreement and pay to the Concessionaire the remaining amount without any deduction for the entire works executed per trimester within a period of 15 days of the beginning the following trimester
- Occupancy fees of any water body within the port basins, berthing along quay walls, channel usage by ships, and all other maneuvering actions… shall be paid directly to the Port Authority. For the avoidance of doubt, the Concessionaire shall not request any percentage of the above-mentioned fees.
- The Concessionaire shall respect at any time the Employer in law fees, and any related modification as per the demand and the Employer decision.

ARTICLE 17: Collect of charges

The Employer is responsible to collect all charges resulting from operating the silo, according to the way that he may find suitable and adequate.

ARTICLE 18: Duty collection

The sums collected by the Employer are recorded in a book with stubs, with details of all sums received entered on the stub and on the detached receipt.
This book will have to be presented to the Concessionaire at the time of each payment made to the Concessionaire.

ARTICLE 19: Publicity of prices

The applicable prices will be made known to the public by means of clearly displayed posters, as close as possible to the installations and equipment, and at locations specified by the Employer.
The Employer will be responsible for the conversations of these posters and will replace them whenever necessary.

ARTICLE 20: Book of complaints

A book will be kept in the Concessionaire's office for receiving complaints either against the Concessionaire, or against its personnel.
The results of the Employer examination of each complaint will also be entered in the book.
This book will be initialed by the Employer. It will be presented whenever requested by the public.
As soon as a complaint has been entered in it, the Concessionaire must notify the Employer.

ARTICLE 21: Responsibility – Insurance

The Concessionaire is responsible for any damage resulting from operation of his installations, in particular the silo equipment, whether caused by itself or by one of its Concessionaires, equipment, personnel… and whether suffered by itself, by the port, by a third party or by a user. It agrees to repair any damage of any kind.

It agrees to repair the damage caused by third parties within the limits of the Concession and is responsible for any action taken against them.

It takes out all the insurance policies corresponding to its responsibilities under application of this Agreement, in particular for the development and maintenance work as stated in the copies of insurance policies appended to this Agreement.

The scope and amount of insurances shall be revised annually to reflect any change in the risks, the value of additions or improvements to the facilities and the effects of inflation.

The Concessionaire shall, prior to any operating activities, submit copies of the insurance policies effected by him to the Employer for approval and he shall provide evidence, whenever requested by the Employer, that the current insurance premiums have been paid.

- **PART FIVE**

Financial conditions

ARTICLE 22: Annual Accounts

Before 31 March of each year, the Concessionaire will provide the Employer with the detailed accounts, based on its books and containing the following, for the previous year:

1) The gross income of all kinds derived from operation of the Concession
2) The maintenance and operating costs, including financial costs (reimbursement of Loans and financial costs inherent in the Concession)

Whenever requested, the Concessionaire will be required to present accounts Documents books, correspondences and other Documents that the Employer considers necessary for supervision of operation.

ARTICLE 23: First payment to the Concessionaire

The first payment to the Concessionaire, after the handover of the silo works by the Employer and putting the silo in operation, shall be per trimester, within 15 days of the beginning of the following trimester, knowing that the financial year begins in the 1st of January.

ARTICLE 24: profit sharing

No profit sharing to be paid for the Employer.

- **PART SIX**

Concession period – Buy back – Expiry – renewal

ARTICLE 25: Concession period

The Concession period shall be **twenty-five (25)** years from the commencement date, which is the temporary handing over and receipt date by the Employer, of all executed works and installations, unless the Concession is terminated under the provisions of this Concession Agreement.

ARTICLE 26: Effect of expiry of the Concession

On expiry of the time set in the previous article and by the sole fact of this expiry, the Employer will assume all the rights of the Concessionaire and receive all revenue from the Concession.
It will immediately take possession of the assets of the Concession and assume responsibility for the Concession's debts duly contracted by the Concessionaire, without compensation for whatsoever reason.
A closing balance of the Concession accounts will be drawn up within a maximum of six (6) months from expiry of the Concession.

ARTICLE 27: Renewal of Concession

The Concessionaire shall not have any exclusive right to renew the Concession Agreement on expiry of the Concession period.
The Employer shall not be under obligation to renew the Concession or let a Concession to any other party.
In the event that the Employer decides to let a further Concession expiry of the Concession period and notwithstanding provisions under Article 26, he shall give the Concessionaire a right of first refusal to renew the Concession, providing that the terms offered by the Concessionaire are, in the opinion of the Employer, no less favorable than those offered by any other potential Concessionaire.
Any Agreement for renewal as aforesaid shall be made at least 1 (one) year before the expiry of the Concession period.
The Concessionaire shall make his offer for renewal at least 1 (one) year and 90 days before the expiry of the Concession period stated at Article 25.

ARTICLE 28: Earlier termination – Forfeiture

The Concession may be terminated by mutual Agreement between the parties.
The Concession may be terminated by either party, due to a confirmed case of force majeure with regard to the provisions of Article 30.
If the Concessionaire assigns the partial or the whole of the Concession to another party, contrary to the provisions of Article 13, or if he is declared bankrupt or, in the case of a company goes into liquidation, or if his affairs are placed in the hands of a receiver or committee of creditors, the Employer may, by written notice to the Concessionaire, terminate the Concession forthwith.
The Employer shall have the right to terminate the Concession if the Concessionaire:

- Without reasonable cause fails to commence the works which it is required to carry out hereunder promptly in accordance with Article 7
- Abandons or repudiates this Concession Agreement; or without reasonable cause wholly suspends the carrying out of the design or construction of the works before completion or interrupt totally or partially any of the services of the Concession
- Fails to demonstrate the sufficient design capability is employed by the Concessionaire to ensure that the project will be available in sufficient time to enable its completion within the time state in Article 7

- Fails unreasonable to respond to a notice under Article 35 or to take such action as may be detailed in its respond to such a notice within a reasonable time

In any such cases, the Employer shall give the Concessionaire written notice of the violation or failure, requiring him to rectify such default within a period of one month.
If the Concessionaire does not rectify the default as aforesaid, the Employer may, by a further written notice terminate the Concession forthwith.
In the event of partial or total interruption of the services of the Concession, or in the event of a serious fault by the Concessionaire, the Employer may immediately take the necessary steps to temporarily ensure provision of the services, at the costs, risks and peril of the Concessionaire.
Should the Concessionaire fail to resume the interrupted services, and should it fail to meet its obligations under the terms of these specifications, it runs the risk of forfeiture.
This will be pronounced, after formal notice, by the Employer, after bearing the Concessionaire.
Forfeiture will not occur if it was impossible for the Concessionaire to meet its obligation by a duly confirmed case of force majeure.
In the event of forfeiture, provision will be made for completion of the works and for continuation of operation, as well as for meeting the other commitments of the Concessionaire by means of an open Tender with a reserve price for the projects already completed, the work done, the equipment and materials procured. This reserve price will be set by the Employer, after hearing the Concessionaire.
No one be allowed to Tender unless it has first been approved by the Employer and has deposited a surety equal to the amount of the bond stipulated by these specifications.
The Tender process will take place in accordance with the regulations.
The successful Tenderer will be subject to the clauses of these specifications and will assume the rights and obligations of the previous Concessionaire, who will receive the price of the Tender.
If the open Tender fails to produce a result, a second Tender process will be attempted without reserve price, after a period of three months. If this second attempt fails to produce a result, the Concessionaire will be finally stripped of all rights and the installations, equipment, ancillary works, utensils and furniture belonging to the Concession, as well as all supplies, will become the property of the Conceding Authority without compensation.
The successful Tenderer of the Employer will be required to assume the undertakings normally borne by the Concessionaire as mentioned in the previous article.

ARTICLE 29: Partial closure of the installations

Should the Employer at any time decide - after hearing the Concessionaire - that in the public interest it is necessary to close part of the installations, either temporarily or permanently, the Concessionaire when requested will evacuate the premises and restore them to their original condition.
Should it fail to meet this obligation within the time allotted, the necessary work will be carried out in its place.
If this concerns installations, the closure of which would lead to the cessation of all or part of the services provided by the Concessionaire, this closure would be announced in the manner utilized for this Concession, unless resulting from work declared to be in the public interest in a law or administrative order.
If application of this article leads to a prejudice for the Concessionaire, it would be entitled to compensation which, if an amicable arrangement cannot be reached, would be set by the competent Lebanese court.

ARTICLE 30: Force majeure

Force majeure shall mean any event or circumstance or combination of events and circumstances which are wholly outside the control of the parties, and which gives rise to force majeure as recognized by Lebanese law, but not limited to:

- war and other hostilities (whether war be declared or not), invasion, other act of foreign enemies in Lebanon
- civil war, rebellion, insurrection, riot, commotion and civil disorder in Lebanon
- ionizing radiation or contamination from nuclear fuel or waste or radioactive, toxic or explosive effects of any nuclear explosive device in Lebanon
- pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speed in Lebanon
- riot, commotion on civil disorder unless solely restricted to employees of the Concessionaire on his sub-Concessionaires and arising from the conduct of the works
- Earthquake and any operation of the forces of nature against which an experience Concessionaire could not reasonably have been expected to take precautions

Neither the Employer nor the Concessionaire shall be considered in default or in contractual breach to the extent that performance of its obligations is prevented by force majeure which arises after the date hereof.
If, as a result of any happening of force majeure, the Concessionaire is prevented from performing its obligations hereunder, the parties shall use their best endeavors to modify the same in the most practical manner, having regard to the circumstances in order to achieve an end result which is the same or as closely similar to that envisaged by this Concession Agreement as may be acceptable to the Employer and the Concessionaire.
Any costs or losses incurred by either party in consequence thereof shall be borne by the party which suffers such costs or losses.
In the event that operation of the Concession is suspended or is seriously modified or curtailed for a continuous period of one year due to the effects of force majeure, either party may, by giving one month's written notice to the other party, terminate this Concession Agreement.

- PART SEVEN

Miscellaneous clauses

ARTICLE 31: Warranties

The Concessionaire warrants that he is a legal entity, properly established under Lebanese law and that he has the legal powers to enter into the Concession Agreement and that he has the financial and other resources and the expertise to perform faithfully and diligently his obligations under this Concession Agreement.

ARTICLE 32; Language and Law

This Concession Agreement shall be construed in accordance with Lebanese law.
This Concession Agreement has been drawn-up in Arabic and English. In the event of any dispute as to the meaning between the Arabic and English texts, the Arabic version shall govern.
However, since the negotiations and the Concession Agreement between the Concession authority and the Concessionaire were carried out in English, the English text should be taken into consideration while trying to interpret the meaning of the Arabic clauses in the Concession Agreement.

ARTICLE 33: Matters affecting execution of the works

The Concessionaire shall be deemed to have obtained all necessary information as to risks, contingencies and all other circumstances which may affect the carrying out of the works which the Concessionaire is required to perform hereunder, and on the project as a whole.
The Concessionaire shall be deemed to have satisfied itself as to the correctness and sufficiency of its business plan, estimated construction costs and construction period.
The Concessionaire's revenues during the Concession period shall cover the cost of all its obligations under this Concession Agreement and all things necessary for the proper completion of the operation of the installations, in particular the silo equipment, the remedying of all defects and the maintenance and insurance of the operation of the installations, in particular the silo equipment, throughout the Concession period.

ARTICLE 34: Election of domicile

The Concessionaire will elect domicile in Tripoli.
It must have offices close to the Concession installations and, if so requested, will employ an agent who will live in the building assigned to said offices. This agent will be authorized to receive all administrative notifications on behalf of the Concessionaire.

ARTICLE 35: Notices

All notices, demands, requests, consents, approvals or other instruments required or permitted under this Concession Agreement shall be made in writing and shall either be delivered by hand against written acknowledge of or on behalf of the addresses, or sent by recorded delivery mail or by facsimile transmission to the address specified by each of the parties for that purpose, recorded and appended to this Concession Agreement or to such other address as may from time to time be notified by either party to the other for this purpose.
In the event of service by mail or fax, service shall be deemed to have occurred upon receipt by the sender of an appropriate confirmation of delivery.

ARTICLE 36: Operating statistics

In the first three months of each year, the Concessionaire will be required to submit a statistical statement of operations to the Employer.

ARTICLE 37: Bond

Before signing the Concession Agreement, the Concessionaire will set up a performance security of US$ 1,500,000 (One million five hundred thousand US dollars) in the conditions laid down by the laws and regulations concerning public works surety bonds.

The performance security will be discharged after the signing of the statement of reception of Concessionaire's installations and replaced by a Concession security of US$ 3,000,000 (Three million US dollars). Any costs arising from measures implemented at the expense of the Concessionaire, under implementation of these specifications, would be taken from this bond.

Whenever a sum is taken from the bond, the Concessionaire will be required to top up the amount within two weeks from the date of formal notice sent to it accordingly.

The bond will be returned to the Concessionaire at the end of the Concession. However, in the event of forfeiture, the unreturned part of the bond will remain the property of the Employer.

ARTICLE 38: Settlement of Disputes

The parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Agreement.

A special Committee nominated by the Employer will give necessary assistance and support in order to reach an amicable settlement.

Any dispute between the Parties as to the matters arising pursuant to this Agreement which cannot be settled amicably within 30 (thirty) days after receipt by one party of the other party's request for such amicable settlement may be submitted by either party to the competent Court in the Republic of Lebanon.

Lebanese Law shall apply to the interpretation of this Agreement and to any jurisdiction which may be invoked thereunder.

ARTICLE 39: Publication, printing, stamp duty registration costs

The publication, printing, stamp duly and registration costs of these specifications and appended items will be borne by the Concessionaire.

Signed in

Date

In two copies,

THE EMPLOYER **THE CONCESSIONAIRE**

Appended to this Concession Agreement:

- instructions to Tenderers
- drawing of the Concession
- list of installations made available by the Employer and statement
- list of installations put in place by the Concessionaire and statement
- technical specifications (including the Employer's Requirements) For the installations but in place by the Concessionaire
- list of tariffs (in the date of signature of the Agreement)
- operating regulations
- insurance
- notices

6. PROJECT REPORT

6.1. GENERAL

The Port of Tripoli wishes to supplement its facilities by installing a grain silo within the port domain. The strategy adopted to accomplish this is to install the above-mentioned silo under a Concession Agreement.

The Concessionaire, who, will be both investor and developer, will develop the site by fitting out the platform and installing the silo with all related civil and MEP works, facilities and buildings and will then operate it for a predetermined time, on expiry of which the facilities will be transferred to the Port authority or the Concession renewed.

This section describes the technical elements necessary for installing the grain silo and is designed to give the Concessionaire a clear view of the context in order to integrate the related investments into its proposal.

The following subjects will be examined successively:

- Specifications of the ships that can use the berth.
- Description of marine infrastructure.
- The design definition of the civil and MEP engineering structures required for the installation of the silo
- The technical characteristics of the silo, its equipment and utilities.
- The rules to be adopted for the operation and maintenance of the facilities.
- The technical specifications for the marine infrastructure.

6.2. PROJECT ASSUMPTION: MINIMUM SILO SIZE

Refer to related Clauses specifying minimum dimensions and characteristics of the silo.

6.3. PORT ENGINEERING

The Concessionaire must refer to attached drawings Reference: ST-HP-2030-MAR-TD-001/002 A, dated January 2023, showing a proposed conceptual:

- Overall area Mass plan of the facility
- Grain silo mass plan

The silo will be located in the western end of the container terminal of the Port, which is considered to be a sheltered one regarding harbor agitation and waves attack.

Dredging and debris removal shall be executed whatever seabed nature is, along the 200m berth length and for 30m width, using adequate dredgers and following environmental regulations in order to reach -15.00m MSL. Dredged material will be dumped in selected and approved dumping areas. These areas could be an offshore one, using split barges or another suitable system, in predefined and approved dumping areas by the relevant Public Authorities with minimum water depths not less than 50m, or a land reclaimed one, following dredged materials nature, Employer need…

Clearance of seabed from miscellaneous debris, wrecks… must be also achieved.

Dumping of salvaged debris cannot be done offshore, but in selected onshore discharges, according to in law regulations. The works execution by the Concessionaire regarding all installations to be made prior to the silo operating must be conform to the International and Lebanese standards and regulations and to all relevant public authorities' requirements.

Regarding this issue, the Concessionaire must prepare and submit an Environmental Impact Assessment (EIA) study covering all aspects of the project (Preparation, works execution, installation, operation…) to the relevant Public Authorities, especially the Ministry of Environment, and obtain all necessary approvals necessary to launch the construction on site and later on to operate the facility. Furthermore, operating the silo during the concession period must be conform to International and Lebanese standards in addition to in law regulations and relevant Public Authorities requirements.

7. EMPLOYER'S REQUIREMENTS

7.1. NATURAL CONDITIONS

All installations will be designed in order to resist and to be adapted to the site natural conditions, especially ground, winds and marine environment.
Any site surveys and geotechnical investigations relevant to the design of installations will be carried out.
General level of Lebanon (NGL) is taken as level reference for this project.
Sea level, which is influenced by tides, winds effects and atmospheric pressure, could vary between -0,45m NGL and +0,80m NGL.
All directions mixed, maximum winds speed is:
26 m/s for a period of return of 10 years
18 m/s for a period of return of 1 year
10 m/s for a wind occurring 10 times a year

7.2. CONCESSIONAIRE OBLIGATIONS

In respect with the Concession Agreement, all installations will be designed, supplied, executed, installed, operated and maintained by the Concessionaire, except if Contractual Documents stipulate otherwise.
In particular, the Concessionaire will have to fund and install all necessary installations for bringing water and electrical power from town (connections, network…) to the silo.
Following specifications are indicated as minimum and better solutions are encouraged, provided that they respect these specifications and keeping in mind that financial aspects are essential.
In all way, all actions and works to be done by the Concessionaire must be approved by the Employer prior to execution.

7.3. PROJECT OBLIGATIONS AND CONSTRAINTS

The project zone shall be constructed, operated and maintained during all the Concession period as per related International and Lebanese Standards.

7.4. SILO CHARACTERISTICS

Reference is made to paragraph 1.1;
It shall include 24 grain bins (5,000T capacity per steel bin with flat bottom) with a 120,000T total capacity and the possibility for storage of wheat, corn, barley, sunflower and other.
The grain bins and all other miscellaneous equipment shall be new and unused and must be completely operational and ready for use, according to international rules and standards and fully classified by recognized classification societies.
Furthermore, 9 flat bottom bins (1,500T each) are to be provided and installed adjacent to the 5,000T ones.
The overall structural stability of the silo shall be ensured regarding soil bearing capacity through:

- Geotechnical investigation
- Soil improvement
- Piling system
- Slabs on grade
- Concrete foundations
- Excavation / filling…

A technical visit to the manufacture must be achieved by the Employer/Engineer and the Concessionaire in order to review all technical specifications before taking any action regarding supplying it to Tripoli Port, with all related electrical and mechanical equipment.

All further supplying negotiations, above mentioned visits, mobilization fees… will be on the Concessionaire's full charge and responsibility.

7.5. PRINCIPLE OF OPERATION AND UTILITIES

Operation of the silo shall be fully computerized, covering all aspects, taking in consideration necessary and approved health, safety and environmental measures.

7.6. EQUIPMENT

Mechanical and electrical equipment shall be designed and approved by the Employer before its supplying by the Concessionaire.
All these equipment's shall be conformed to International Standards like US and/or European ones, and provided from reliable and well-known manufacturers and shall include in minimum:

- One ship loader (Minimum 400T/hr)
- Two ship unloaders (Minimum 200T/hr each)
- Several loading truck stations
- One unloading truck station
- Handling/expedition tower
- 4 weight bridges (~80T capacity each)
- Loading chain conveyor
- Unloading chain conveyors
- Belt conveyors
- anchor bolts, level sensors, outside and inside ladders, roof handrail and radar level sensors
- Catwalks, sweep augers, aeration systems, temperature systems, fumigation systems, Intake pit grids, Rotary drum cleaners with aspiration, weigher with aspiration, loading bellows with filters for the truck loading silos, sets of installation tools, installation cables, cleaner elevator, 2 main elevators with magnets, loading and unloading chain conveyors, slides, valves, ductworks and pipes, Central aspiration system, spare parts list and compressor units.

7.7. ELECTRICAL POWER SUPPLIES

The silo must be equipped in minimum with electrical power supplies comprising:

- A main power supply
- An emergency power supply

The main power supply shall be provided from a transformer station.

7.8. UTILITIES

The silo area shall include (in addition to bins, unloaders, loader and all necessary MEP equipment):

- Building offices (2 stories ~ 270m^2 each) housing all the managerial and operating staff
- Workshop (~160m^2)
- Technical building (~75m^2), for electrical installation comprising at minimum:
    a) A medium-voltage connection to the town grid network
    b) A Transformer and main low-voltage switchboard equipped with all the outgoing lines necessary for the operation of the equipment, utilities and lighting. The construction of this transformer station will comply with the standards and regulations in effect.
- Guard house
- 24-hour-per-day guard service
- Storage area for storing the necessary tools, supplies and spare parts

- Car parking (~3,200m^2)
- Truck parking (~5,300m^2)
- Any other structure needed to operate the silo

The Concessionaire shall provide for the Employer all detailed drawings regarding the above-mentioned structures including necessary architectural, structural and MEP calculations reports and details, in addition to the infrastructures and overall layout of the mentioned leased area.
The Concessionaire shall not begin the construction or the installation of any structures before obtaining the final approval of the Employer on the listed documents and drawings.

7.9. OPERATION AND MAINTENANCE

Operation of the silo includes functioning and maintenance which will be ensured by personal, equipment, tools and consumable resources, according to International Standards like US and/or European ones in addition to the recognized regulations.

7.9.1. PERSONNEL

The personal resources (who's CVs are to be approved by the Conceding Authority prior to employment with its full right to ask the Concessionaire to cancel any employee contract during operation for the reason that the Conceding Authority find suitable) shall comprise at minimum:

- General Manager : 1 post
- Head of Department : 5 posts
- Team leader : 6 posts
- Head of Team : 5 posts
- Head of Delivery Unit : 4 posts
- Electromechanical Specialist : 6 posts
- Principal Machine Operator : 10 posts
- Machine Operator : 20 posts
- Accountant : 2 posts
- Administrative Employee : 7 posts
- Management : 4 posts
- Maintenance operator : 12 posts
-

7.9.2. MAINTENANCE AND REPAIR

Preventive maintenance and routine work interventions shall be carried out by the permanent personnel and will require maintenance supplies and consumables (grease, oil, standard tools, etc.).
Repair operations may be carried out by specialized external Concessionaires with respect to the Concession Agreement.

7.10. REGULATIONS

All installations shall comply with International Standards like US and/or European ones in addition to the recognized Laws.
In particular, all installations shall comply with the safety rules and environmental protection norms set by Lebanese and International recognized Laws (eventual Environmental Impact Assessment will be carried out according to the Requirements of the Ministry of Environment).

The equipment provided shall comply with the applicable International Standards like US and/or European ones from all aspects.
The silo must be completely operational and ready for use, according to international rules and Standards like the US and/or European ones, newly built and fully operational.
More specifically, the safety rules for personnel protection shall be applied.
The electrical and mechanical equipment shall comply also with International Standards like the US and/or European ones.
The silo shall moreover be equipped with fire-fighting equipment.
The alleyways will be equipped with standard fire extinguishers.

8. TECHNICAL SPECIFICATIONS

8.1. GENERAL

This specification details the requirements for the supply of material and execution of works in a marine environment.
The Drawings (Appendix 1) shall be considered in conjunction with this specification.

8.2. STANDARDS, CODES OF PRACTICE AND REFERENCES

The following Standards and Codes of Practice are referenced within the Specification.
All materials, workmanship and testing shall conform to the requirements of the latest editions of the following Standards and Codes of Practice except as explicitly varied by this specification, or to any other requirements that can be requested by the Engineer:

- BS 6349 Maritime Structures;
- CUR/CIRIA Recommendations of Construction Industry Research and Information Association (CIRIA) C683, "The Rock Manual", 2007;
- CUR/CIRIA Recommendations of Construction Industry Research and Information Association (CIRIA) C683, "The Rock Manual", 1991;
- ISRM International Society for Rock Mechanics. Suggested Methods for Determining Point Load Strength, 1985;
- ACI 313-97: Standard practice for design and construction of concrete silos and stacking tubes for storing granular materials
- ANSI/ASAE EP433 DEC1988 (R2011) "Loads exerted by free-flowing grain on bins"
- AS 3774-1996 "Loads on bulk solids containers"
- BS EN 1991-4:2006: Eurocode 1 - Actions on structures – Part 4: Silos and Tanks
- BS EN 1993-4-1: Eurocode 3 - Design of steel structures - Part 4-1: Silos
- BS 812-111: Testing aggregates. Methods for determination of ten per cent fines value (TFV);
- BS 812-112: Testing aggregates. Method for determination of aggregate impact value;
- BS 812-117: Testing aggregates. Method for determination of soundness;
- ASTM C 131-81: Test for Resistance to Abrasion of Small size Coarse Aggregate by Use of Los Angles Machine;
- ASTM D2938: Unconfined compression strength;
- BS 1367.2: Resistance to weathering;
- BS 1377-3:1990 Methods of test for soils for civil engineering purposes. Chemical and electro-chemical tests;

- BS 4027:1996 - Specification for sulphate-resisting Portland cement;
- BS 5930:1990 - Code of practice for site investigations;
- BS EN 196-2:2005 - Methods of testing cement. Chemical analysis of cement;
- BS EN 196-9:2003 - Methods of testing cement. Heat of hydration. Semi-adiabatic method;
- BS EN 196-21:1992 - Methods of testing cement. Determination of the chloride, carbon dioxide and alkali content of cement;
- BS EN 197-1: 2001- Cement - Part 1: Composition, specifications and conformity criteria for common cements;
- BS EN 450 -1: 2007 - Fly ash for concrete - Part 1: Definition, specifications and conformity criteria;
- BS EN 933-1:1997 - Tests for geometrical properties of aggregates. Determination of particle size distribution. Sieving method;
- BS EN 933-3:1997 - Tests for geometrical properties of aggregates. Determination of particle shape. Flakiness index;
- BS EN 933-4:2000 - Tests for geometrical properties of aggregates. Determination of particle shape. Shape index;
- BS EN 934-4:2001 Admixtures for concrete, mortar and grout. Admixtures for grout for prestressing tendons. Definitions, requirements, conformity, marking and labelling;
- BS EN 934-6:2001 Admixtures for concrete, mortar and grout. Sampling, conformity control and evaluation of conformity;
- BS EN 993-7:2000 - Methods of test for dense shaped refractory products. Determination of modulus of rupture at elevated temperatures;
- BS EN 1008:2002 - Mixing water for concrete. Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete;
- BS EN 1097-2:1998 - Tests for mechanical and physical properties of aggregates. Methods for the determination of resistance to fragmentation;
- BS EN 1097-5:1999 - Tests for mechanical and physical properties of aggregates. Determination of the water content by drying in a ventilated oven;
- BS EN 1097-6:2000 - Tests for mechanical and physical properties of aggregates. Determination of particle density and water absorption;
- BS EN 12390-1:2000 - Testing hardened concrete. Shape, dimensions and other requirements for specimens and molds;
- BS EN 12390-2:2000 - Testing hardened concrete. Making and curing specimens for strength tests;

- BS EN 12390-3:2002 - Testing hardened concrete. Compressive strength of test specimens;
- BS EN 12390-6:2000 Testing hardened concrete. Tensile splitting strength of test specimens;
- BS EN 12390-7:2000 Testing hardened concrete. Density of hardened concrete;
- BS EN 1367-4:1998 - Tests for thermal and weathering properties of aggregates. Determination of drying shrinkage;
- BS EN 1744-1:1998 - Tests for chemical properties of aggregates. Chemical analysis;
- BS 1881-208:1996 - Testing Concrete: Recommendations for the determination of the initial surface absorption of concrete;
- ASTM C40-73C40-04 Standard Test Method for Organic Impurities in Fine Aggregates for concrete;
- ASTM C88-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate;
- ASTM C142-97(2004) Standard Test Method for Clay Lumps and Friable Particles in Aggregates;
- ASTM C295-03 Standard Guide for Petrographic Examination of Aggregates for concrete;
- ASTM C494/C494M-04 Standard Specification for Chemical Admixtures for concrete;
- ASTM C1260-01 Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

The design and construction shall comply with the requirements set by the International Standards like US and/or European ones and with the requirements of the Employer and/or the Engineer.

8.3. RESPONSIBILITIES OF THE CONCESSIONNAIRE FOR THE WORKS EXECUTION

The selected Concessionaire shall be responsible for:

A) Obtaining and maintaining all permits/clearances necessary to access the site and carry out the Works safely, including the compliance with the requirements of relevant Authorities and the instructions of the Engineer

B) Communicating only with the Engineer. No other external communication is authorized without notification and prior approval from the Engineer

C) Provision of all materials, plants and equipment, labor, consumables, site supervision, and all necessary requirements to complete the Works

D) Maintaining the site environmental conditions throughout the Works period, including provision of discharge or disposal procedure compliant with the requirements of relevant Authorities and/or the Engineer

E) Restoration of the fieldwork locations, where required, including reinstating access roads and other site areas to the satisfaction of the relevant Authorities and/or the Engineer

F) Full access and cooperation with any other third-party and Contractors that may be working on the site

G) Adherence to the Engineer's specifications

H) Compliance to any relevant environmental measures

I) Compilation of all required Method Statements and Health & Safety Plans

J) Providing insurances as per Engineer's requirements

K) Not proceeding with ordering any materials until approval in writing from the Engineer

L) Preparing and submitting to the approval to the Engineer a fully detailed program which shall be updated on a regular basis

M) Providing sufficient staff and equipment to perform the duties in executing the Contract

N) The full-time supervision of the whole of the Works

O) Taking all precautions to prevent the outbreak of fire and providing adequate firefighting appliances on site to the approval of the Engineer

P) The Concessionaire and all persons employed by him and his Sub-Contractors, to comply with the Provisions of all Acts, Orders, Laws and Regulations concerning the safety, health or welfare of persons working on site as per Lebanese regulations

Q) The Concessionaire and all persons employed by him and his Sub-Contractors, to comply with the provisions of the safety regulations at site

R) Ensuring that accidents shall be properly documented, reported immediately to the KCT Engineer and assistance given by way of medical help and transportation to hospital

S) Removal from site of all redundant plant on completion of the works

T) Only modern, properly maintained equipment of the appropriate capacity and suitability for the duty required, shall be used for the Works

U) Protection of the Works from damage by his own workmen performing subsequent operations

V) Provision and maintenance of signs, red warning lamps and barricades as necessary

W) Immediately prior to handing over the works the Concessionaire shall thoroughly clean the whole of the works and surrounding area all to the approval of the Engineer

X) Ensure that excessive noise and pollution does not occur during the execution of the Works

Y) Provision of all necessary attendance as may be required for the completion of the Works

Z) Ensure the proper adoption of QA / QC procedures

AA) The working areas on site are subject to the limitations imposed by the Engineer. A temporary stockpile area will be made available to the selected Sub-Contractor (location and area to be approved by the Engineer)

BB) Supply of all lighting and power required for the Works, the work of his Sub-Contractors, including supplying, operating and maintaining temporary switches, cables and leads. The Concessionaire shall pay for all charges for the current consumed and connections

CC) Provision of temporary aids to navigation (if applicable) ensuring safe marine navigation at all times in accordance with the requirements of the concerned authorities

DD) Preparation and submittal of "Shop", "Fabrication" and "As-Built" drawings

EE) Concessionaire to ensure the existing road to the project opened recently by the Employer is intact from any damage caused by construction traffic, and to maintain it periodically to the Engineer satisfaction

FF) Concessionaire has to provide periodical (weekly or as needed) interim survey report to the Engineer to enable proper monitoring of works, and to provide pre-surveys and a post-survey of every completed area, along with volume calculations as required and to the satisfaction of the Engineer

GG) Concessionaire to submit program of Work in accordance with the Client requirements

8.4. PROVISIONS

The following items will be provided by the Concessionaire:

- Site offices on land for the Concessionaire and Engineer
- Provision of utilities for Concessionaire and Engineer site offices (power, water, high-speed internet connection) via temporary services
- Maintenance of Concessionaire and Engineer site offices (cleaning, consumables, etc.)
- Site offices will be watertight, lockable, air conditioned if necessary and provided with adequate lighting

8.5. INSPECTION

The Concessionaire, including any subordinate organizations engaged by him, shall be subject to surveillance inspection and audit by the Engineer.
Inspection of works will be performed by the Engineer while the Works are in progress to verify compliance with the specified technical and quality requirements, to observe the equipment and procedures, and to review the program.
Inspection or audit by the Engineer shall not relieve the Concessionaire of his responsibility for complying with the requirements of this specification.

8.6. SCHEDULE FOR THE WORKS

The Concessionaire shall provide a detailed schedule for the Works in a chart format within two weeks from the starting date, and shall receive the approval of the Engineer on it, before starting Works execution on site.

8.7. SUBMITTALS

The Concessionaire shall submit within two weeks from the starting date, and shall receive the approval of the Engineer on it, before starting Works execution on site, the following minimum information:

- Detailed proposed Method Statement discussing proposed phasing, Works by land, Works by water, HSE issues, minimization of environmental impact, disposal methodology on land, production/day expected, etc.
- The experience and qualifications of the Sub-Contractors in similar works (year, location, client, scope of Works, duration and value of the contract).
- The experience and qualifications of the Sub-Contractor project team.
- List of equipment to be assigned to carry out the Works.
- Work schedule
- Compliance to the specifications.

8.8. SITE SPECIFICATION

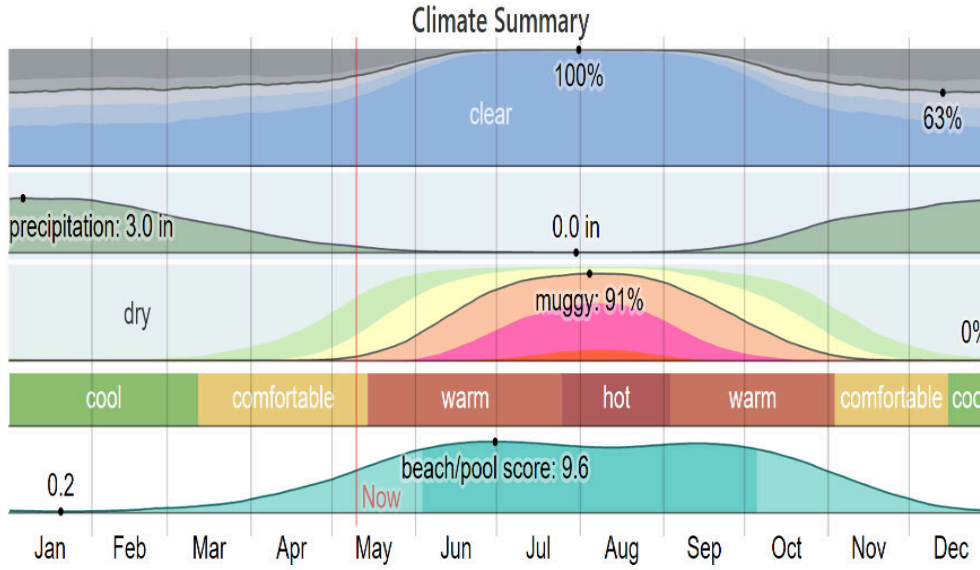
8.8.1. GENERALITY

The required facility shall include in general:

- A grain silo, with the following minimum characteristics, dimensions and capacities:
    - 120,000T total capacity of bins
    - 5,000T capacity per steel bin with flat bottom
    - Possibility for storage of wheat, corn, barley, sunflower and other
- One ship loader (Minimum 400T/hr)
- Two ship unloaders (Minimum 200T/hr each)
- Several loading truck stations
- One unloading truck station
- Necessary mooring and quay accessories for ship berthing in front of the mentioned silo along 200m of quaywall line @-15.00 NGL.
- Handling/expedition tower
- 4 weight bridges (~80T capacity each)
- Loading chain conveyor
- Unloading chain conveyors
- Belt conveyors
- Anchor bolts, level sensors, outside and inside ladders, roof handrail and radar level sensors
- Catwalks, sweep augers, aeration systems
- Temperature systems, fumigation systems, Intake pit grids, Rotary drum cleaners with aspiration, weigher with aspiration
- Loading bellows with filters for the truck loading silos, sets of installation tools, installation cables, cleaner elevator, 2 main elevators with magnets,
- Valves, ductworks and pipes, Central aspiration system, spare parts list and compressor units
- Power and water supply systems
- Auxiliary civil, MEP and building works that must be executed on the same land area of the silo
- Car parking
- Truck parking
- CCTV system
- Guard and security
- …

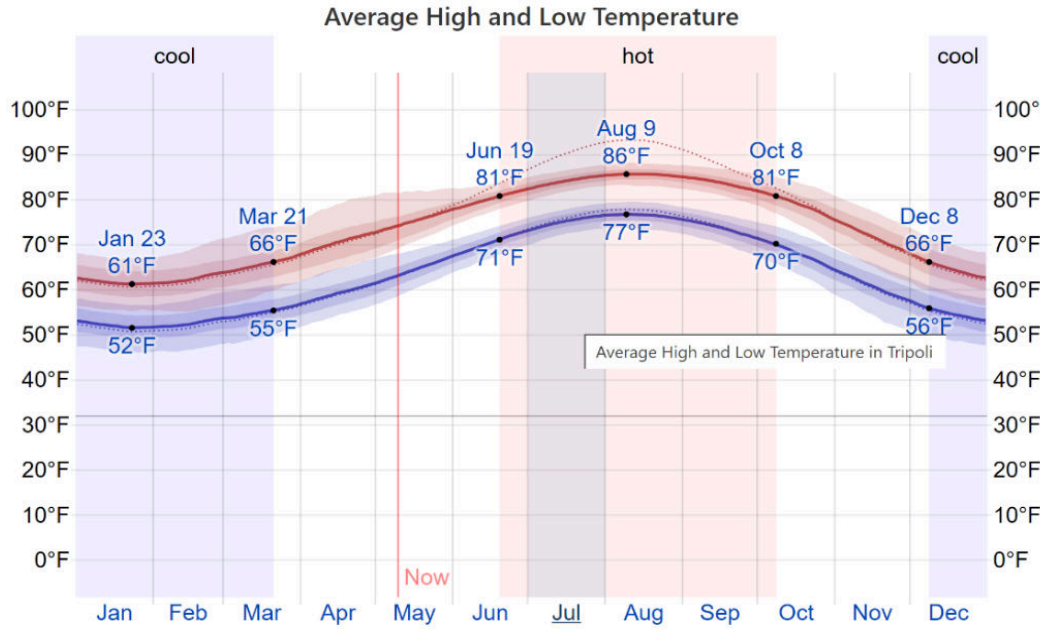
8.8.2. CLIMATIC DATA

in Tripoli, the summers are warm, muggy, arid, and clear and the winters are cool, wet, windy, and mostly clear.
Over the course of the year, the temperature typically varies from 52°F to 86°F and is rarely below 46°F or above 88°F.



TEMPERATURE

The hot season lasts for 3.6 months, from June 19 to October 8, with an average daily high temperature above 81°F.
The hottest day of the year is August 9, with an average high of 86°F and low of 77°F.
The cool season lasts for 3.4 months, from December 8 to March 21, with an average daily high temperature below 66°F.
The coldest day of the year is January 23, with an average low of 52°F and high of 61°F.



PRECIPITATION

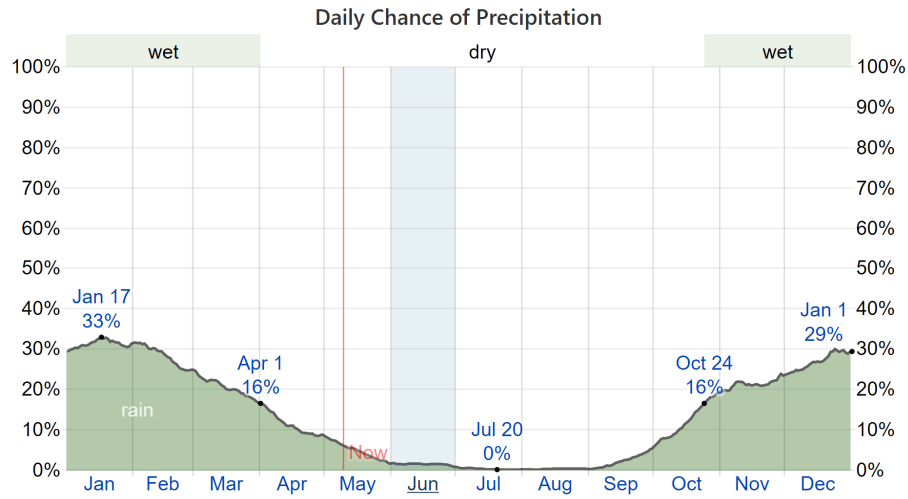
A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Tripoli varies significantly throughout the year.

The wetter season lasts 5.2 months, from October 24 to April 1, with a greater than 16% chance of a given day being a wet day. The chance of a wet day peaks at 33% on January 17.

The drier season lasts 6.7 months, from April 1 to October 24. The smallest chance of a wet day is 0% on July 20.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two.

Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 33% on January 17.



RAINFALL

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year.

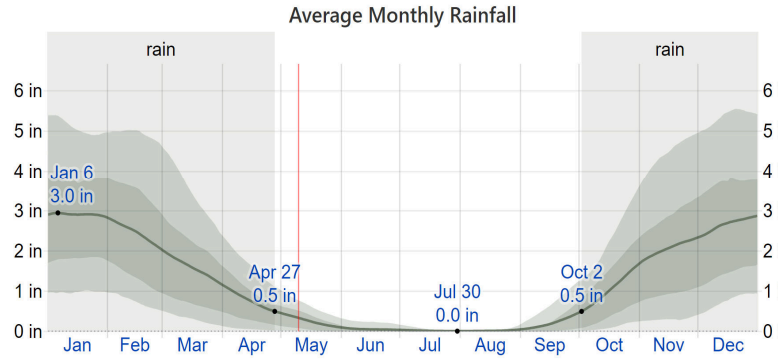
Tripoli experiences significant seasonal variation in monthly rainfall.

The rainy period of the year lasts for 6.8 months, from October 2 to April 27, with a sliding 31-day rainfall of at least 0.5 inches.

The most rain falls during the 31 days centered around January 6, with an average total accumulation of 3.0 inches.

The rainless period of the year lasts for 5.2 months, from April 27 to October 2.

The least rain falls around July 30, with an average total accumulation of 0.0 inches.



HUMIDITY

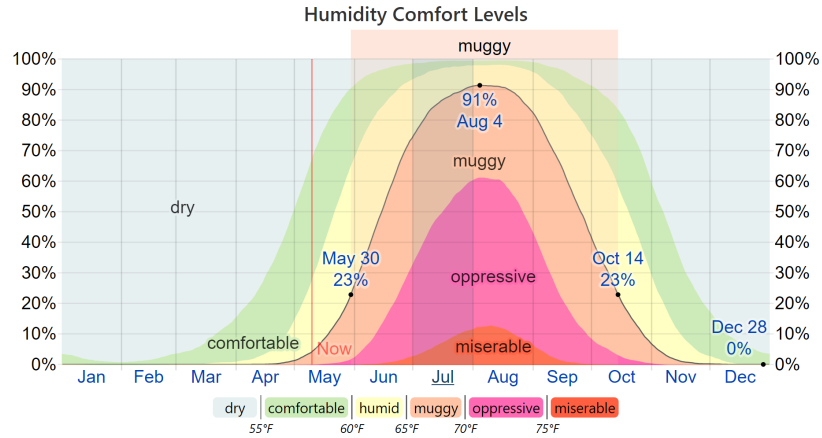
Humidity comfort level is based on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid.

Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night.

A muggy day is typically followed by a muggy night. Tripoli experiences extreme seasonal variation in the perceived humidity.

The muggier period of the year lasts for 4.5 months, from May 30 to October 14, during which time the comfort level is muggy, oppressive, or miserable at least 23% of the time. The muggiest day of the year is August 4, with muggy conditions 91% of the time.

The least muggy day of the year is December 28, when muggy conditions are essentially unheard of.



WIND

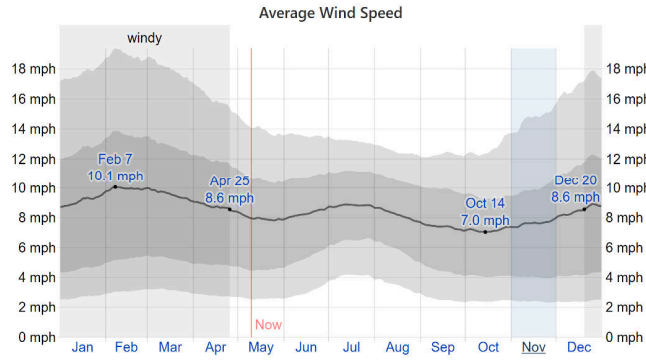
This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground.

The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

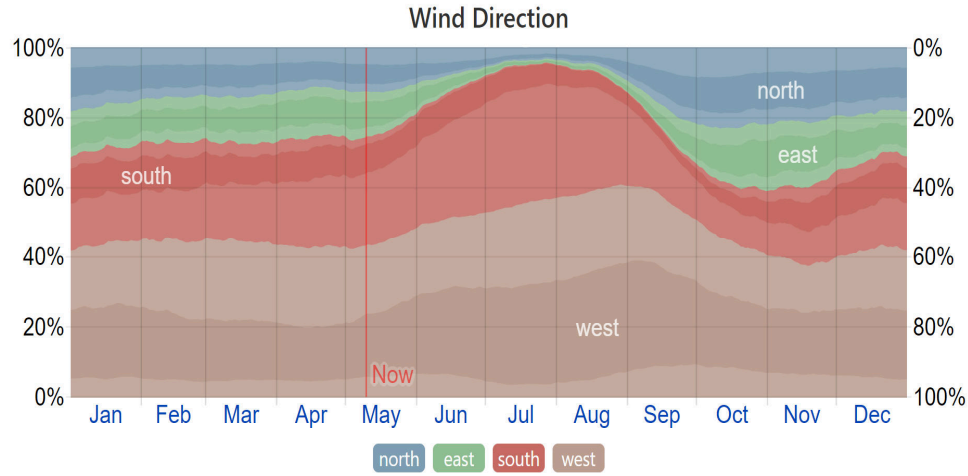
The average hourly wind speed in Tripoli experiences significant seasonal variation over the course of the year.

The windier part of the year lasts for 4.2 months, from December 20 to April 25, with average wind speeds of more than 8.6 miles per hour.

The windiest day of the year is February 7, with an average hourly wind speed of 10.1 miles per hour. The calmer time of year lasts for 7.8 months, from April 25 to December 20. The calmest day of the year is October 14, with an average hourly wind speed of 7.0 miles per hour.



Predominant average hourly wind direction in Tripoli is from the *west* throughout the year.



8.8.3. SOME GRAINS DATA FOR BULK STORAGE

Grain	Bulk density (kg m^{-3})	Moisture (%)	Porosity (%)	Specific gravity (kN m^{-3})
Barley	618	9.7-10.7	39.5-57.6	12.1-13.3
Rape	669	6.5-6.7	38.4-38.9	11.0-11.5
Maize	721	9-15	40.0-44.0	11.9-13.0
Linseed	721	5.8	34.6	11.0
Oat	412	9.4-10.3	47.6-55.5	9.5-10.6
Rice	579	11.9-12.4	46.5-50.4	11.1-11.2
Rye	721	9.7	41.2	12.3
Soy	772	6.9-7.0	33.8-36.1	11.3-11.8
Wheat	772	9.8	39.6-42.6	12.9-13.2

8.8.4. CONFORMITY TO ATEX REGULATIONS

All facility, components and equipment shall be designed, built and operated in conformity to ATEX regulations, classified as follows:

Area classification	**Area inclusions**
ATEX 20	Inside volume of filter equipment and ducts Inside volume of vacuum cleaning system equipment and pipes
ATEX 21	Inside volume of grain handling equipment Inside volume of storage cells Grain outlet discharge points on belt or chain conveyors Screw handling devices
ATEX 21	Grain reception hopper at Truck Inside volume of hopper and buffer tank
No classified risk	Head House building Pits and cellars Galleries under cells Outside Catwalk Trucks and train reception building

8.8.5. HANDLING EQUIPMENT AND WEIGHT BRIDGES

CAPACITY OF THE INSTALLATION

Based on an average grain specific weight of 0.75, the Capacity of the installation shall be from 400 to 600 tons/hr.

TURNOVER OF STORAGE INSTALLATION PER YEAR

10 to 20 times per year.

CATWALKS LOADING

250kgs/m^3

GALVANIZATION

All outside equipment shall be galvanized, in conformity with N.F. A 36.321 and A 46.321 NF A 91-121 and 91 - 122.
Damaged part will be painted with zinc rich paint, thickness 100 microns.
Galvanized spray paint is prohibited.

HANDLING EQUIPMENT AND WEIGHT BRIDGES

The mechanical equipment for handling equipment and weigh bridges shall include in minimum:

- Handling equipment (conveyor, elevator, valve, ducting, etc.)
- Over band
- Scale / upstream and downstream hoppers
- Cleaner
- Expedition bins
- Connexion ducting
- Weight bridges
- Sampling equipment
- Compressed air equipment
- Vacuum centralized cleaner
- Security features (grid, casing, etc)

UNLOADING SHIPPER

The mechanical equipment for the unloading shipper shall include in minimum:

- Gantry on rails
- Turret / Driving cabin
- Engine room
- Ship unloading system (vacuum or chain conveyor)
- Chain conveyor
- Telescopic loading spouts
- Anchoring devices
- Winch for Bobcat

8.8.6. STEEL COMPONENTS

Bins will be made of steel with a yield strength ranging from 350 MPa for wall rings up to 600 MPa for stiffeners.
Innovative metal coating can be applied, talking in consideration achieving the highest resistance to corrosion in aggressive environment (marine environment in this case).

Z-600 galvanized steel can be used also, containing 600 gr/m^2 of Zinc, equivalent to a thickness of 42 microns per side which makes it longer-lasting even in the most aggressive of atmospheres (as established in Standard ISO 9223).
Minimum galvanization for stiffeners is Z-600. This option goes for stiffeners up to 3,5 mm, thicker stiffeners are hot-dip galvanized.
Silos will feature an inspection door for maintenance in the second wall ring as well as another one on the roof.
Access stairs to the silo, roof and gateways are to be designed to be safe and ergonomic, according to UNE-EN ISO 14122-2 standard and manufactured in highly resistant galvanized steel offering the best solution for silo inspection and maintenance.
Roof vents must guarantee proper bin ventilation preventing the entrance of water even in the most adverse of conditions.
For easier visual control of the silo and the material stored inside, inspection holes are included on the roof which, due to the quick-close system and easy access from the stairs, are an important handling tool.
Wind-Ring allows bin to maintain the bin's cylindrical shape without any effect from wind loads which offers rigidity and safety.
They may be installed on the roof or on the wall ring depending on the diameter and height of the bin. Ventilation for proper grain conditioning and conservation must be ensured.

8.9. MATERIALS

8.9.1. CEMENT

A) CEMENT GENERAL

1) The cement to be used throughout the Works shall be obtained from manufacturers approved in writing and shall be as described under one of the following headings and shall comply with the latest editions of the mentioned Standards:

a) Portland Cement (PC). Cement Class 42.5 N complying with BS EN 197-1 but containing not less than 4% and not more than 13% proportion by mass of tri-calcium aluminates.

b) Moderate Sulphate Resisting Portland Cement (MSRPC). Cement Class 42.5 N complying with BS EN 197-1 but containing not less than 4% and not more than 8% proportion by mass of tri- calcium aluminates, or cement complying with ASTM C150 Type II. In either case the cement shall not contain more than 2.7% proportion by mass of Sulphur trioxide.

c) Sulphate Resisting Portland Cement (SRPC). Cement complying with either BS 4027 Class 42.5N or ASTM C150 Type V.

d) High Slag Blast furnace Cement (HSBC). Combination manufactured in the concrete mixer from Portland cement to BS EN 197-1 and ground granulated blast furnace slag (GGBS) conforming to BS 6699. The combination shall contain a minimum of 60% slag by mass of nucleus.

e) Portland Pulverized - Fuel Ash / Fly Ash Cement (PFAC).
Combinations manufactured in the concrete mixer from Portland cement to BS EN 197-1 and pulverized fuel ash (Fly ash) conforming to BS EN 450 (category S).
The combination shall contain at least 30% pulverized - fuel ash by mass of nucleus.

2) Cement shall comply with the additional requirements in Table 1.

Table 1 - Additional requirements for cement

Property	**Test method**	**Limits**
Acid soluble alkali as Na2O equivalent	BSEN 196 : Part 21	Not higher than 0.6%
Heat of hydration	BS 4550 : Part 3	Not higher than 315 kJ/kg at 7
Specific surface	BSEN 196 : Part 6	225 - 350m^2/kg

3) The temperature of the cement shall not exceed 65ºC at the time of incorporation into a concrete mix.
   Cement type for each mix shall be as shown in the table of concrete mixes.

B) CEMENT TESTING

1) Cement shall be certified by the manufacturer as complying with the requirements of the appropriate specification.

2) Before ordering cement, the Concessionaire shall submit details of the proposed supplier and information on the proposed methods of transport, storage and certification for approval and show that the quantity and quality required can be attained and maintained throughout the construction period.
   Representative samples of the proposed cement are to be taken and forwarded to an independent laboratory approved by the Superintendent for analysis before the source is approved.

3) Having obtained approval, the Concessionaire shall not change the agreed arrangements without permission.

4) Each consignment of cement shall be accompanied by a certificate showing the place of manufacture and the results of standard tests carried out on each day's bulk production included in the consignment.

5) Additionally, tests shall be carried out on each consignment of cement on arrival, and also at monthly intervals during storage.

6) The Concessionaire shall store the cement so that separate consignments can be identified until the results of the testing are available.

7) Tests should be carried out for the properties listed in Table 2 with test methods and limits to BS or ASTM as appropriate:

Table 2 - Tests to be carried out on cement

Properties to be tested
Strength
Fineness
Heat of hydration

Setting time
Soundness
Reactive alkali level as NA2
Chloride content
Loss on ignition
Insoluble residue
Tri-calcium aluminates
SiO2, MgO, Ai2O3, Fe2O3,
SO3

8) The cementitious materials like GGBS, fly ash and MS to be used throughout the works shall be obtained from manufacturers approved in writing.
Testing and delivery of these materials shall be as per related Clauses.

8.9.2. AGGREGATE

A) AGGREGATE GENERAL

1) Aggregate shall comply in all respects with BS 882 / BS EN 12620

2) The Concessionaire shall obtain approval of proposed aggregate sources, and shall select suitable aggregate and samples of sand and stone for specified testing before obtaining aggregate

3) Laboratory tests according to BS 812 shall be made at regular intervals to confirm the suitability of aggregate

B) QUALITY AND TESTING

1) Aggregate shall be free from earth, clay, loam and soft, clayey, shale or decomposed stone, organic matter, other impurities or any matter likely to affect durability of concrete and shall be hard and dense.
The percentage of hollow shells shall not exceed 3% by mass retained on 2.36mm sieve to BS 410 as determined by BS 812: Part 103.1

2) Aggregate to be used in the construction of structures for retaining aqueous liquids shall comply with BS 8007.
Aggregate shall comply in all respects with BS 882 / BS EN 12620

3) The following shall apply when tested in accordance with BS 812:
   a) Water absorption shall not exceed 2%

4) The following criteria shall be ascertained by testing in accordance with BS 812 and BS 882/ BS EN 12620, unless indicated otherwise, to assess the suitability of aggregate

5) The results shall comply with the limits given in BS 882 / BS EN 12620 or as otherwise stated herein:
   a) Grading (BS 812: Part 103, BS EN 933-1)
   b) Magnesium sulphate soundness (BSEN 1367-2, ASTM C88)
   c) Specific gravity and water absorption (BS 812: Part 2)

d) Clay, silt and dust content (BS 812: Part 103)
e) Clay lumps and friable particles (ASTM C142)
f) Organic impurities (ASTM C40, ASTM C87)
g) Acid soluble sulphate and chloride content (BS 812: Parts 118 & 119, BS1377-3, and BS EN 1744-1)
h) 10% fines value for coarse aggregates (BS 812: Part 111)
i) Elongation (BS 812: Part 105.2) and flakiness (BS 812: Parts 105.1 & 105.2)
j) Potential alkali reactivity (BSI/WG10, ASTM C289 and ASTM C227)
k) Los Angeles abrasion test, if required (ASTM C131 & ASTM C535)
l) Drying shrinkage in accordance with BS 812: Part 120
m) Moisture content (BS 812: Part 109)

6) The frequency of the above tests (a) to (m) shall be in accordance with Table 3.

Test Reference	Frequency once per period of days	
	Aggregate	Sand
(b)	1	1
(c)	30	-
(d)	7	7
(e)	1	1
(f)	7	-
(g)	30	30
(h)	3.5	1
(i)	7	-
(j)	3.5	-
(k)	Initial only	Initial only
(l)	Initial only	-
(m)	Initial only	Initial only
	2/day	3/day

Table 3 - Test to be carried out on aggregates

7) Tests (a), (d) and (m) shall be carried out as indicated or per 100m^3 whichever is the more frequent.

8) The combined grading of aggregate shall be determined on a daily basis.
The percentage passing any sieve size as determined by approved trial mixes shall be the target grading for all concrete of that type.

9) The combined grading of the works concrete shall not vary by more than 4% on any sieve from that target.

C) FINE AGGREGATE

1) As defined in BS 882 BS EN 12620 fine aggregate shall be mainly capable of passing through a 5mm BS test sieve and shall be graded so that when mixed with the coarse aggregate and cement a concrete of maximum density is produced.

2) Crushed sand may be added to natural sand in approved proportions in order to achieve the required grading. Crushed sand alone may not be used without approval.

3) The amount of material passing a 75 micron BS 410 fine test sieve when tested in accordance with BS 812 : Part 103 table 4 (wet-sieving method) shall not exceed 3% by mass.

4) When subjected to five cycles of the soundness test specified in ASTM C88, fine aggregate shall show a loss not exceeding 10% when magnesium sulphate solution is used.

5) The use of washed beach sand as fine aggregate may be permitted providing that the grading and salt content are maintained within the limits given herein.
   Each sand shall be dug from above high-water level and washed thoroughly.
   Before taking sand from any area the salt content shall be established and only sand from approved areas shall be used.

6) Sand for mortar shall comply with BS 1199 and 1200 / BS EN 13139.

D) COARSE AGGREGATE

1) As defined in BS 882 / BS EN 12620 Coarse aggregate shall be mainly retained on a 5.00mm BS 410 test sieve; the grading shall be within the limits prescribed in BS 882 / BS EN 12620 so that when mixed with the approved fine aggregate and cement a workable concrete of maximum density is produced.
   The densities of the classes of concrete shall be as approved after tests have been carried out on the site.

2) The amount of material passing a 75micron BS 410 fine test sieve when tested in accordance with BS 812: Part 103 (wet-sieving method) shall not exceed 1% by mass.

3) Drying shrinkage shall not 0.075 percent when tested in accordance with BS 812: Part 120.

4) When subjected to five cycles of the soundness test specified in ASTM C88, coarse aggregate shall not show a loss exceeding 10% when magnesium sulphate solution is used.

5) The flakiness and elongation indices of the predominant size fractions in each single-sized coarse aggregate, determined in accordance with BS 812, shall not exceed 30% by mass.

E) ALKALI - REACTIVITY POTENTIAL

1) Aggregate shall not contain any materials that are reactive with alkalis in the aggregate itself or in the cement, the mixing water or in water in contact with the finished concrete or mortar in amounts sufficient to cause excessive localized or general expansion of the concrete or mortar.

2) The Concessionaire shall initially assess an aggregate source by testing in accordance with ASTM C289.
   If potential reactivity is indicated, then mortar bar tests in accordance with ASTM C227 shall be carried out and the results shall comply with the limits given in ASTM C33 for overall effect on the permanent works mixes, before use of the aggregate is approved.

F) SULPHATE AND CHLORIDE CONTENT

1) The acid-soluble sulphate (SO3) content shall not exceed 0.4% by mass.
2) The acid-soluble chloride content as chloride ion in aggregate as a percentage by mass shall not exceed the limits given in Table 4.

Table 4 - Sulphate and chloride content limits for aggregate

Concrete type	Coarse aggregate	Fine aggregate
Mass (unreinforced)	0.06%	0.05%
Reinforced	0.03%	0.03%

Note: The concrete mix shall also comply with the overall limits for chloride and sulphate content given elsewhere in this specification.

8.9.3. REINFORCEMENT

A) STEEL FOR REINFORCEMENT

1) Reinforcement for use in reinforced concrete shall comply where appropriate with BS 4449, 4466, 4482, 4483, BS 8110 and 8666.

2) Reinforcement for structures shall comply with the requirement in BS 5400.

3) High-yield deformed bars shall be Type 2 complying with BS 4449, unless otherwise approved.

4) Modulus of elasticity for any steel reinforcing bar shall be not less than 200kN/mm².

5) Steel for pre-stressing shall be separately approved.

B) TYING WIRE

1) Tying wire shall be galvanized mild steel of diameter approximately 1.5mm.

2) Tying wire shall have the same minimum concrete cover as detailed for reinforcement.

3) Tying wire for use with epoxy coated steel reinforcement shall be nylon coated.
   The ends of the tying wire shall be turned into the main body of the concrete.

C) TESTING

1) Prior to approval the Concessionaire shall provide copies of the manufacturer's certificates of test results relating to the steel reinforcement to be supplied, and shall additionally provide independent test results obtained from an approved laboratory.

2) Samples for testing shall be selected randomly from each consignment of reinforcement delivered to the site representing different days' production at the manufacturer's works.

3) One test shall be carried out per 5,000m length of bars delivered to site.

D) STAINLESS STEEL

1) Where specified and shown on the Drawings stainless steel reinforcement shall be hot rolled austenitic stainless steel Type 316S33 to BS 6744, with a minimum tensile strength of 510N/mm^2.

2) Test certificates and product analysis certificates shall be provided. Note that Type 304 is strictly excluded.

E) EPOXY COATED STEEL

1) Where specified and shown on Drawings, fusion bonded epoxy coated steel reinforcement shall comply with BS ISO 14654.

2) Epoxy coating for reinforcement shall comply with BS ISO 14656.

8.9.4. WATER

A) WATER GENERAL

1) The Concessionaire shall make his own arrangements and obtain approval for the provision of fresh water for the manufacture and curing of concrete.

B) QUALITY

1) Water to be used for mixing and curing concrete and mortar shall be fresh and free from sediment and dissolved or suspended matter which may be harmful and shall comply with the requirements of BS 3148 or BS EN 1008.

2) Water samples from the intended source of supply shall be taken for analysis before any concrete work is commenced, and at intervals throughout the duration of the Contract.

3) If the samples are unacceptable the Concessionaire shall either change to a new supply or take steps to improve the existing source, as approved.

C) SULPHATE AND CHLORIDE CONTENT

1) The sulphate (SO3) content shall not exceed 500mg/l, and the chloride ion content shall not exceed 350mg/l.
   Tests to establish the contents shall be carried out at monthly intervals.

Note: Each concrete mix shall also comply with the overall limits for chloride and sulphate given elsewhere in this specification.

8.9.5. ADMIXTURES

A) ADMIXTURES

1) Where approved or specified, admixtures complying with BS 5075, BS EN 934-2 or ASTM C494 shall be used as a means of:

a) Achieving workability with the lowest appropriate water-cement ratio in order to achieve durability;
b) Controlling and retarding setting;
c) Reducing bleeding and associated plastic settlement and cracking.

2) Set-retarding and water-reducing admixtures shall normally be limited to those based on ligno-sulphonates or modified ligno-sulphonates or sodium naphthalene sulphates.
Air entraining agents shall be based on neutralized vinsol or other resin.

3) Unless approved by the Superintendent admixtures from different manufacturers shall not be used.
Compatibility of different admixtures with binders like Fly ash and GGBS shall be tested and approval shall be obtained from the Superintendent before the trial mix approval.

4) Admixtures other than those specified herein shall only be used provided that the prior approval of the Superintendent has been obtained and any information or test results required by him have been provided and are to his satisfaction.

5) Admixtures containing chlorides or other corrosive agents shall not be used.

6) In the event of admixtures being used, the concrete tests described in the Specification shall be incorporated to ensure the specified strengths are achieved and comparison shall be made with concrete manufactured without the admixture to prove that the density has not been reduced.

7) When admixtures are used in the Works very strict control is to be maintained to ensure that the correct quantity of admixture is used at all times.

8) The equipment to be used for dispensing and the method of incorporating the admixture in the concrete shall be to the approval of the Superintendent.

9) The dispensing unit shall be translucent such that the operator can see the discharge of the admixture. Calibration of dispensing unit shall be checked and approved.

B) POLYPROPYLENE FIBERS

1) Fibrous concrete reinforcement shall be 100% virgin polypropylene fibers specifically manufactured for use as a concrete reinforcement and so certified by the manufacturer. It shall contain no reprocessed olefin materials.

2) The fiber dosage shall provide a minimum surface area of 200m^2 of fibers per cubic meter of concrete. The length of each fiber shall be between 10mm and 50mm. Fibers may be monofilament or fibrillated.

C) CORROSION

1) Corrosion inhibitor admixtures (Hycrete X1000 or equivalent) shall be added to reinforced concrete mix design and the Sub-Contractor should provide either by itself or through the admixture supplier the warranty that no side effects would occur and the minimum required compressive strength of the mix design will be achieved.

8.10. DELIVERY AND STORAGE

A) CEMENT

1) Cement shall be delivered in bulk or in sealed and marked bags, and shall be protected from the weather by enclosed transfer systems or other approved coverings.

2) The Concessionaire shall provide approved silo to store sufficient bulk cement for continuity of work, and the cement shall be placed therein upon delivery.
Approved precautions shall be taken to prevent cement dust causing a nuisance.

3) Alternatively, the Concessionaire shall provide ventilated sheds with raised floors for the storage of sufficient bagged cement for continuity of work.

4) Each consignment shall be stacked separately for inspection, testing and approval before use.

5) The cement shall be placed in the sheds upon delivery and shall be used in the order in which it was delivered.

B) AGGREGATE

1) Aggregate shall be stored in concrete-based bins with the base laid to falls to provide drainage away from the storage area or on stages to prevent intermixing and the inclusion of dirt and foreign materials.

2) Each size of aggregate shall be stored separately.

3) Storage bins shall be emptied and cleaned regularly.

C) REINFORCEMENT

1) Steel reinforcement shall be stored in an approved manner above ground, at a location covered by a concrete ground slab, under cover and racked as necessary for protection from aggressive elements.

2) Canvas or similar covers shall be provided for the reinforcing bars to prevent the deposit and accumulation of deleterious materials on the bars. Similar provision shall be made to cover the bars in the reinforcement bending area.

8.10.1. CONCRETE GRADE

A) MIXES GENERAL

1) Concrete shall be as shown in the Table of Mixes below (Table 5). The number of mixes may require to be increased.

2) The criteria given in Table 5 are designed to produce concrete of the required strength and durability.

B) TABLE OF MIXES

Table 5 - Table of mixes

Concrete grade	Type of cement	Maximum size of aggregates	Minimum quantity of cement	Maximum quantity of cement	Maximum free water/cement ratio	Specified Characteristic Strength (Cubic)	
		mm	kg/m^3	kg/m^3		7-day N/mm²	28-day N/mm²
30/20/S	SRPC	20	350	400	0.47	20	30
40/20/M	MSRPC	20	370	400	0.42	26	40
40/20/S	SRPC	20	370	400	0.42	26	40
40/20	PC	20	370	400	0.42	26	40
40/20/H or 40/20/P	HSBC or PFAC	20	380	420	0.42	26	40
50/20/H or 50/20/F	HSBC or PFAC	20	380	420	0.4	33	50

Notes on table of mixes:

PC Portland cement
SRPC Sulphate resisting Portland cement
MSRPC Moderately sulphate resisting Portland cement
COMB Combination manufactured in the mixer at the time of concrete production

1) Grade 50/20/F shall contain polypropylene fibers as specified.

2) The Characteristic Strengths are for concrete which has been cured at a temperature of 20°C ±1°C, and are the values below which no more than 5% of the test results fall. The 7-day strengths shall be used only as a guide.

3) HSBC shall contain at least 60% GGBS complying with BS 6699 and concrete shall comply with the additional limits as indicated in related clause.

4) PFAC shall contain minimum 30% Pulverized Fuel Ash complying with BSEN 450 and shall comply with the additional limits as indicated in related clause.

5) Concrete containing HSBC or PFAC may contain Silica Fume/Micro silica complying with EN13263 or equivalent approved by the Superintendent up to 5% by weight of binder.

6) Concrete with HSBC, PFAC and Microsilca requires particular attention concerning protection and curing. The Sub-Contractor shall provide a comprehensive method statement with information on material, incorporation and special precautions when using Microsilca and other minerals.

C) QUALITY AND TESTING

1) Concrete shall comply with BS 8500-1 and BS 8110 except where BS 8007 or this specification differs.

2) Sampling for test purposes shall comply with BS 1881 Part 101.

3) The making and curing of specimens shall comply with BS 1881 Parts 108, 109, 110 and 111.

4) If air-entrainment is specified the average air content at the time of placing measured in accordance with BS 1881 shall be:

5) Concrete containing 20mm maximum size aggregate 5% ±1%.

6) Concrete for water-retaining structures shall be watertight and shall comply with the recommendations of BS 8007.

7) Mass concrete for paving shall be tested to BS 1881 Part 118 and shall have a characteristic flexural strength of 4.0N/mm^2 at 28 days.
Characteristic flexural strengths are for concrete which has been cured at a temperature of 20°C ±1°C and are values below which no more than 5% of the test results fall.

8) If concrete specimens are cured at higher temperatures or for longer periods than BS 1881 Part 111 requires, the adjusted Characteristic Strength shall be calculated as follows:
$100\ f'/f = A + B \log [24D\ (T+12)/1000]$
f' = adjusted Characteristic Strength
f = specified Characteristic Strength
T = curing temperature
D = age at testing in days

A & B are coefficients given in Table 6.

The above equation applies only to PC, MSRPC and SRPC.

Record cube strength	**A**	**B**
Less than 15	10.0	67.5
15 to 35	20.0	20.0
Greater than 35	30.0	52.5

Table 6 - Coefficients for the calculation of the concrete's adjusted characteristic strength

This calculation may be applied for curing at temperatures up to 27°C.

1) Before placing concrete, the Sub-Contractor shall obtain approval of the mixes proposed for each class of concrete and the average target strengths.
The mixes shall be designed to achieve the minimum workability for the Concessionaire to place and compact the concrete with the equipment proposed for use.

2) The mean strength shall exceed the Characteristic Strength by a margin of 1.64 times the standard deviation expected from the concreting plant, except that no standard deviation less than 3.5N/mm^2 shall be used as a basis for designing a mix.

8.10.2. TRIAL MIXES

A) LABORATORY TRIAL MIXES

1) Preliminary laboratory tests shall be carried out to determine the mixes to satisfy the specification with the available materials.

2) Trial mixes shall be tested to determine the following properties of mixes proposed for initial field tests:
   a) Bleeding in accordance with ASTM C232 (non-vibrating) Nil/negligible.
   b) Drying shrinkage in accordance with BS 812-120 / BRE Digest 357.
   c) Air content if applicable.
   d) Free water/cement ratio.
   e) Workability.
   f) Fresh and hardened concrete densities.
   g) Absorption in accordance with BS 1881: Part 122.

3) The upper target limit for absorption after 30 minutes shall be 2% for reinforced concrete and 2.3% for unreinforced concrete.

4) The following tests should commence when the concrete specimens are 28 days old:
   a) Initial Surface Absorption Tests (ISAT) shall be carried out in accordance with Test 6 of BS 1881: Part 5, 1970 and BS 1881: Part 208, 1996.
   b) The target limits shall be as in Table 7:

Table 7 - Target limits for ISAT

Time after starting test	**10 min**	**30 min**	**1 hour**
ISAT results ml/m^2/s	0.25	0.17	0.10

5) For Reinforced Concrete only:
   a) Penetration of water in accordance with DIN 1048. The target limit for penetration at 4 days shall be 30mm.
   b) Chloride permeability shall be in accordance with ASTM 1202. The target limit shall be 2000 Coulombs.

6) For Concrete with HSBC or PFAC only:
   a) Penetration of water in accordance with DIN 1048.
   b) The target limit for penetration at 4 days shall be 10mm.
   c) Chloride permeability shall be in accordance with ASTM 1202.
   d) The target limit shall be 1000 Coulombs
   e) Chloride diffusion test shall be carried out as per Nord NT build 492

7) Maximum diffusion coefficient shall be 1.75x10-12m^2/s at 90 days at 20ºC or as approved by the Superintendent.

8) If any of the values obtained for properties (a) to (h) for unreinforced concrete or (a) to (m) for reinforced concrete that were mentioned in clause 2.2.B.4 are unacceptable, the mixes shall be re-designed.

B) INITIAL FIELD TESTS

1) Trial mixes shall be prepared under full-scale site conditions and tested in accordance with BS 1881.

2) Samples of concrete incorporating the reinforcing details to be used shall be cast and examined, before hardening using hand tools, and after hardening by coring to assess the mixes.
   Cores shall be 150mm diameter by 200mm long.

3) Trial mixes shall be made on each of three days; the workability shall equate to the designed target value. Six cubes from each mix shall be taken, three for test at 28 days.
   Further trial mixes shall be made if the range (the maximum minus the minimum of the three cube results in any batch) exceeds 15% of the average of that batch, or if the range of the three batch averages exceeds 20% of the overall average of the batches.

4) The mixes shall be tested to determine the following properties:
   a) Bleeding in accordance with ASTM C232.
   b) Air content if applicable.
   c) Free water/cement ratio.
   d) Flexural strength in accordance with BS 1881: Part 118.

5) The average 28-day Characteristic Strength of the three trial mixes shall not be less than the designed mean strength, and the results of the above tests shall be acceptable before the mix is approved. Otherwise the mix shall be re-designed.

8.10.3. QUALITY CONTROL

A) TEST SPECIMENS

1) Test specimens shall be manufactured in an on-site laboratory, specially equipped for the purpose, in controlled conditions.

2) They shall be made, cured, stored, transported and tested to BS 1881. The method of compacting test specimens shall be as approved.

3) The testing machine shall be housed in a laboratory and calibrated to BS EN 10002-3 when delivered; the calibration shall include the use of the Foote strain gauge and be verified at 3-monthly maximum intervals.

B) SAMPLING: COMPRESSIVE STRENGTH

1) A sample of concrete shall be taken at random on eight separate occasions during each of the first five days of using a mix and tested for compressive strength.
   The standard deviation shall be calculated from at least 40 individual cube results each representing separate batches of similar concrete produced by the same plant under the same supervision.
   The current margin for the plant shall be thus established as 1.64 times the standard deviation.

2) Thereafter one sample shall be taken at random for each class of concrete from every group of 25 batches made by each batching plant, and at least one sample shall be taken each day that concrete of a particular grade is made.

3) In addition to the above requirements, at least one sample shall be taken from each individual structural unit, or part of a unit, when the latter is the product of a single pour.

4) From each sample three cubes shall be made for testing at 28 days and one for testing at 7 days for control purposes.

5) The 28-day results shall be the mean of the three cubes.

6) The frequency of sampling may be required to be varied.

7) The procedures shall be repeated when materials or design mixes are changed.

C) SAMPLING: FLEXURAL STRENGTH

1) A sample of mass concrete for paving shall be taken at random on eight separate occasions during each of the first five days of using a mix and tested for flexural strength. The standard deviation shall be calculated from at least 40 individual results each representing separate batches of similar concrete produced by the same plant under the same supervision. The current margin for the plant shall be thus established as 1.64 times the standard deviation.

2) Thereafter one sample shall be taken at random for each class of concrete from every group of 25 batches made by each batching plant, and at least one sample shall be taken each day that concrete of a particular grade is made.

3) In addition to the above requirements, at least one sample shall be taken from each individual structural unit, or part of a unit, when the latter is the product of a single pour.

4) From each sample three specimens shall be made for testing at 28 days and one for testing at 7 days for control purposes. The 28 day result shall be the mean of the three specimens.

5) The frequency of sampling may be required to be varied.

6) The procedures shall be repeated when materials or design mixes are changed.

D) STRENGTH RESULTS

1) The results will be unacceptable if:
   a) The average strength determined from any four consecutive test results does not exceed the specified characteristic strength by 0.5 times the current margin, or
   b) One or more results in any forty consecutives are less than 85% of the specified characteristic strength, or
   c) Three or more results in any forty consecutives are less than the specified characteristic strength.

2) One or more of the following actions will then be instructed:
   a) Changing the mix.
   b) Improving quality control.
   c) Cutting and testing specimens from placed concrete.
   d) Load – testing relevant structural units.
   e) Non – destructive testing of placed concrete.
   f) Cutting – out and replacing defective concrete.

3) If the range of individual strengths of specimens made from the same sample exceeds 15% of the mean, then the method of making, curing and testing specimens shall be checked. In the event of the range exceeding 20% the KCT Engineer will order one or more of the actions outlined in (a) to (f) above.

4) In the event of (c) the Sub-Contractor shall cut specimens from approved locations.

5) Cores shall be tested in accordance with BS 1881 as modified by Concrete Society Report TR 11 including Addendum (1987). The values shall be reduced by 0. 69 N/mm2 per week of age in excess of 28 days.

E) OTHER TESTS

1) Durability test as per the Clause 08.1 (I, j k and l) shall be repeated for each class of concrete for every accumulative quantity of 1500 m3 of concrete with a maximum of one test per day by each batching plant.

2) The air content of air-entrained concrete shall be determined to BS 1881: Part 106 for each batch produced until consistency has been achieved, when fewer batches may be tested.

3) Compaction factor, slump, Vebe or other workability tests shall be carried out at the site of the pour on each truck load of concrete delivered. The workability shall be as for the trial mixes; permitted tolerances shall be in accordance with BS 8500-1.

4) Random monitoring of the plastic density of the concrete shall be carried out weekly, using a calibrated container.

8.10.4. BATCHING

A) MACHINERY

1) Batching shall be by weigh-batching machines equipped with accuracy checks for the weighing mechanism. The machines shall be cleaned, checked and adjusted regularly as approved.

2) The water supply to the concrete mixers shall have a metering system to control and record the amount.

B) ACCURACY OF BATCHING

3) Batched materials shall be measured out within the tolerances in Table 8 and discharged into the mixer without loss:

Table 8 - Batched materials measuring tolerances

Cement	± 2% of the weight of the cement in the batch
Aggregate	± 2% of the weight of each aggregate in the batch
Water	± 2% of the weight of water added to the batch
Admixture	5% of the amount to be added to the batch

2) The batched quantities shall be adjusted to compensate for variation in the moisture content of the aggregates with the approval of the Superintendent.

C) CALIBRATION OF MEASURING EQUIPMENT

1) Measuring equipment shall be checked and calibrated at the start of preliminary concrete tests and at weekly intervals. The necessary test weights and the like shall be kept available on site.

2) Scales shall be checked over their complete range by a specialist every three months. A calibrated container shall be used to check the accuracy of admixture dispensers once each month. The results of these checks shall be notified.

D) MIXING

1) Concrete shall be mixed in batches in machines which comply with BS 1305.

2) The constituents shall be thoroughly mixed before discharge.

3) The machines shall be capable of discharging while running.

E) READY-MIXED CONCRETE

1) Ready-mixed concrete shall not be used unless approved, and shall comply with the requirements specified herein and those of BS 1926 and the Quality System for Ready Mixed Concrete (QSRMC) Technical Regulation.

2) Ready-mixed concrete, plants and mixer trucks shall be subject to approval.

3) Truck-type concrete mixers shall comply with the requirements of BS 4251.

F) RECORDS

1) Daily returns shall be provided showing the quantities of cement and the total volume batched of each class of concrete for each section of the works and temporary works.

8.10.5. CONTROL OF CHLORIDES AND SULPHATES

A) CHLORIDES IN CONCRETE

1) The total estimated chloride ion content as a percentage by weight of the cement in the mix shall not exceed the following limits:

2) For reinforced concrete:
   a) 0.20% if made with cements other than SRPC;
   b) 0.1% if made with SRPC.

3) For mass concrete:
   a) 0.50% if made with cements other than SRPC;
   b) 0.12% if made with SRPC.

4) The Concessionaire shall test the constituents of the concrete to establish these contents as provided for elsewhere in this Specification.

5) In addition, regular tests to BS 1881: Part 124 for chloride content shall be made on the hardened concrete. The following values are acceptable:

a) For reinforced concrete made with cements other than SRPC:
95% of the test results less than 0.20% Cl by weight of cement and no result greater than 0.25% Cl by weight of cement.
b) For reinforced concrete made with SRPC: 95% of the test results less than 0.1% Cl by weight of cement and no result greater than 0.13%.
c) For mass concrete made with cements other than SRPC: 95% of the test results less than 0.5% Cl by weight of cement, and no result greater than 0.65% Cl by weight of cement.
d) For mass concrete made with SRPC: 95% of the test results less than 0.12% Cl by weight of cement and no result greater than 0.15% Cl by weight of cement.

6) All of the above limits shall apply in addition to the limits for individual ingredients of the mix given elsewhere in this specification.

B) SULPHATES IN CONCRETE

1) The total estimated sulphate content (SO3) of the mix calculated from the ingredients including that present in the cement shall not exceed 3.7% by weight of cement in the mix.

2) In addition, regular tests to BS 1881 Part 124 shall be made on the hardened concrete to determine the total sulphate content, which shall not exceed 4% by weight of cement in the mix.

3) The above limits shall apply in addition to the limits for individual ingredients of the mix given elsewhere in this specification.

C) PERMISSIBLE LEVEL OF CHLORIDES AND SULPHATES

1) The permissible level of chlorides and sulphates quoted in the above clauses shall not be considered as mean values for the whole of the Works, but shall apply to any concrete.

8.10.6. PLACING

A) PLACING GENERAL

1) Concrete shall be placed in the position and sequence indicated on the Drawings, or as directed.

2) Placing shall not be commenced until the fixing and condition of reinforcement and items to be embedded and the condition of the containing surfaces or formwork has been approved.

3) 24 hours notification shall be given of the intention to place concrete.

4) Concrete shall be transported by means which prevent contamination (by dust, rain etc.) segregation or loss of ingredients, and shall be transported and placed without delay.

5) 5) Where the time to compacting the concrete in its final position is likely to be greater than 1 hour after introduction of cement to the mix, retarding admixtures shall be used. Retarding admixtures shall be chloride free and shall only be used with prior approval of the Superintendent. Dosage rates of admixtures shall be determined following trial mixes, and consider transit time and ambient temperature.

6) The Sub-Contractor shall take all necessary measures to prevent cracking in concrete especially due to autogenous, plastic shrinkage, thermal cracking, etc. These measures shall include avoiding placing concrete under environmental conditions when plastics shrinkage is likely to occur.

7) Concrete shall be placed directly in its final position without segregation or displacement of the reinforcement, embedded items and formwork. Concrete shall not be placed in water, except as specified.

8) Peak temperature of the concrete during hydration should not exceed 70ºC.

B) EXTENT OF POURS

1) The limit of individual pours and the height of lifts shall be as approved.

2) For walls, the length of panel placed at one time shall not exceed 6m; adjacent panels shall not be placed within 2 days, but shall be placed as soon as practicable thereafter. Subsequent vertical lifts shall not be poured within 2 days.

3) Floors, roofs and ground slabs shall be placed in an approved sequence of panels. 'Chequerboard' placing shall be avoided. Adjacent panels shall not be placed within 2 days, but shall be placed as soon as practicable thereafter. Panels shall not exceed 25m2.

4) If the use of slip-forms or paving trains is permitted, these limits will be revised.

5) The sequence of pours shall be arranged to minimize thermal and shrinkage strains.

C) PLACING EQUIPMENT

1) Concrete shall generally be placed without segregation by pumping or bottom-opening skips. If chutes are used their slopes shall not cause segregation and spouts or baffles shall be provided.

D) TIME FOR PLACING

1) Concrete and mortar must be placed and compacted within 45 minutes of water being added to the mix or otherwise included via damp aggregates, unless admixtures are in use. Partially-set concrete shall not be used in the works.

E) COMPACTION

1) Concrete shall be compacted during placing by approved internal vibrators.

2) 2) The vibrators shall operate at a frequency of not less than 10,000 cycles per minute, and shall be designed for continuous operation.

3) The performance of vibrators shall suit the working conditions, and they shall generally not be less than 75mm diameter.

4) The radius of influence shall ensure that the mass under treatment is compacted at a speed commensurate with the rate of supply of concrete.

F) VIBRATORS

1) Vibrators shall penetrate the full depth of the layer of concrete placed and just into the layer below, and be withdrawn slowly to avoid the formation of voids.

2) Vibration shall not to be applied directly or indirectly to concrete after the initial set has taken place, nor shall it be used to make concrete flow in formwork.

G) CONTINUITY OF PLACING

1) Placing in each section of work shall be continuous between construction joints. The Sub-Contractor shall make provision for standby equipment.

2) If the placing of concrete is delayed due to breakdown, then the Sub- Contractor shall erect vertical stop-ends and form a construction joint or remove the concrete already placed and restart after repair of the breakdown, as directed.

H) PLACING IN INCLEMENT WEATHER

1) Placing shall not take place in the open during storms or heavy rains. If such conditions are likely to occur the Sub-Contractor shall provide protection for the materials, plant and formwork so that work may proceed. If strong winds are prevalent protection from driving rain and dust shall be provided.

I) PLACING IN HIGH TEMPERATURE

1) The temperature of concrete shall not exceed 30°C at the time of placing and the temperature differential shall not exceed 25ºC for concrete containing carbonates aggregates or 20ºC for concretes containing siliceous aggregates.

2) Temperature differential is defined as the difference in temperature between the form or face of a concrete pour and the center of the pour, or at a distance of 1.5m, whichever is the shortest).

3) Recommendations for Hot Weather Concreting' in the 1991 edition of ACI 305 shall be complied with. The following measures inter alia may be required to control the placing temperature:
   a) Shade aggregate, cement silos, water tanks and concrete plant
   b) Paint concrete plant white
   c) Run concrete plant with flake ice before mixing or transporting concrete
   d) Use chillers to cool the mixing water
   e) Add flake ice as a proportion of the mixing water
   f) Place concrete at night
   g) Use of liquid nitrogen

4) The Sub-Contractor shall supply suitable maximum/minimum thermometers and record the shade and sun temperatures at locations where concrete is being placed. In addition, the Sub-Contractor shall also record wind speed and relative humidity at the place of concreting.

5) Concreting shall not be permitted where the rate of evaporation exceeds 1.0kg/m^2/hr.

J) CONTROL OF THERMAL CRACKING IN LARGE POURS

1) For large pours, i.e. where the thickness of the concrete element exceeds 600mm, the Sub-Contractor shall adopt special precautions, to avoid thermal cracking due to temperature differential.

2) In no case shall this temperature differential exceed 25ºC for concrete containing carbonate aggregates or 20ºC for concretes containing siliceous aggregates.

3) The difference in the mean temperature between the hardening concrete and adjacent hardened concrete, which will restrain the movement of the hardening concrete, should not exceed 12ºC unless specifically approved on the basis of the Sub-Contractor's detailed documentation. Peak temperature of the concrete during hydration should not exceed 70ºC.

4) The Concessionaire shall submit a detailed method statement to the Superintendent, for approval, defining his proposed arrangement to avoid the effects of thermal cracking and temperature differential. The method statement shall include but not be limited to, the size and sequence of pours, additional curing regime, concrete temperature- monitoring system of pours, formwork type and removal time, and calculations for temperature and strain development at internal and surface locations, taking into account heat of hydration, ambient radiation and temperature, and physical restraints.

5) In case early age cracks are observed, the Concessionaire shall replace/remediate the defects to the satisfaction of the Superintendent.

K) PLACING AT NIGHT

1) If approval has been given for placing at night or in dark interiors, adequate lighting shall be provided where mixing, transportation and placing are in progress.

L) PLACING UNDER WATER

1) Underwater concrete shall be placed with minimum disturbance of the water. Running water and wave wash shall be controlled. The specified concrete grade shall be used and the mix design shall provide for good flowing ability. Tremie pipes, bottom-dump skips or other approved placing equipment shall be used. Segregation shall be avoided.

2) Placing shall be commenced in approved sections and continued to completion.

3) The tremie pipe shall be buried in the concrete and the pipe must not be emptied until the pour is complete. If a bottom-dump skip is used, the contents shall be covered by canvas or similar before lowering into the water. The doors shall be opened when the skip is resting on the bottom with no tension in the support cable, and the skip shall be lifted gradually so that the concrete flows out steadily.

M) Preparation before Placing

1) Before placing concrete for reinforced work on the ground, the formation shall be compacted as specified and a screed of blinding concrete shall be applied to form a surface for construction.

2) Before placing concrete on or against rock, masonry, brickwork or old concrete, loose material shall be removed and the surface washed down; water seepage shall be stopped or channeled away from the work.

3) For mass concrete placed against masonry or brickwork the following shall apply:
   a) The mortar joints in the face work shall have fully hardened.
   b) The surface shall be soaked prior to placing.
   c) The concrete shall be worked around ties and bond stones and into open joints.

8.10.7. FORMWORK

A) FORMWORK GENERAL

1) The Concessionaire shall obtain approval of the methods and materials proposed. Details of formwork for special finishes shall be approved before materials are ordered. Formwork shall provide concrete of the shape, lines and dimensions shown on the Drawings.

2) Formwork shall be constructed from materials of sufficient strength, supported to provide rigidity during placing and compacting concrete without discernible deflection and shall be removable without disturbing the concrete. Internal ties shall be metal. Removable ties shall be located so that the specified cover to reinforcement is maintained to all surfaces including that of the tie-holes. If ties are left in the cover shall be as specified for the reinforcement or as approved. Tie cavities shall be roughened and filled with approved non-shrink concrete or epoxy mortar.

3) Formwork panels shall have true edges for accurate alignment and shall be fixed with either vertical or horizontal joints. Where chamfers are required the fillets shall be cut to provide an even line. Joints shall not permit leakage of grout, nor steps and ridges in exposed surfaces.

B) ROUGH FORMWORK

1) Rough formwork shall be butt-jointed, seasoned, sawn timber.

C) FINE FINISH FORMWORK

1) Fine finish formwork shall be used for all concrete surfaces unless detailed otherwise on the Drawings. This finish shall be obtained from forms designed to produce a hard smooth surface with true, clean arises.

D) PREPARATION OF FORMWORK FOR CONCRETING

1) Formwork and supports shall be cleaned; temporary openings shall be provided for the removal of rubbish.
   The formwork shall be coated with an approved release agent and the excess removed. Release agent shall not be allowed to come into contact with concrete already placed or with reinforcement.

2) Not less than 4 working hours' notice shall be given for the inspection and approval of the formwork and reinforcement, prior to which concrete shall not be placed.

E) REMOVAL OF FORMWORK

1) Formwork shall be removed without damage to the concrete, but not until the concrete has sufficient strength to support itself.
   Centers and props may be removed when the member has sufficient strength to carry itself and any loading. External loading shall not be applied until the concrete has reached the 28 days CCS.

2) Table 9 is a guide to the minimum periods between placing and the removal of formwork for concrete made with PC, MSRPC and SRPC:

Table 9 - Minimum periods between placing and removal of formwork

Vertical sides of beams, walls, Columns		
lift not exceeding 1.2m	12 hours	but see Curing and protection Clause
lift exceeding 1.2m	36 hours	
Soffits of main slabs and beams Props left under	5 days	
Beams and main slabs Removal of props	18 days	
Vertical sides of beams, walls, Columns		
lift not exceeding 1.2m	12 hours	but see Curing and protection Clause
lift exceeding 1.2m	36 hours	
Soffits of main slabs and beams Props left under	5 days	
Beams and main slabs Removal of props	18 days	

3) For mixes containing other types of cement the formwork striking times shall be determined in accordance with CIRIA Report No 136
Formwork striking times - Criteria prediction and methods of assessment.

4) After removal remedial work shall not be undertaken until the concrete has been inspected and approved.

F) PERMANENT FORMWORK

1) Permanent formers of GRP pipe are to be used where indicated on the Drawings. The minimum wall thickness of the GRP shall be 5mm.

8.10.8. REINFORCEMENT

A) REINFORCEMENT GENERAL

1) Steel rod reinforcement shall be cut, bent and fixed to BS 8110: Part 1 / B.S. 8666.

2) Cutting or bending by the application of heat is not permitted.

3) 3) Welding of reinforcement shall only be permitted when approved in writing by the Superintendent. If such approval is given then the workmanship shall be in accordance with BS EN 1011.

The Concessionaire shall submit full technical details of his proposed procedures prior to seeking approval.

B) FIXING

1) The number, size, form and position of pieces of reinforcement shall be as shown on the Drawings. They shall be held in position in the formwork during the placing of concrete by use of distance pieces and spacer bars.

2) Links shall be taut so that bars are braced and the inside of their curved parts shall be in contact with the bars being connected. Tying wire shall be twisted tight with pliers and the free ends shall be bent inwards.

3) Reinforcement shall be grit-blasted before use to remove rust, oil, grease, salt and other deleterious matter, and where pitting has occurred the causes and products thereof. Repeated blasting may be required when the reinforcement is in position, or partially cast in. Partially-set concrete adhering to exposed bars during concreting operations shall be removed.

4) The use of mechanical couplers of any type or form shall only be as detailed on the Drawings or as instructed by the Superintendent. Couplers shall conform to the requirements in BS 5400.

5) Reinforcement temporarily projecting from the concrete at joints shall not be bent out of position without approval, in which event the reinforcement shall be bent over a suitably sized former to prevent any damage or over-stressing.

C) BENDING SCHEDULES

1) The Concessionaire will be supplied with drawings detailing the reinforcement required and shall prepare for approval bending schedules in accordance with BS 4466/BS 8666. Laps and anchorages shall be 45 bar diameters in length unless detailed otherwise.

D) WELDING

1) Electric arc welding may be used, if approved, for joining bars. Covered-alloy or shielded-arc electrodes shall conform to BS EN 499.

2) Workmanship shall be to BS 5135.

   Joints shall be butt-welded with standard double-V or double-U welds.

E) COVER TO REINFORCEMENT

1) The location of reinforcement and nominal dimensions of concrete cover shall be as shown on the Drawings.

2) Tolerance for the concrete cover shall be ±5 mm for superstructure. However, reinforcement for substructure shall be placed within a tolerance of plus 10mm (towards increasing the concrete cover) and minus 5mm (towards reducing the concrete cover). The achievement of cover shall be confirmed by checking by cover meter after concreting.

3) Nominal cover shall be measured to the reinforcement nearest to the concrete face concerned.

4) Only approved spacers may be used in permanent works. Before spacers are approved for use in the works, their capability to securely hold the reinforcement in position during

concreting without detriment to concrete placement, compaction or durability shall be fully demonstrated.

5) Concrete spacers shall be of similar concrete grade and durability to the parent concrete and shall have non-metallic ties. The spacers shall comply with the specified requirements for water absorption. The materials and installation or spacer shall comply in accordance with BS 7973 Part 1 & 2:2001.

6) Plastic spacer shall be allowed for piles only subject to the approval of Superintendent.

8.10.9. JOINTS

A) CONSTRUCTION JOINTS

1) Construction joints shall be located and the sequence of placing arranged as approved, or as shown on the Drawings, to minimize shrinkage and thermal strains in the concrete.

2) Concrete placing shall not be interrupted except where joints occur, and shall continue after normal hours if necessary to achieve this.

3) Joints shall be formed square to the work with keyways included.

4) Horizontal joints shall be generally at least 500mm above ground level if Design Sulphate Classes DS-4, DS-4m, DS-5 or DS-5m of BRE Special Digest 1, Part 1, Table 2 apply, and 500mm above high-water level in marine locations, or as shown on the Drawings.

5) Upon removal of the formwork the joint face shall be inspected, and if the soundness of the concrete is not approved the Sub-Contractor shall investigate and remedy defects.

6) Before placing is resumed at a joint the set surface shall be roughened to remove laitance and expose the aggregate; the concrete shall have gained sufficient strength to ensure that aggregate is not in any way damaged or loosened within the matrix.

7) If damaging materials have come into contact with the surface of the joint the concrete shall be cut back and the roughened surface cleaned by compressed air or water jets and brushed and watered immediately before placing.

8) Chemical surface-retarders shall not be used.

9) Construction joints shall be sealed with an approved sealant on debonding tape at external and liquid-contact faces.

10) Construction joints in water-retaining structures shall incorporate an approved waterbar and construction joint details shall be submitted to the Superintendent for approval.

B) DESIGN JOINTS

1) Expansion and contraction joints shall be as shown on the Drawings.

2) A contraction joint in a non-water-retaining structure shall form a plane of discontinuity in the member. The concrete face first cast shall be painted with two coats of approved rubberized bitumen paint before the adjacent concrete is placed. The adjacent concrete

shall include a groove against the joint for sealant. The exposed edges shall be sealed with an approved sealant on debonding tape.

3) If a contraction joint is likely to be contaminated, the joint shall be sealed immediately with an approved free-flowing sealing fluid as soon as the formwork has been removed.

4) An expansion joint in a non-water-retaining structure shall be formed as for a contraction joint, but non-absorbent closed-cell polyethylene joint filler shall be included so that the adjacent concrete members can expand.

5) A design joint in a water-retaining structure shall include a continuous waterstop strip of copper, rubber, rubber and steel or PVC fixed across the joint as shown on the Drawings. The concrete shall be free from honeycombing and worked against the embedded part of the strip. Projecting portions of the strip shall be protected from damage during operations and, in the case of rubber and plastic, from light and heat.

6) Bituminous paint shall be applied to the lips of the loop of copper water stop and the loop filled with bituminous compound before embedding in the concrete.

7) The method of joining water stops shall be in accordance with the manufacturer's instructions.

8.10.10. CURING AND PROTECTION

A) Curing and Protection

1) Concrete shall be protected from sunshine and drying winds by approved shading and wind breaks, and from cold, rain or running water, for a period of 14 days after placing. Additional measures for protection and curing must be taken while using concrete containing GGBS / Fly ash or Micro silica. During this period the following measures shall be taken to prevent the loss of moisture and to minimize thermal stresses caused by the difference in temperature between the surface of the concrete and the core of the concrete mass:

2) Horizontal surfaces:
   a) Polythene sheeting shall be placed immediately after finishing.
   b) After final set has taken place, the polythene shall be replaced by wet hessian covered with polythene; the hessian shall be kept permanently damp.
   c) After 14 days the hessian and polythene shall be removed and an approved aluminized or white resin-based curing compound applied. The rate of application shall be as recommended by the manufacturer.
   d) Alternative methods of curing must be approved before use where special finishes are required.

3) Vertical surfaces:
   a) Polythene over wet hessian shall be secured to the surfaces immediately after removal of the formwork. The hessian shall be kept permanently damp.
   b) After 14 days the hessian and polythene shall be removed and an approved aluminized or white resin-based curing compound applied.

4) Water used during curing operations shall be fresh water. Curing membranes shall be compatible with waterproofing or other materials that may subsequently be applied to the surface of the concrete.

5) In case of using approved curing compound, products with at least 90% efficiency shall be applied. The rate of application shall be as per the manufacturer's recommendations. Application of curing compound shall be allowed only after 7 days of wet curing.

B) CONTAMINATION

1) Concrete shall be protected from contamination by sea or brackish water, oil, fuel and other deleterious materials for a minimum period of 30 days after placing.

C) INSULATING FORMWORK

1) Insulating formwork shall be left in place for 72 hours after placing or until the temperature peak of the concrete is reached. The initial curing period in (B)(1) above may then be reduced in proportion.

D) PROTECTION OF JOINTS

1) Rebates formed to receive sealant and the surfaces of construction joints shall be protected from curing compound by wet hessian to ensure proper curing of the joint surface and adjacent concrete. The protection shall remain in place until the joint surface is sealed.

8.10.11. FINISHES

A) FINISHES GENERAL

1) The finished faces of concrete shall be sound, even colored, even- textured and free from defects. Arises shall have a 20 x 20mm chamfer unless detailed otherwise on the Drawings. A fine finish shall be provided unless detailed otherwise on the Drawings.

B) CONCRETE SURFACES WITHOUT FORMWORK

1) On upward-facing surfaces which do not require formwork or special finish the finish shall be produced by proper placing and compacting operations alone.

2) For a fair finish screening shall be used, carried out by sliding and tamping a screed board running on the top edges of the formwork, or on screening guides, to give a dense concrete skin.

3) For a fine finish screening shall be used as described, then left until the concrete has stiffened and the film of moisture has disappeared. A steel or wooden float shall then be used for a glossy or sandpaper surface as required. Working shall be the minimum compatible with a good finish. The surface shall be protected from waterdrops.

C) WIRE-BRUSHED FINISH

1) After removal of the formwork the surface of the concrete shall be abraded by stiff wire brushes and water to remove the cement laitance and expose the aggregate.

D) BUSH-HAMMERED FINISH

1) The surface shall be abraded by carborundum stones to remove irregularities.

2) Within 3 weeks, the surface shall be bush hammered to remove the cement laitance and expose the aggregate. Approved bush hammers shall be worked to within 12mm of corners and arises; the remaining 12mm shall be hand-chiseled to match.

3) Bush hammers shall be operated perpendicularly to the surface, and the remaining exposed aggregates shall not be loose or fractured.

4) The treated surface shall be washed with water and stiffly brushed. The exposed aggregate shall be clean and free from film.

E) CHEMICAL RETARDERS

1) Chemical surface retarders, if approved, may be used to produce an exposed aggregate finish, and the Sub-Contractor shall demonstrate that the durability of the concrete surface is not reduced.

F) CARBORUNDUM FINISH

1) Carborundum finish shall be achieved by sprinkling carborundum grit on the unset surface and working-in by wooden float.

2) The grit shall vary in size between BS 1.18mm mesh and BS 0.60mm mesh and shall be distributed from a BS 1.18mm hand-screen at the rate of 2.15kg per m^2.

G) SPECIMEN PANELS OF CONCRETE

1) The Sub-Contractor shall produce specimen panels of finished concrete for approval. The approved panels shall be retained by the Superintendent and used to determine the acceptability of concrete finishes in the Works.

8.10.12. SPECIAL CONCRETE

A) PRECAST CONCRETE

1) The Sub-Contractor shall submit for approval details of arrangements for casting, handling and placing precast units.

2) The Sub-Contractor shall cast sample panels for approval, and approved panels shall be retained on site as the control standard for subsequent panel production.

3) Precast concrete units shall be cast on manufactured beds. The beds shall not be liable to settlement and shall have smooth, hard and level surfaces. Each unit shall be marked with a serial number and date of casting. Steel bars shall not be embedded in the concrete for lifting.

4) Units shall not be removed from the beds until the representative flexure-test beams reach adequate strength for handling and shall not be placed until the cubes representing them reach the appropriate 28- day Characteristic Strength.

B) NO-FINES CONCRETE

1) The aggregate for no-fines concrete shall be coarse graded from 10mm to 20mm. A small percentage of fines from 10mm to 5mm may be added to improve the strength if approved. Cement shall be mixed with the aggregate in the proportion of 1 to 8 by volume. Segregation of the cement grout shall be prevented.

C) GRANOLITHIC CONCRETE

1) Granolithic concrete shall consist of one part by weight cement to three parts of combined coarse and fine aggregate. The combined aggregate grading shall be as in Table 10:

Table 10 - Combined aggregate grading for granolithic concrete

BS sieve	Percentage passing
14 mm	100
10 mm	95 - 100
5 mm	30 - 45
2.36 mm	30 - 35
1.18 mm	15 - 25
0.60 mm	10 - 20
0.30 mm	5 - 10
0.15 mm	0 - 5

2) Granolithic concrete shall be laid on top of the unset base concrete, and compacted and worked to the correct levels. The surface shall be floated with a steel float after hardening until water sheen has disappeared. Cement or cement-sand shall not be sprinkled onto the surface. The layer shall be 12 to 18mm thick.

3) If a granolithic layer is required to be placed on set concrete, the latter shall be scrabbled and cleaned to expose the aggregate, and an approved bonding agent applied. The layer shall not be less than 50mm thick.

4) If required, compounds shall be added or applied to give a concrete with improved dust proof and oil-proof qualities. The compounds shall be used in accordance with the manufacturer's instructions.

5) Granolithic concrete paving shall be placed in panels not exceeding $3m^2$. Approved contraction joints shall be provided around the perimeter of each panel.

D) CEMENT-MORTAR, GROUT AND RENDERING

1) Cement-mortar shall consist of one part cement and four parts fine sand by volume with just enough water to achieve workability.

2) Grout shall consist of cement mixed with water in approved proportions. Fine sand may be included in approved quantities.

3) Rendering shall consist of three parts fine, sharp sand to one part cement applied in two 10mm coats and one 5mm finishing coat. The color of the finishing coat shall be as approved.

4) Acid-resistant epoxy mortar shall be obtained from an approved manufacturer and shall be applied in accordance with the manufacturer's instructions.

5) Mortar, render and grout shall be used freshly mixed.

8.10.13. PROTECTIVE COATINGS

A) EXTERNAL SHEET TANKING MEMBRANE

1) External sheet tanking membrane to concrete substructures shall be an impervious, cold applied flexible laminated sheet, consisting of multi - layer high density cross laminated polyethylene film with a backing of self-adhesive rubber bitumen compound to give a combined thickness of 1.5mm and protected with silicone coated release paper.

2) The mass of the membrane shall be not less than 1.6 kg/m2 gross.

3) A special grade of compound formulated for hot climates shall be used, which has in excess of 10 years of successful usage in the Middle East.

4) The laminate shall withstand cracking of the substrate up to a crack width of 0.6mm.

Minimum test performance data shall be as follows:

Table 11 – Minimum test performance protective coating.

Property	Test Method	Results
Tape Strength	ASTM D638	Long 4.2 N/mm Trans 4.8N/mm
Tensile Strength	ASTM D638	Long 42 N/mm^2 Trans 48N/mm^2
Elongation Film	ASTM D638	Long 210 % Trans 160%
Tear Resistance	ASTM D1004	Long 270N/mm Trans 270N/mm
Adhesion to Primed Concrete	ASTM D1000	1.8 N/mm
Adhesion to Self	ASTM D1000	1.8 N/mm
Puncture Resistance	ASTM E154	290N 65mm
Water Resistance	ASTM D570	----
	After 24 hours	0.14%
	After 35 days	0.95%
Environmental Resistance	ASTM D543	Conforms
Moisture Vapor Transmission Rate	ASTM E96	<0.3g/m^2/24 hrs
Adhesive Softening Point	ASTM D36	Not lower than 103°C
Adhesion to Primed Concrete	ASTM D1000	1.8 N/mm
Adhesion to Self	ASTM D1000	1.8 N/mm

5) Generally, for floor slabs, the membrane shall be applied to the blinding concrete. The protective layer of concrete or screed shall be placed to extend 200mm outside the lines of the floor slab.

6) For vertical faces the dry surfaces shall be cleaned and primed.

7) A fillet 25 x 25mm of bitumen putty shall be formed at the corner between the wall and the protruding membrane covered blinding layer.
8) The membrane shall be backed to the wall, brought down over the fillet, and extended over the protruding margin of the bottom membrane to form a watertight seal.

9) A layer of concrete or mortar shall be placed over the jointed section. Minimum 150mm overlaps shall be provided at joints.

10) Sheet tanking membrane shall be Bituthene 1000X HC, or equal and approved.

11) Prior to the application of the membrane to vertical surfaces, the concrete shall be primed with one brush coat of compatible primer specially formulated for hot climates containing 50% aromatic hydrocarbon solvents and 50% bitumen solids, giving an average coverage of approximately 10 to 12m^2 per liter, dependent on texture and porosity of concrete surface. The primer shall be compatible with the waterproofing, recommended by the waterproofing manufacturer, and specially formulated for hot climates.

12) Cold applied rubber/bitumen mastic compound, or bitumen putty for trowel application shall be used for molding into fillets and collars. Tapes shall be used for sealing around pipes and irregularities. The grade of materials shall be formulated for hot climates.

13) Waterproofing membrane shall be protected from mechanical damage by a bitumen-impregnated board of minimum thickness 3.0mm. The board shall be weather, water and rot-proof. The board shall be nearly cut to closely abut at joints which shall be continuously taped with 75mm wide strips of heavy duty self-adhesive tape.

14) The membrane shall extend to 75mm below finished ground level where it shall be tucked into a 20 x 20mm continuous rebate, secured by tanalised hardwood battens fixed at 300mm centers by shot-fired masonry nails, and pointed with approved sealant.

15) Above membrane tuck-in level, the vertical edges of concrete structures shall be coated to 200mm above finished ground level, or other level as detailed on the Drawings, with an approved pitch extended epoxy resin coating to a minimum thickness of 250 microns.

<u>B) EXTERNAL BRUSH APPLIED TANKING MEMBRANE</u>

1) Substructures shall be protected externally, where required, with a two-coat brush-applied tanking membrane applied to the top of blinding concrete and to the outside surfaces of all buried concrete.
2) Coatings shall be solvent-based bituminous compounds complying with the UK Building, Research Station recommendations for damp-proof membranes, Digest No 54, Series 2.

3) In addition, the first coat shall comply with BS 3416 Types 1 and 2.

4) The second coat shall incorporate non-asbestos fiber reinforcement and shall be applied to a minimum thickness of 1.5mm.

5) The surfaces shall be cleaned and brought to a fine finish before coating. Each coat shall be applied at the rate specified by the manufacturer.

6) Coating shall be protected by protective board during backfilling.

8.10.14. TOLERANCES

A) TOLERANCES OF CONCRETE SURFACES

1) The tolerances of concrete surfaces shall be in accordance with the following:
   a) Foundations and other in – situ buried concrete: BS 5606
   b) Exposed concrete: BS 5606
   c) Floor slabs to receive self-levelling floor compound: ± 8mm
   d) Floor slabs with concrete wearing surface: BS 8204 : Part 2, Class SR1 with level tolerance of ± 8mm

8.10.15. CONCRETE SURFACE TREATMENT

A) ABOVE GROUND CONCRETE COATINGS – GENERAL

1) All exposed surfaces of reinforced concrete elements shall be protected by a water repellent, chloride resistant coating. Coatings for specific applications are to be as shown on the drawings. All other surfaces shall receive the protective and decorative coating specified in related clause.

2) All concrete coatings shall be supplied by an approved manufacturer with technical representation in the Republic of Lebanon, and a track record of product applications in the Republic of Lebanon. All materials shall have a proven 10 years satisfactory performance in climatic conditions similar to the Republic of Lebanon.

   The complete coating system including primers shall be applied in accordance with Manufacturer's instructions.

3) Coatings shall be applied by a specialist applicator approved by the Manufacturer and the KCT Engineer, and shall have at least 5 years proven successful experience.

4) A method statement for application shall be submitted giving full details of all equipment and application methods proposed and safe access provisions. The method shall include wet and dry film thickness tests, pull off tests and any other quality control tests appropriate to the coating performance.

5) Sample Panels of each coating type shall be prepared, before approval of material and applicator, on L shaped panels comprising vertical and horizontal surfaces of at least 1 sqm each.

6) Full records of areas coated, quantity of material applied, ambient and substrate temperature, and humidity shall be kept on a daily basis and submitted to the KCT Engineer.

B) SURFACE PREPARATION

1) Surfaces shall be lightly grit blasted to remove all contamination such as oil, grease, loose particles, decayed matter, laitance, mold release oils and curing compounds.

2) Any surface defects and blow holes shall be filled to produce a fine finish using a proprietary product such as an acrylic modified cementitious repair fairing coat (or mortar for larger defects). The repaired shall be completed at least 48 hours before application of coatings.

C) COATING FOR GENERAL EXPOSURE

1) Unless a particular finish is specified on the drawings, all exposed concrete surfaces shall be coated with the following system.

2) The coating system shall comprise a penetrating silane-siloxane primer and subsequent pigmented coating of minimum total thickness 150 microns DFT applied in two coats.

3) Minimum test performance for the complete coating system shall be:

Table 12 – Minimum test performance coating system

Carbon dioxide diffusion resistances (Taywood method). Equivalent thickness of air: Initial: 2000 hours QUV weathered	More than 140m 100m
Reduction in chloride ion penetration (diffusion cell method)	More than 98%
Able to bridge crack of at least	0.3mm
Water vapor transmission (SD) Taywood method, of not more than	1.0m
Fire Testing to BS 476 Pt 7 1987 Spread of Flame:	Class 1

4) The coating shall be UV resistant, resistant to alkalis and water, and available as standard in a range of pale colors including white, grey, beige, green and blue.

D) SILANE

1) Exposed concrete surfaces shall be given two coats of silane protective treatment applied according to the manufacturer's instructions.

2) The silane material shall comply with United Kingdom Highway Agency BD43/90.

8.10.16. LIST OF TEST REQUIREMENT

TESTS FOR CEMENTITIOUS MATERIALS, AGGREGATE, WATER AND STEEL

Table 13 - Tests for cementitious materials, aggregate, water and steel

Sr	Particular	Test	Applicable Standard	Limit (s)	Minimum Frequency
A	Cement	Test for compliance with appropriate standard indicated in PART 2 including the following specific requirements:			
		Alkali level	BS EN196	Max 0.6%	Each source change in material*
		Heat of hydration	BS 4550 : Part 3	315kJ/kg @ 7 days	Each source change in material*
		Specific surface fineness	BSEN 196: Part 6: 1992	Shall not be greater than 350m^2/kg & not less than 225m^2/kg	Each source change in material*
		C3A content (tri-calcium aluminates content)	BSEN 196: Part2:1995	OPC- 4-13% SRC- 3.5%	Each source change in material*
		Chloride content	BSEN 196-21	Max 0.05%	Each source change in material*
		Early strength Standard Strength	BSEN 196-1	As per BS EN197	Each source change in material*
		Initial setting time	BS EN 196-3	As per BS EN197	Each source change in material*
		Soundness (expansion)	BS EN 196-3	As per BS EN197	Each source change in material*
		Loss of ignition	BS EN 196-2	As per BS EN197	Each source change in material*
		Insoluble residue	BS EN 196-2	As per BS EN197	Each source change in material*
		Sulphate content	BS EN 196-2	3.0% by mass	Each source change in material*
		Pozzolanity	BS EN 196-5	As per BS EN197	Each source change in material*
B	GGBS (Slag)	Testing to confirm compliance with requirements of BS 6699			Each source change in material*
C	PFA (Fly ash)	Testing to confirm compliance with requirements of BS EN 450			Each source change in material*
D	Micro Silica (Silica Fume)	Testing to confirm compliance with requirements of EN 13263 / ASTM C1240-95 / NS 3045			Each source change in material*

*After acquiring approval for each source from the Superintendent each consignment of cement and other cementitious materials shall be accompanied by a compliance certificate from the manufacturer. Further test as may be required by the Superintendent in case of doubt.

E	Aggregates	Grading	BS 812: 1989 P103, BS EN933-1	Standard	▪1 test per 1000m^3
		Material finer than 0.075mm	BS 812: 1989 P103	3 % Max.	▪1 test per 1000m^3
		Clay lumps and friable particles	ASTM C 142	1% Max.	▪1 test per 4000m^3
		Organic impurities	ASTM C 40	Lighter than std. color	▪1 test per 2000m^3
		Water absorption	ASTM C128:2001/C127:2001	2 % Max	▪1 test per 2000m^3
		Specific gravity	ASTMC128;2001/ C127:2001	2.6 % Max	▪1 test per 2000m^3
		Shell content	BS 812:1995 P106	5 % Max	▪1 test per 2000m3
		Particle shape	BS 812:1990 P105.1, 105.2	30 % max	▪1 test per 2000m^3
		Acid soluble	Qualitative BS812:1988 Part		▪1 test per 1000m^3
		chlorides, Cl	117 Appendices A/B		▪Each 12 concrete day if result is more than 75% of the limit & each month if results are less than 75% of the limit.
			Qualitative BS 812:1988 Part 117 Appendices C, BS 1377-3	0.01-0.03%	
		Acid Soluble Sulphates, SO3	BS 812: 1988 Part 118, BS EN 1744-1	0.3% Max.	▪Per 1000m3 or each 24 concrete days if result is more than 75% of the limit & each 2 mo. If result is less than 75% of the limit whichever is less.
		Soundness, MgSO4 (5 cycles)	ASTM C88:1999A, BS EN1367-2	12 % Max.	▪Each 48 concrete days or 4,000m^3
		Mechanical strength (10% fines or Impact Value)	BS 812 Parts 111,112	Min 100kN /Max 30%	▪Each 72 concrete days or 6,000m^3
		Los Angeles Abrasion	ASTM C131/ C 535	Max 30%	▪Each 72 concrete days or 6,000m3
		Moisture variation in sand-by moisture			▪Twice daily
		Drying shrinkage	BS 812 Part 120	0.05 % Max.	▪At the start of the project and whenever there is a change in the source of supply.

		Potential reactivity: aggregates	ASTM C295, C289	Innocuous	▪At the start of the project and whenever there is a change in the source of supply.
		Cement aggregate combination	ASTM P214 and C227	Max 0.1% (6 month)	
	Water	Max. chloride content	BS EN 1008		▪Each source and once every week for quality testing. ▪At start of the project ▪Change in the source ▪When performing initial test. ▪In case of an increase in the chloride content of the constituents or in case of doubt.
		Prestressed concrete or grout		Max. 500mg/l	
		Concrete with reinforcement or embedded metal		Max. 1000mg/l	
		Concrete without reinforcement or embedded metal		Max. 4,500mg/l	
		Sulphate content	ASTM D512:2002	Max 350ppm	▪At the start of the project. ▪Whenever there is change in the source of supply. ▪When performing initial test.
		Alkali carbonates and bicarbonates	ASTM D 513	Max 500ppm	
		Total dissolved solids	BS 1377: Part3:1990	Max 2000ppm	
		pH	ASTM D1293:1999	min7/max9	
G	Reinforcement	Testing to confirm compliance with requirements of BS4449			

B) TEST ON CONCRETE (INITIAL AND PRODUCTION STAGES)

Table 14 - Test to be carried out on concrete during the initial and production stages

Type of Tests	**Applicable Standard**	**Limit(s)**	**Minimum Frequency**
1.Bleeding	ASTM C232:1999	Max. 0.5%	▪1 test routine representative sample during the trial mix. ▪1 test routine during every production (1st batch or load of each production day).
2.Drying shrinkage and wetting expansion	BS 1881 Part 5/BS 6073 Part 1	Max.0.05%/ Max.0.03%	▪ 1 test routine representative sample during the trial mix only. ▪ as required by Superintendent.
3.Air content	BS EN12350: P7:2000 / ASTM C231	Max 2%	▪1 test routine representative sample during the trial mix. Note: concrete containing entrained air: 1st batch or load of each production day until values stabilize.

4.Free water/cement ratio	Ref. BS EN 206-1:2000 P.30	As per PART 8.2	▪1 test routine representative sample during the trial mix.
5. Workability (slump & concrete temperature, concrete flow tests)	BS 1881 Part 102:1983/ BS 1881-2	As required by Superintendent / BS EN 206	▪ 1 test routine representative sample each during the trial mix. ▪ Every truck load or Batch.
6. Fresh and hardened concrete density	BS 1881 Part 107 & 114:1983	Standard	▪ 1 test routine representative sample during the trial mix. ▪ Same routine sampling of compressive strength of cubes during the production stage.
7. ISAT (Initial Surface Absorption Test)	BS1881-208:1996/ BS 1881-5: 1970	Refer to PART 9.1	▪ 1 test routine representative sample during the trial mix.
8. Water absorption	BS 1881-122	1.6 % after 30 min.	▪ 1 test routine representative sample during the trial mix. ▪ For every 1500m^3 on 28-day old sample during the production.
9. RCPT (Rapid Chloride Penetration Tests)	ASTM C1202	1000 coulombs Refer to PART 9.1	▪ 1 test routine representative sample during the trial mix. ▪ For every 1500m^3 on 28-day old sample during the production.
10. Water penetration	BS EN12390; Part 8: 2000	Max. 10mm at 28 days Max. 15mm at 7 days	▪ 1 test routine representative sample during the trial mix. ▪ For every 1500m^3 on 28-day old sample during the production.
11. Concrete compression tests	BS 1881 Part 108,111,116	As per PART 10	▪1 sample representative at random on 8 separate occasions during the 1st five days to established standard deviation. ▪1 sample representative at random for each class of concrete in
			accordance to PART 10 of the specification. ▪At least 1 sample representative from individual structural unit or part of a unit when the later is the product of a single pour.
12. Splitting tensile strength	BS 1881 Part116/ ASTM C496:1996/ BS EN 12390-6		▪At least 6-cylinder samples representative for 3 at 7days, 3 at 28days at every 100 batches. ▪But at least once a week during full scale concreting operations.

13. Chloride content	BS 1881: Part 124	0.1 -0.2 % (refer PART 12.1)	▪ At the trial mix. ▪ Every accumulative quantity of 1500m3 of concrete with a maximum of one test per day.
14. Sulphate content	BS 1881: Part 124	3.7 % (refer PART 12.2)	▪ At the trial mix. ▪ Every accumulative quantity of 1500m3 of concrete with a maximum of one test per day.
15. Wetting expansion	BS 6073:1981 Part1	max 0.03%	If required by the Superintendent.
16. Chloride diffusion test NT Build 492	BS 1881-122	Max diffusion coefficient 1.75 x 10-12 m^2/s at 90 days	Min. 1 test for qualification test for each mix and as required by the Superintendents
17. Tensile strength	BS 1881: Parts 117 & 118		▪ 1 test during the trial mix and at every 100 batches/once a week (ref: PART 10.3)
18. Flexural Strength of concrete prism	BS EN 12390:P5		▪ 1 test routine representative during the trial mix or as required by the Superintendent

In the case where range exceeds 15% of average for a single batch or range of 3 No. batches average exceeds 20% of overall the following additional tests shall be carried out: Tests no. 1,4,12,16,17,18.

C) QUALITY CONTROL (DURING CONSTRUCTION)

1) Additional tests shall be carried out at change of source and as required by the Superintendent.

Table 15 - Quality control test to be done during construction

Type of Tests	Applicable Standard	Limit(s)	Minimum Frequency
Compression tests	BS EN 12390 :P3		refer to PART 8 and PART 10
Splitting tensile strength	BS EN 12390 :P6		refer to PART 10
Water absorption	BS 1881-122	refer to PART 9	For every 1500m^3 on 28- day old sample
Water penetration	BS EN12390	refer to PART 9	For every 1500m^3 on 28- day old sample
RCP test	ASTM C1202	refer to PART 9	For every 1500m^3 on 28- day old sample
Drying shrinkage	BS 1881 Part 5	max 0.05%	
Wetting expansion	BS 6073:1981 part1	max 0.03%	

Air content			For concretes containing entrained air: first batch or load of each production day until values stabilize.
Workability (slump & concrete	BS 1881-2		Per batch or truck load
Bleeding			Trial mix: 1 test / Prodt'n: 1 test*
Chloride content	BS 1881-124		When performing initial test or in case of an increase in the chloride content of the constituent.
Sulphate content	BS 1881-124		When performing initial test or in case of an increase in the chloride content of the constituent.
Chloride diffusion test	BS 1881-122	refer to PART 9	Min. 1 test. Where a new cement/constituent source is used.

* Additional tests shall be carried out at change of source and as required by the Engineer when in doubt

9. APPENDICES

Appendix 1: Drawings

ST-HP-2030-MAR-TD-001-A Jan 2023
ST-HP-2030-MAR-TD-002-A Jan 2023

SEATEC sarl
LEBANON - Byblos - Down Town - Beauyni Center - 1st Floor
Phone 00961 9 55 00 22 Mobile 00961 3 29 10 30
Fax 00961 9 55 00 44 Mobile 00961 70 55 00 22
E-mail seatec@seatec-sarl.com Web www.seatec-sarl.com

PROJECT ID

Project : Grain Silo at Port
Reference : ST-HP-2030 / 220
Location : Tripoli - LEBANON

PROJECT MAIN PARTICIPANTS

Client	LEBANESE REPUBLIC Commercial Harbor of Tripoli GEPT	
Contractor		
Engineer	SEATEC sarl	

Drawing Details

Commercial Port of Tripoli
Grain Silo Concept
Proposed Overall Mass Plan

Scale					Format	
1/3000					A0	
ST	HP	2030	MAR	TD	001	A
	JAN.	2023			Folio	1 / 2

Notes

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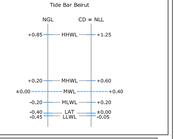
Attached to Tender Document ST-2030-TD-001-J dated February 2023.

Tide Bar Beirut

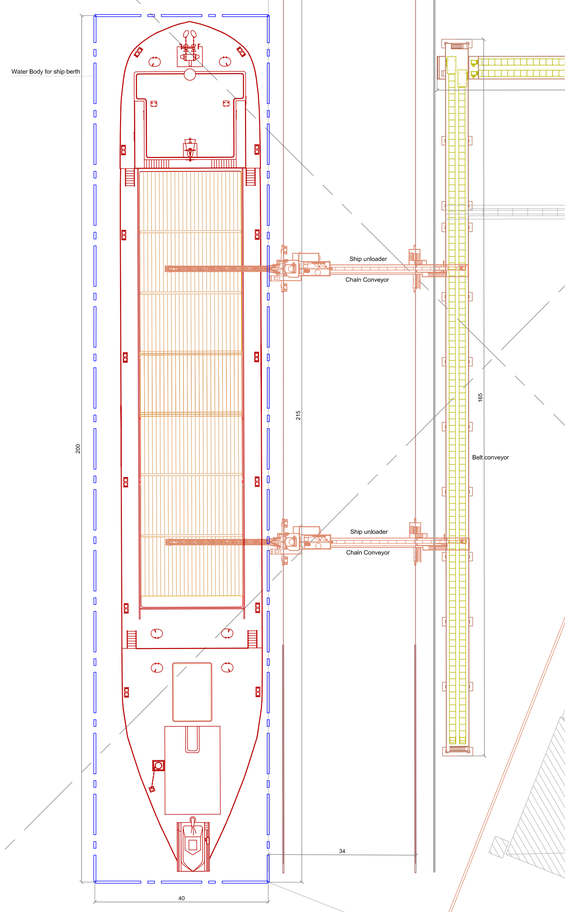


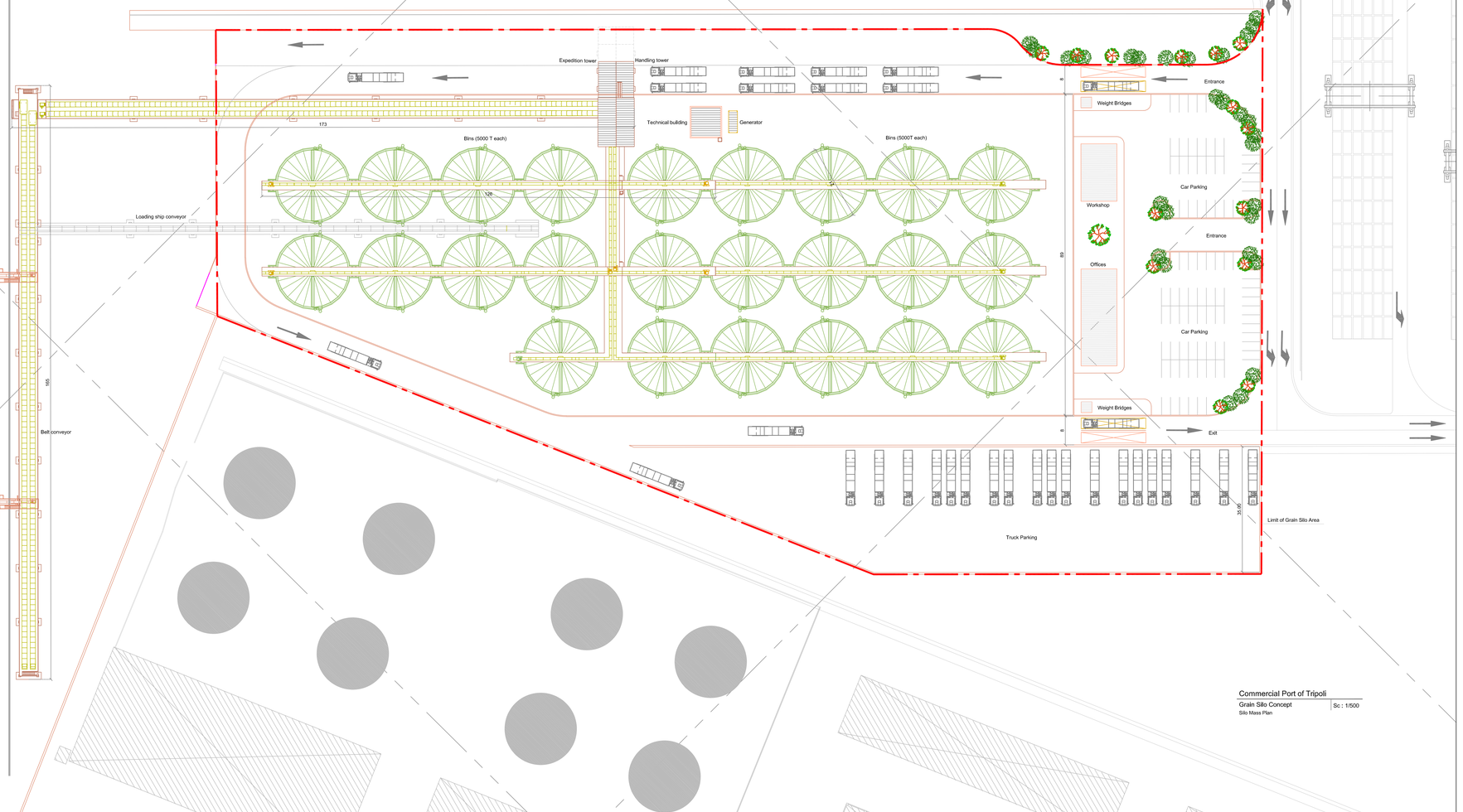
Legend

Review Sequence and Status

No	Revision Title	Verified by	Date	Status

Commercial Port of Tripoli
Grain Silo Concept
Proposed Overall Mass Plan
Sc : 1/3000





Commercial Port of Tripoli
Grain Silo Concept
Silo Mass Plan
Sc : 1/500

SEATEC sarl
LEBANON - Byblos - Down Town - Beauyni Center - 1st Floor
Phone 00961 9 55 00 22 Mobile 00961 3 29 10 30
Fax 00961 9 55 00 44 Mobile 00961 70 55 00 22
E-mail seatec@seatec-sarl.com Web www.seatec-sarl.com

PROJECT ID

Project : Grain Silo at Port
Reference : ST-HP-2030 / 220
Location : Tripoli - LEBANON

PROJECT MAIN PARTICIPANTS

Client: LEBANESE REPUBLIC, Commercial Harbor of Tripoli, GEPT
Contractor:
Engineer: SEATEC sarl

Drawing Details

Commercial Port of Tripoli
Grain Silo Concept
Proposed Silo Mass Plan

Scale					Format	A0
1/500						
ST	HP	2030	MAR	TD	002	A
	JAN.	2023			Folio	2 / 2

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Tide Bar Beirut

NGL		CD = NLL
+0.85	HHWL	+1.25
+0.20	MHWL	+0.60
+0.00	MWL	+0.40
-0.20	MLWL	+0.20
-0.40 / -0.45	LAT / LLWL	+0.00 / -0.05

Legend

Review Sequence and Status

No	Revision Title	Verified by	Date	Status