

**DIVISION 15**  
**MECHANICAL WORKS**

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## **SECTION 1**

### **General Conditions / Requirements**

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**DIVISION 15****MECHANICAL WORKS****SECTION : 1.00****GENERAL CONDITIONS / REQUIREMENTS****1.01 INTRODUCTION**

The following General Conditions and Requirement particularly relate to the Mechanical Engineering aspects of the Contract. They shall be read and interpreted in conjunction with all other Sections of the Specification, the Drawings, the Schedules and all other documents forming part of the Tender Documents.

**1.02 EXTERNAL DESIGN CONDITIONS**

The design environmental conditions for the building are as follows:

Summer Design Temperature	:	38 °C dry bulb, 21 °C wet bulb
Absolute Maximum Temperature	:	40 °C dry bulb
Mean Daily Range Temp	:	14 °C.
Winter Design Temperature	:	0 °C dry bulb
Altitude	:	777 m level
Latitude	:	31°, 57' North
Longitude	:	35°, 57' East

**1.03 EQUIPMENT RATINGS**

All equipment selected for use on this Contract shall be suitable for continuous and reliable operation under the external design conditions stated. In addition, items of equipment installed in enclosed spaces may be subject to temperatures in excess of those prevailing externally and this shall be taken into account. Where ratings are given in this Specification and/or shown on the Drawings, they are the actual ratings to be achieved after the application of all de-rating factors.

All equipment and enclosures that may be subject to internal condensation shall be fitted with suitably rated electrically operated thermostatically controlled anti-condensation heaters.

#### **1.04 COORDINATION**

The Contractor shall be responsible for all aspects of coordination necessary to ensure that the works are properly installed in accordance with the Contract Drawings and Specification. This shall include the inter relationship between Mechanical and Electrical Services, the Building Foundations, Fabrics and Finishes, and all Specialist Equipment contained therein, whether supplied under this Contract or not.

Coordination shall cover the programming and physical requirements of all works. Particular care must be taken in the setting out of works in common ducts, tunnel, false ceiling or similar areas accommodating several services. The disposition of services shall be such that necessary segregation is maintained and that the completed installation affords ready access at a later date for the replacement, maintenance and extension thereof.

#### **1.05 EQUIPMENT**

All equipment to be installed under this contract shall be manufactured by a world wide well known manufacturers, and the quality of the product shall be of an approved standard.

The Contractor must give details of type and manufacturer and the manufacturer must have local representative capable of supplying spare parts, and giving technical support throughout the working life span of the equipment.

The Contractor shall name each material or equipment he proposes to supply for the purpose of this project, supported by all details and technical data. The Engineer reserve the right to reject any equipment in favor of their choice.

#### **1.06 SHOP DRAWINGS**

The Contractor shall prepare shop drawings for the installation. These shall be based upon the actual equipment to be installed, according to manufacturers subsequently approved by the Engineer.

The Contractor shall make such adjustments to the design, as are necessary to accommodate the technical and physical, requirements of the selected equipment in the preparation of the shop drawings.

Such adjustments shall at all times ensure that the final performance of the completed installations is achieved as intended.

Shop drawings shall be checked and coordinated with the work of all trades involved before submission for the approval of the Engineer and shall bear the Contractor's stamp of confirmation as evidence of such checking and coordination. Drawings submitted without this stamp of confirmation will be returned to the Contractor for re-submission.

**1.06 SHOP DRAWINGS (CONT'D)**

Drawings shall be initially submitted in 3 sets of prints accompanied by a letter of transmittal. After return of the "Engineer approved for construction" print, the Contractor will furnish the number of additional prints (not to exceed ten in number) specified by the Engineer.

Each drawing shall have a blank area of 18 cm. x 12 cm. located adjacent to the title block and reserved for the comments of the Engineer. The title block shall display the following: -

- a ) Number and title of drawing (s),
- b ) Date of drawing or revision,
- c ) Name of project and employer,
- d ) Name of consultant,
  
- e) Name of contractor and sub-contractor submitting the drawing(s),
- f) Clear identification of contents and location of work,
- g) Specification title and number,
- h) Scale of drawings.

The scale drawings shall be to a minimum scale of 1:50 and in complex areas, such as plant room and service ducts, scales of 1:20 and 1:10 shall be applied.

The Contractor shall submit all drawings sufficiently in advance of construction requirements to permit not less than fifteen working days for the Engineer's checking and appropriate action.

The approval of drawings will be general, but approval shall not be construed as permitting any departure from the Contract requirements, nor relieving the Contractor of the responsibility for any errors, including details, dimensions, materials, etc. and specified performance of equipment.

**1.07 RECORD DRAWINGS AND MANUALS**

Within thirty days of the Certificate of Completion, the Contractor shall provide 3 sets of fully detailed "as installed record drawings" of the whole Contract Works together with full installation operating and maintenance instructions to be checked and approved by the Engineer. Temporary manuals and record drawings shall be made available at least one month before to enable the Employer's staff to familiarize themselves with the installation. These should preferably be the final manuals with temporary insertions for the items which cannot be finalized until the Works are completed and tested.

The drawings shall comprise general arrangement drawings of all installations; detail drawings of plant rooms and similar areas; single line diagrams of all services; line diagrams of control systems and electrical circuit diagrams.

**1.07 RECORD DRAWINGS AND MANUALS (CONT'D)**

The drawings shall indicate the colour coding, labeling and identification of all the services as previously described, and shall give full working details of size, load, duty and capacity of each item of plant. The drawings shall also clearly indicate the location of all vents, drains, dampers, valves and test points. The line diagram shall indicate the type, location and function of each component and, together with the interconnecting wiring and piping, the terminal connection reference numbers or letters on the actual equipment.

The drawings shall:

- a) Indicate sizes and positions of all plant, equipment pipes conduits.
- b) Indicate the circuit reference for all equipment and each outlet shown. All references shall agree with the chart and labels in distribution boards fixed to the switchgear.

In addition to the Record Drawings, the Contractor shall obtain and provide two sets of the manufacturer's detailed drawings of all items of plant, suitably titled and with drawing reference numbers added.

The Record Drawings shall be specially prepared and shall not be modified Working Drawings. The preparation of these drawings shall be processed during the installation of the Contract Works, as each section is completed. To ensure that this requirement is met, the Engineer shall be all to inspect the drawings on request.

The operating and maintenance instructions shall be prepared as soon as the working drawings are in hand and shall take the form of a manual in which is described the layout and function of the system, schedules of components comprising each and every item of equipment including manufacturer's name, reference and serial number and operating maintenance instructions based on the manufacturer's standard amplified where necessary. An overall maintenance schedule shall be prepared by the Contractor on a system basis, listing out in simple terms the plant, nature of attention and intervals due. This shall be cross-referenced with the manufacturer's standard instructions.

Drawings shall be arranged to fold out from their position and be entirely visible when any part of the manual read. They shall be printed on linen backed paper.

The manuals shall be encased in loose leaf binders.

The Contractor shall include for the preparation and supply of four copies of the manuals and drawings after all details have been approved by the Engineer. Also the supply of two sets of reproducible, one set to be handed to the Client and one set shall be kept with the Engineer.



**1.08 SERVICES FOR TESTING**

All fuel, oil, gas, water and electricity for the purposes of testing and commissioning shall be provided by the Contractor up to the date of the issue of the Certificate of Temporary Acceptance. This shall include the initial charging of all systems and equipment with water, oil and refrigerants, etc.

**1.09 SPARE PARTS AND TOOLS**

After completion of the Works and during the specified maintenance period the Contractor shall be responsible for the supply and installation at the fixed time recommended by the manufacturers of all spare parts and components, required for the ideal running of all engineering services installation.

In addition the contractor shall coordinate with the client for the procurement of the following recommended spare parts needed for proper preventive maintenance program. The contractor shall allow to enlarge this list based upon the recommendations of the equipment suppliers.

<u>EQUIPMENT</u>	<u>LOCAL MANUFACTURER</u>	<u>IMPORTED</u>
Boilers	1 set controls. 2 complete nozzle assemblies. 1 set electrodes and insulators. 1 flame failure safety control. 1 set belts.	Same.
Air Conditioning	1 set controls	Same plus manufacturer's.
Central Plant		1 complete charge of refrigerant and oil
Chiller	1 set fan bearings	Same
Refrigeration	1 set controls.	1 set controls.
Compressors & Condensing Units	1 dryer or dryer filter for each system containing dryer. 1 high side strainer for each expansion valve assembly containing same.	1 spare compressor each size. 1 complete charge of refrigerant for each system, containing dryer. 1 high side strainer for each expansion valve assembly same.
Unit Coolers	1 expansion valve each size	1 evaporator each size. 1 expansion valve each size.
Fan Coil Units	10% filter replacement 2% complete fan coil units each size	20% filter replacement. 4% complete replacement each size.

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HVAC Units	1 set belts for each unit 10% filter replacement each size	1 set belts for each unit 1 adjustable sheave for each unit 20% filter replacement each size
HVAC Control	5% thermostat replacement	10% thermostat replacement
All HVAC Starters	1 set contacts each type	2 set contacts each type
Contactors & Relays	1 magnetic coil each type 1% heater replacement 5% pilot light replacement	2 magnetic coils each type 2% heater replacement 10% pilot light replacement
All Hand-Operated Shut-off Valves	5% complete valves and type	10% complete of each size and type
Automatic Control Valves	10% complete repacking, reseating kits each type Automatic air vents, 2 each size in system	20% complete repacking, reseating kits each type 1 each size and type Automatic air-vents, 6 each size in system Manual air vents, 6 each size in system
Steam Traps	1% replacement each type and size, minimum 1	5% replacement each type and size, minimum
Insulation	2% replacement each type and size	5% replacement each type and size
Central control Panels	None	10% replacement pilot light and switches

**1.10 SPARE PARTS INFORMATION & TOOLS**

1. Spare Parts information: The Contractor shall furnish spare parts information for all equipment furnished under this contract. The information shall be complete, legible, organized, and submitted by system in two (2) copies, and shall include:
  - 1.1 A list of spare parts, special tools, and supplies, for each item of equipment, which are either normally furnished a no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract.
  - 1.2 A complete list of spare parts and supplies recommended by the manufacturer to assure efficient and continues operation of each item of equipment for a period of two (2) years after completion and acceptance of entire work under this contract.

**1.10 SPARE PARTS INFORMATION & TOOLS (CONT'D)**

- 1.3 The list shall show the recommended minimum stockage level for reordering and shall identify all long lead items. A long lead item is defined as any item of equipment which cannot be ready for delivery in less than six months after receipt of order. The lists shall include the following information for each recommended spare part:

Manufacturer's Part Name  
Manufacturer's Name and Address  
Manufacturer's Part Number  
Manufacturer's Drawing Number Showing Part  
Next Higher Assembly  
Equipment Symbol Keyed to Contract Drawings  
Recommended Number of Spares  
Net Unit Price  
Quantity installed per Assembly  
Lead Time  
Shelf Life  
Peculiar Life  
Peculiar cleaning, calibration, packaging and preservation requirements.

Name and address of the authorized spare parts representative and spare parts stocking source nearest to the project site.

Alternate sources of procurement.

**2. SPECIAL TOOL AND TEST EQUIPMENT LIST:**

- 2.1 The Contractor shall furnish to the Engineer two (2) copies of recommended list of all special tools and test equipment. The special tools and test equipment shall cover all items required for the successful operation and maintenance during a ten years equipment life. In compiling the special tools and test equipment list, the Contractor shall indicate all special tools and test equipment items that require calibration, including frequency and method. Necessary standards shall be listed immediately after each item that requires calibration, and they must be traceable to the National Bureau of Standards or other reference satisfactory to the Engineer. Tool lists shall include all tools required. Test equipment lists shall include all equipment required for acceptance testing and calibration. The Contractor shall supply two (2) copies of all vendor-supplied catalogs and instructions for operation and maintenance of the tools and test equipment furnished under this contract.

**1.10 SPARE PARTS INFORMATION & TOOLS (CONT'D)****3. SUBMISSION OF PRELIMINARY PARTS LIST:**

- 3.1 The Contractor shall submit one (1) copy of his preliminary parts list with recommendations for spares within the time frame set forth above. This list is subject to the Engineer review and written approval. The Consultant may revise the listing as to quantities of recommended spares as a condition of approval. The Consultant reserves the right to order all, none or any portion of additional spare parts from the manufacturer's complete parts list and the preliminary Parts List.
- 3.2 Resubmittals: Any resubmittals or additional submittals of equipment lists, spare parts lists or associated information shall be made within thirty (30) calendar days from notice by the Engineer and all costs associated with the submissions shall be borne by the contractor.
- 3.3 Final Parts List: The final list shall be submitted not later than one hundred twenty (120) calendar days prior to contract completion date, in five (5) copies and shall be annotated "Final" on each sheet.

**1.11 TRAINING OF ENGINEERING STAFF**

The Contractor shall provide training for the employees of the employer. Such training shall cover all aspects of using, running, commissioning and maintaining of all Engineering services.

**END OF SECTION**