

**SAUDI TELECOM COMPANY**

**Reference Interconnection Offer (RIO)**

**Annex C, Attachment 6**

**ENVIRONMENTAL & POWER  
REQUIREMENTS  
FOR COLLOCATION**

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## **1 GENERAL**

### **1.1 Introduction**

- 1.1.1 This attachment contains the requirements to ensure the conformity of the Other Licensed Operator's equipment operation during its lifetime for the expected climatic, mechanical and electrical environment.
- 1.1.2 Requirements given by fixed figures are referred to international accepted standards for testing procedures. For each type of equipment there shall be a proof of compliance to the relevant environmental requirements.
- 1.1.3 For verification of environmental requirements, IEC test procedures are specified. The OLO may propose to STC for approval relevant ETSI compliant test procedures as an alternative.

## **2 CONSTRUCTION REQUIREMENTS**

### **2.1 Protection Against Dust and Sand**

- 2.1.1 The construction of all equipment shall ensure protection against damage from dust and fine sand.
- 2.1.2 Equipment which is particularly sensitive to dust (e.g. disk drive units) shall be installed with appropriate covers to ensure normal operation.

### **2.2 Chemical and Biological Constraints**

- 2.2.1 All materials shall be chosen in order to reduce the risk of fire. Extensively used materials shall have an index of oxygen not less than 21%.
- 2.2.2 Testing procedures of ASTM D2863, Standard method of test for flammability of plastic using the oxygen index method, shall be used to verify this requirement.
- 2.2.3 No parts of the equipment shall produce toxic or corrosive fumes and smoke when exposed to light or heat. If the equipment catches fire, the burning material shall not produce any toxic fumes.

2.2.4 All metallic parts shall be protected against corrosion. All parts shall be able to withstand damage caused by sulphuric compounds of SO<sub>2</sub>, SO<sub>3</sub> and H<sub>2</sub>S.

### **2.3 Protection of Personnel**

2.3.1 All equipment shall be constructed in a way that causes no damage to persons and environment.

2.3.2 The construction shall give adequate protection against accidental contacts with parts of voltage higher than 50 V.

2.3.3 It shall not be possible to touch with the test finger<sup>1</sup> the functional insulation<sup>2</sup> of parts at voltages above 250 V rms.

2.3.4 The enclosure of the equipment shall have no openings giving access to parts with dangerous voltages other than those openings supplied for maintenance of the equipment. If such openings are used, sufficient protection against contact with parts having dangerous voltages (i.e. above 50 V) shall be provided.

2.3.5 There shall be no energy hazards in operator access areas<sup>3</sup>.

## **3 ACOUSTIC NOISE**

### **3.1 Noise Levels**

3.1.1 The equipment shall not generate acoustic noise exceeding the following levels of sound pressure:

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<sup>1</sup> Test finger denotes the "standard test finger" described in IEC publication 435 (Safety of data processing equipment).

<sup>2</sup> Functional insulation denotes the insulation necessary for the proper functioning of the equipment, and for basic protection against electric shock.

<sup>3</sup> Energy hazard denotes a hazard that exists at any live part of a piece of equipment if, between the exposed live part and an adjacent exposed metal part of different polarity, there exists a potential of 2 V or more and an available continuous power level of 240 volt-amperes or more, or a reactive energy level of 20 joules or more. Above 50 V the protection against electric shock shall also protect against energy hazards.

- a) Not greater than 60 dB(A) re 1 pW in premises where persons normally are present.
- b) Not greater than 80 dB(A) re 1 pW otherwise.
- c) For impulse noise or permanent tone the above levels shall be reduced by 10 dB(A).
- d) No installation shall introduce acoustic noise into its environment which exceeds the existing ambient noise by 2 dB, during the most quiet time normal to the area. The measurement shall be made at a distance of 30 metres from the installation.
- e) Testing procedures according to ISO 3741 or ISO 3743 shall be used to verify the requirements to acoustic noise.

#### **4 REQUIREMENTS DURING OUTDOOR OPERATION**

##### **4.1 General**

- 4.1.1 The requirements in this subsection are valid for equipment operating outdoors or dug into the ground.

##### **4.2 Climate**

- 4.2.1 The Other Licensed Operator shall provide a climatogram (with a similar structure to the example shown in Figure 2) which clearly shows the temperature and humidity boundaries which define and/or limit the performance of his system during operation in an outdoor environment.

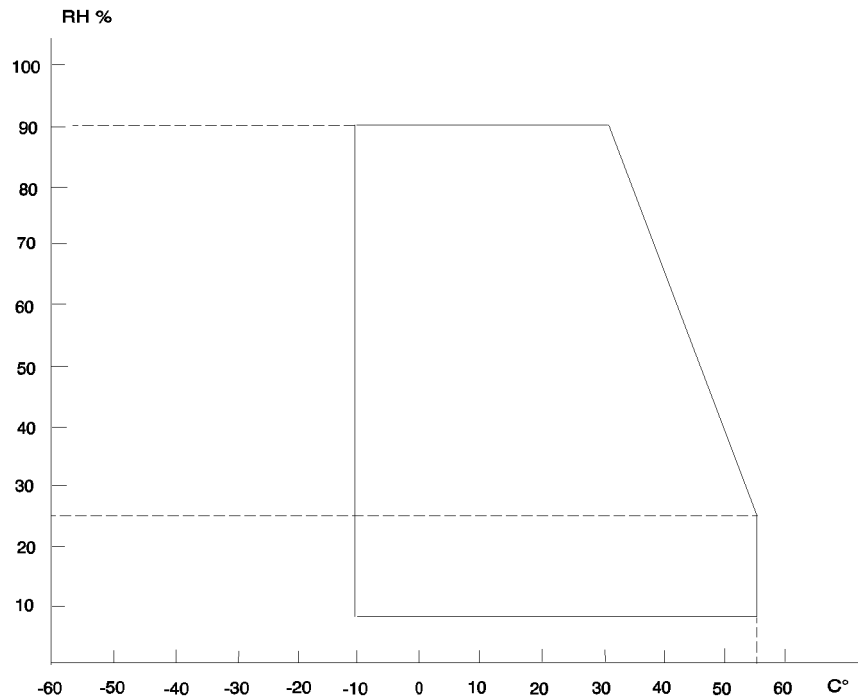


Figure 2. Example Climatogram

- 4.2.2 During operation the equipment shall also endure a temperature variation of 1°C/min. The equipment shall also be able to operate during a relative humidity of 100 % at temperatures of approx. 25°C.
- 4.2.3 Compliance to the climatic requirements stated in 4.2.1 and 4.2.2 shall be verified by the following testing procedures:
- a) IEC 68-2-3, Damp heat, steady state.
  - b) IEC 68-2-14, Change of temperature.

#### 4.3 Condensation

- 4.3.1 The equipment shall endure condensation without deviation from specifications. Condensation shall not generate destructive corrosion to any part of the equipment.

#### 4.4 Sun Radiation

- 4.4.1 During an environmental temperature of 55°C the equipment shall endure sun radiation of an intensity corresponding to 1.12 kW/m<sup>2</sup>.

4.4.2 To verify the compliance of this requirement, test procedure according to IEC 68-2-5, Simulated Solar Radiation at ground level, shall be applied.

#### **4.5 Vibration**

4.5.1 All equipment shall function according to specification after a vibration by an acceleration of 0.5 g limited by a peak deviation of 0.075 mm in the frequency range of 5 - 150 Hz.

4.5.2 To verify this requirement, the test procedure of IEC 68-2-6, Vibration (sinusoidal), shall be used.

#### **4.6 Shock**

4.6.1 All equipment shall function according to specification after a fall, from a stand-up position, of 50 mm height to each corner when the near end corner is built up 10 mm and the opposite corner built up 20 mm.

4.6.2 The equipment shall also function according to specification after exposing to 6 half sinusoidal pulses by an amplitude of 294 m/s<sup>2</sup> and duration of 18 ms applied in each of 3 (alternatively 2) perpendicular directions.

4.6.3 The following testing procedure shall be used to verify that these requirements are complied to by the equipment:

- a) IEC 68-2-31, Drop and topple.
- b) IEC 68-2-27, Shock.
- c) IEC 68-2-32, Free fall.

#### **4.7 Pressure**

4.7.1 Equipment to be dug into the ground shall endure a pressure of 147 kPa.

4.7.2 Waterproof equipment shall endure a water pressure of 147 kPa without moisture seeping in.

4.7.3 The testing procedure of IEC 68-2-17, Sealing, shall be used to verify that these requirements are complied to by the equipment.



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## 5 OPERATION IN PREMISES OF CONTROLLED CLIMATE

### 5.1 Environment

5.1.1 This sub-section contains the environmental conditions for equipment operating in premises where temperature and humidity are both regulated.

### 5.2 Climate

5.2.1 The Other Licensed Operator shall provide a climatogram (with a similar structure to the example shown in Figure 2) which clearly shows the temperature and humidity boundaries which define and/or limit the performance of his system during operation in a controlled environment. The climatogram shall include a curve within the bounds of which continued operation of the equipment shall be guaranteed without catastrophic failure.

5.2.2 The following testing procedure shall be used to verify that the equipment complies to the climatic requirements provided in 2.5.1.1. :

- a) IEC 68-2-3, Damp heat, steady state.
- b) IEC 68-2-1, Cold.
- c) IEC 68-2-2, Dry heat.

### 5.3 Vibration

5.3.1 All equipment shall function according to specification during a vibration by an acceleration of 0.5 g limited by a displacement amplitude of 0.035 mm in the frequency range of 5-150 Hz.

5.3.2 All equipment shall function according to specification after a vibration by an acceleration of 1 g limited by a displacement amplitude of 0.075 mm in the frequency range of 10-150 Hz.

5.3.3 Portable equipment (e.g. test equipment) shall be operative during a vibration of 2g limited by a peak variation of 0.35 mm in the frequency range of 10-150 Hz.

5.3.4 The testing procedures of IEC 68-2-6, Vibration (sinusoidal), shall be used to verify that the vibration requirements are complied to by the equipment.

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## 5.4 Shock

- 5.4.1 All equipment shall function according to specification after a fall, from stand-up position, of 50 mm height to each corner. The near end corner shall be built up 10mm and the opposite corner 20mm.
- 5.4.2 The equipment shall also function according to specification after exposing to 3 half sinusoidal pulses of an amplitude of 98 m/s<sup>2</sup> and duration of 11 ms applied in each of 3 (alternatively 2) perpendicular directions.
- 5.4.3 Portable equipment shall operate during 3 half sinusoidal pulses of an amplitude of 294 m/s<sup>2</sup> and a duration of 18 ms applied in each of 3 (alternatively 2) perpendicular directions.
- 5.4.4 The following testing procedure shall be used to verify that the requirements regarding shock are complied to by the equipment:
- a) IEC 68-2-31, Drop and topple.
  - b) IEC 68-2-27, Shock.

## 5.5 Electrical Protection

- 5.5.1 The equipment must be protected to function when exposed to the electrical environment. The equipment shall be resistant to the maximum values of static electricity, overcurrents and overvoltages given in this sub-section. The protection can in general be included in the equipment itself or implemented by external protection devices.

## 5.6 Static Electricity

- 5.6.1 The equipment shall comply with the test procedures of IEC 801-2, Electromagnetic Compatibility for Industrial Measurement and Control Equipment Part 2, Electrostatic Discharge Requirements.

- 5.6.2 The test voltage shall be applied to those input connectors and parts of the equipment which can be touched or reached without removing covers. The equipment shall operate according to specification during testing at level 3 for both direct contact and air-discharge. The equipment shall not be damaged when tested at level 4 for both direct contact and air-discharge.
- 5.6.3 ESD precautions according to STTP shall be used during maintenance of the equipment (e.g. wrist straps when removing PCB's). The Contractor shall provide the necessary tools to comply with this specification.
- 5.6.4 Replaced and repaired PCB's shall be delivered in static shielded protective packing material and be protected in boxes suitable for repetitive transport between stores and field locations. The packing shall protect electronic components from physical damage and damage from electrostatic and electromagnetic fields in accordance with TSP 2529.

## **5.7 Overcurrents and Overvoltages**

- 5.7.1 The main sources of overcurrents and overvoltages are lightning surges, inductions from failure or unbalance in the power system and direct contact with power lines. This sub-section contains the minimum criteria for the resistibility of the equipment to overvoltages and overcurrents from these sources.
- 5.7.2 The principles of protection against overcurrents and overvoltages shall be in accordance with ITU-T Rec. K.11.
- 5.7.3 For exchanges the levels of resistance shall be grouped in these 2 categories:
- a) unexposed environment (ITU-T Rec. K.20, Table 1/K.20)
  - b) exposed environment (ITU-T Rec. K.21, Table 1/K.21).
- 5.7.4 All exchange lines shall be protected according to the requirements of Exchange Specification, Volume ES.
- 5.7.5 The protection performance of gas discharge tubes and solder melt pellets shall comply with STC material specification MAT-3301.
- 5.7.6 For equipment external to exchanges (e.g. repeaters), the electrical protection should be based on ITU-T Rec.K.17.

## **6 ELECTROMAGNETIC INTERFERENCE**

### **6.1 General**

6.1.1 Digital systems are sources of electromagnetic emissions which may interfere with other systems or radio receivers. At the same time they can be susceptible to the electromagnetic energy emitted by radio transmitters, or noise generated by other systems or electric equipment.

6.1.2 Demonstration of compliance with the requirements of these specifications shall be performed in accordance with the test methods and instrumentation as outlined in the appropriate CISPR (Comite International Spécial des Perturbations Radioélectriques) specifications.

### **6.2 Electromagnetic Radiation**

6.2.1 The radiation of electromagnetic fields from the equipment shall not be greater than 30 V/m in the frequency range of 3 - 1000 MHz measured at a distance of 30m.

6.2.2 The equipment shall function according to specifications during an incoming electric field of 5 V/m in the frequency range of 3 - 1000 MHz.

6.2.3 The equipment performance shall not be affected when it is subjected to a magnetic field of strength 3 A/m at 60 Hz, decreasing 10 dB per decade to 250kHz.

6.2.4 The above requirements shall be tested according to CISPR publication 16.

### **6.3 Conducted Interference**

6.3.1 Conducted emission on power lines

Equipment shall not generate interference voltages above 1 mV rms for any frequency below 100 MHz into any power line.

6.3.2 Resistance to conducted interference

The equipment shall operate according to the specifications when the following interference test voltages are superimposed onto the power feed line or between power feed line and ground:

- a) For equipment including DC power supply the superimposed interference test voltage shall be 0.5 V rms in the frequency range 10-10<sup>7</sup> Hz.
- b) For equipment including AC power supply the superimposed interference test voltage shall be :
  1. 1.5 V RMS in the frequency range 10 - 5.5x10<sup>5</sup> Hz.
  2. 4.0 V RMS in the frequency range 5.5x10<sup>5</sup> - 2x10<sup>6</sup> Hz.
  3. 1.0 V RMS in the frequency range 2x10<sup>6</sup> - 3x10<sup>7</sup> Hz.

## 7 MECHANICAL DESIGN

### 7.1 Construction

- 7.1.1 The equipment to be installed according to this specification shall conform to sound engineering practices with respect to design and construction.
- 7.1.2 The equipment shall be designed and constructed without any protruding sharp corners or edges in order to avoid danger to persons or surroundings.
- 7.1.3 The mechanical construction of racks, plugs, jacks, covers etc. shall not be mounted in a way that requires extensive dismantling work to get access to the equipment.
- 7.1.4 The equipment modules (shelves and PCB assemblies) shall be easily accessible and easy to change for repair.
- 7.1.5 Appropriate covers and enclosures shall be used on all equipment, which is susceptible to dust.
- 7.1.6 Cabinets and racks shall be designed to provide evenly distributed floor load.
- 7.1.7 All equipment drawers shall be capable of being fully extended or/and pivoted while still on the slides to gain access to the underside for ease of maintenance.
- 7.1.8 All slide-in units shall contain guide pins or slots.

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- 7.1.9 All controls and visual indicators shall be located at a height of less than 2 metres from the floor.
  - 7.1.10 Cableways, storage hooks for flexible cables etc. shall be smooth and free from sharp edges.
  - 7.1.11 All indicators shall be clearly visible at an angle of 60 degrees from dead centre in any direction.
  - 7.1.12 The indicators shall be clearly visible in a room of normal illumination without the need for shades or additional lighting.
  - 7.1.13 All cables shall be properly dressed.
  - 7.1.14 It shall not be possible to squeeze or pinch cables when opening or closing equipment doors or panels.
  - 7.1.15 All cables with plug-ends required for inter-equipment connections and connection to printed circuit boards shall have a mechanical latching device to prevent accidental disconnection.
  - 7.1.16 All connectors shall have adequate spacing between adjacent connectors or other units to allow a firm grasp on the associated plug for removal. When adequate spacing is not possible, plugs must be equipped with a handle.
  - 7.1.17 All connectors shall be easy to access for plug-in and removal.
  - 7.1.18 Connectors shall be reinforced and able to withstand a minimum of 500 connections and disconnections without impairment of the performance.
  - 7.1.19 All exposed surfaces shall be painted, anodized, chrome-plated or otherwise protected to comply with tropical climate requirements.
  - 7.1.20 All exposed surfaces and access openings shall be free from sharp edges, or pointed ends.
  - 7.1.21 For the safety of personnel all frames, racks, cabinets and conduits shall be grounded.
  - 7.1.22 Heavy equipment requiring removal for maintenance shall be mounted at/or near the bottom of a rack.

7.1.23 Each portable unit with a weight of more than 12 kg shall have a separate label indicating the weight.

## **7.2 Physical Protection**

7.2.1 The racks and frames of the equipment shall be designed to give sufficient physical protection to the equipment and components.

7.2.2 When drawers or modules are extended, there shall be devices to protect from side blows. Protection brackets or screens shall be attached to the racks or frames if needed for this purpose. Quick connect/disconnect devices shall be used in such cases.

## **8 MECHANICAL DIMENSIONS**

### **8.1 General**

8.1.1 The equipment shall not require ceiling heights exceeding 3.4 m.

8.1.2 The floor loading shall not exceed 750 kg/m<sup>2</sup>.

8.1.3 During installation no equipment unit shall have a weight of more than 500 kg.

8.1.4 No replaceable unit shall have a weight of more than 25 kg. Exceptions can be accepted for I/O devices.

### **8.2 Space Allocations**

8.2.1 The configuration and lay-out of equipment shall comply to the following requirements:

- a) Minimize the use of available floor space in existing buildings.
- b) Permit easy extension of the installed equipment.
- c) Provide easy access for maintenance.
- d) Include areas for administrative and maintenance operations.

### **8.3 Distance Between Racks**

- 8.3.1 No detailed requirements are given for the distance between equipment racks. The distance shall however be large enough to allow for easy execution of the installation and maintenance work in a normal operational situation.
- 8.3.2 The Other Licensed Operator shall ensure standard distance between the racks for new installation.
- 8.3.3 The Other Licensed Operator shall ensure the necessary clearance from walls and columns as well as aisles spacing for maintenance of equipment.

### **8.4 Cabling**

- 8.4.1 The cables shall be designated on both ends. It shall be possible to work out the destination of the cable from each end, either directly from a label or by a reference number explained in the installation documentation.
- 8.4.2 The Other Licensed Operator shall identify if cabling between racks shall be positioned in cable trays above the equipment, a false floor or trenches.

### **8.5 Marking**

- 8.5.1 Each rack shall be provided with a label giving the serial number of the rack.
- 8.5.2 All equipment exposing hazards to maintenance staff (e.g. high voltage, laser beams) shall have warning notices clearly indicating the type of hazard.

### **8.6 Heat Dissipation**

- 8.6.1 Racks containing electronic components shall be designed for efficient cooling. The principle of self-convection is preferred.
- 8.6.2 The maximum heat dissipation in each type of rack shall be stated.