13-SDMS-07

REV. 00

MATERIAL SPECIFICATION

FOR

OUTDOOR TELECOMMUNICATION EQUIPMENT ENCLOSURES

CONTENTS

1 Scope

This document specifies the minimum technical requirements for design, engineering, construction, manufacture, inspection, testing and performance of special purpose Outdoor Enclosures used to house active telecommunications equipment and ancillary components used in Distribution FTTx network deployments within Saudi Electricity Company (SEC).

The enclosures may be installed at various locations within the FTTx network, including but not limited to:

i. NG substations
ii. Distribution MDNs
iii. LV Transformer locations

Typically the Enclosures will house FTTx related telecommunications equipment belonging to and operated by SEC. This standard describes enclosures intended for ground level installation however, the general construction, environmental and performance requirements shall also apply to enclosures intended for wall or pole mounting.

2 Applicable Codes and Standards

This Distribution Material Standard Specification shall be read in conjunction with the latest revision of Distribution General Specification 01-SDMS-01 which shall be considered as an integral part of this standard.

The latest revision/amendments of the following codes and standards shall apply to the equipment/material covered in this Specification and shall be considered as forming an integral part of this Specification

DIN 41494	Equipment practices for electronic equipment; mechanical structures of the 482.6 mm (19 inch) series
DIN 41494-7	Dimensions of cabinets and suites of racks
DIN 41494-8	Components on front panels; mounting conditions, dimensions
EIA-310-D	Horizontal spacing of the vertical rows of holes
ETS 300 019	Environmental conditions and environmental tests for telecommunications equipment
ETS 300 119-2	Equipment Engineering (EE); European Telecom Standard for equipment practice Part 2: Engineering requirements for racks and cabinets
ETS 300 119-4	Engineering requirements for sub-racks in miscellaneous racks/cabinets

ETS 300 753	Acoustic noise emitted by telecommunications equipment
ETSI EN 301169	Engineering requirements for outdoor enclosures
ETSI ES 203156	Thermal management requirements for outdoor enclosures
IEC 60297-3-100	Basic dimensions of front panels, sub-racks, chassis, racks and cabinets
IEC 60297-3-101	Sub-racks and associated plug-in units
IEC 60297-3-102	Injector/extractor handle
IEC 60297-3-103	Keying and alignment pin
IEC 60297-3-104	Connector dependent interface dimensions of sub-racks and plug-in units
IEC 60297-3-105	Dimensions and design aspects for 1U chassis
IEC 60529	Degree of Protection provided by closure (IP Code)
IEC 61969-2	Mechanical structures for electronic equipment - Outdoor enclosures
IEC 61969-3	Mechanical structures for electronic equipment - Outdoor enclosures - Part 3: Environmental requirements, tests and safety aspects
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts
ITU-T R.K.35	Bonding configurations and earthing at remote electronic sites
Telecordia GR-487-CORE	Generic Requirements for Electronic Equipment Cabinets

3 Definitions & Abbreviations

3.1 Definitions

3.1.1 Outside (External): The external environment at any location within Saudi Arabia where installed components may be subject to direct solar radiation, wind, dust, precipitation etc.

3.1.2 Indoor (Internal): Components installed for operation within a building or a cabinet/enclosure that provides protection from the environment and specific control of ambient temperature and humidity

3.1.3 Equipped Outdoor Enclosure: An outdoor equipment enclosure as defined by EN 301169-1, delivered from the supplier with the telecommunications equipment and any necessary environmental and ancillary systems pre-installed in the enclosure. Equipped enclosures may typically be provided as part of a telecom turnkey implementation.

3.1.4 Miscellaneous Outdoor Enclosure: An outdoor equipment enclosure as defined by EN 301169-2, delivered without associated telecommunication equipment but configured with internal compartments, racks, rails and mounting hardware necessary for subsequent

equipment installation. Enclosures will also be supplied with environmental and ancillary systems rated for the intended final use of the enclosure.

3.1.5 Telecommunication Equipment: The electronic systems, power supplies, batteries and passive components that may be installed in the enclosure.

3.1.6 Environmental Systems: The components and measures incorporated into the enclosure to:

i. Isolate the telecommunications equipment from the external environment and
ii. Maintain the internal environment within the relevant operational ranges of the telecommunications equipment.

3.1.7 Ancillary Systems: The components and other measures incorporated into an enclosure to provide functions not directly associated with the telecommunications equipment. Ancillary systems may include but are not limited to

i. Temperature and environment sensors
ii. Enclosure access and security systems
iii. Fire suppression
iv. Damage detection
v. Etc..

3.2 Abbreviations and Acronyms

Abbreviations and acronyms used in this Specification shall have the following meanings:

HEX	Heat Exchanger
AC	Air Conditioning
TEC	Thermo-Electric Cooling
EIA/TIA	Electronics Industries Alliance/Telecom Industries Association
ETSI	European Telecommunications Standards Institute
ETS	European Telecommunications Standard
FTTH	Fiber to the home
FTTI	Fiber to the internet
FTTP	Fiber to the premises
FTTX	Fiber to the terminal
LSZH	Low Smoke Zero Halogen
PON	Passive Optical Network
RoHS	Restrictions on Hazardous Substances

4 Requirements

4.1 General

4.1.1 Unless otherwise stated, the requirements of this specification apply to both Equipped and Miscellaneous outdoor enclosures.

4.1.2 Enclosures shall be designed and manufactured to be:

i. Used in open air conditions
ii. Used in weather unprotected locations
iii. Mounted in fixed (stationary) locations

4.1.3 Enclosures shall be fully qualified as suitable for use at the following locations;

i. Electrical substations and other installations including locations involving high-voltage (HV), medium-voltage (MV) and low-voltage (LV) electrical installations.
ii. Streets and sidewalks
iii. Private areas
iv. Open public areas

4.1.4 Suppliers shall provide to SEC a comprehensive manufacturer's drawing or set of specifications for proposed products, fully dimensioned and describing the materials and construction used. The manufacturers drawing and specification shall also reference compliance to the relevant industry standards.

4.1.5 The manufacturer shall also provide SEC with test results and compliance certificates relevant to the design approval and routine tests referenced in this specification.

4.1.6 In addition to drawings and test data suppliers shall submit at least ten (10) verifiable references where each proposed item or component is used in a live, operational situation.

4.2 Construction & Finish

4.2.1 Enclosure construction shall be in accordance with the general principles of EN 300169 and IEC 61969-2.

4.2.2 Enclosures shall have a robust construction consisting of a structural high grade steel frame and a double layer wall. As a minimum, the inner wall shall be 1.2mm aluminium sheet and outer walls shall be made from 1.5mm thick electro galvanized sheet steel.

4.2.3 Enclosures shall be supplied fully assembled and sealed with assembly to include environmental systems or other components that may be specified.

4.2.4 All internal and external surfaces of the assembled and sealed enclosure shall be powder coated to a uniform thickness in a colour to be specified by SEC.

4.2.5 All outer surfaces shall also be coated with an additional polymer (typically polyester) based layer formulated to provide additional protection and which also resists or prevents the application of graffiti or the adhesives used on posters, stickers and advertisements.

4.2.6 Assembled enclosures shall be able to support an additional vertical static load of 4000 N/m2.

4.2.7 Enclosure doors shall be secured with a suitable lock. Any handles or other opening arrangements shall not project from the door when in the closed and locked position to discourage tampering.

4.2.8 Door hinges shall be internal to the enclosure and shall not be accessible when the door is in the closed position.

4.3 Dimensions

4.3.1 Unless otherwise specified, the overall dimensions of enclosures shall confirm to the coordination dimensions specified in EN 300169 or IEC 61969-2

4.4 Internal Arrangement

4.4.1 Enclosures shall contain space and necessary mounting arrangements to accommodate equipment sub-racks conforming to ETS 300 119-4.

4.4.2 Enclosures shall also be able to accommodate;

i. Power supply units and batteries
ii. Power distribution units
iii. Optical Distribution Frame and patch panels
iv. Climate control and/or heat exchanger (4.5).
v. Fan units and air-flow management
vi. External cable entries and cable termination
vii. Internal cable management

4.5 Environment

4.5.1 Assembled enclosures shall operate within specification over the temperature range -10°C to +70°C and relative humidity up to 100%

4.5.2 The assembled enclosure shall provide protection against the ingress of liquids and particles to the level IP55 or greater.

4.5.3 Where necessary, enclosures shall be provided with mechanisms and systems to maintain the environment within the enclosure within parameters suitable for the operation of the active and passive telecommunications equipment within the enclosure taking account of;

i. The requirement that internal temperature and humidity may need to be maintained at levels below ambient for significant periods of time.
ii. The thermal contribution of the equipment within the enclosure.

4.5.4 Systems for maintaining a below ambient internal environment shall consist of a Temperature Control Unit (TCU) using the following cooling methods:
i. Air Conditioning (AC) systems integrated into the enclosure as specified in 4.5.8
ii. Thermo-Electric Cooling (TEC) systems integrated into the enclosure as specified in 4.5.8.

4.5.5 The cooling capacity of an outdoor enclosure shall be defined as follows:

$$K = \frac{Q}{T_{inlet} - T_{ambient}}$$

Where:

K = cooling capacity of the enclosure [W/^{o}C]
Q = heat dissipation of telecommunication equipment [W]
T_{inlet} = temperature of the air at the equipment inlet inside the enclosure [^{o}C]
$T_{ambient}$ = surrounding ambient temperature [oC] of the environment in which the enclosure is located.

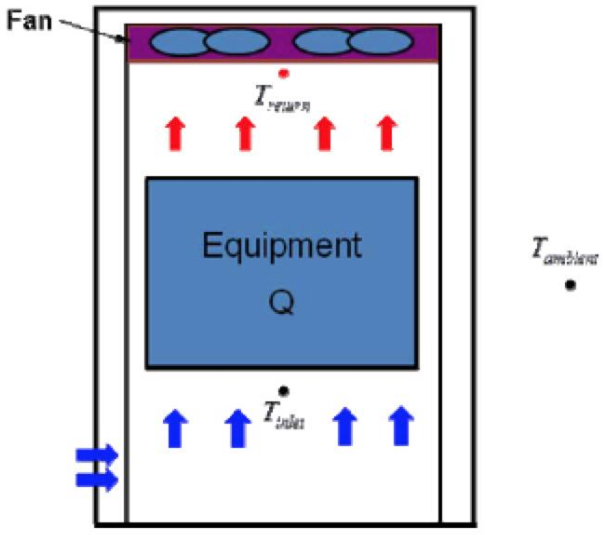


Figure 1 Temperature location within outdoor enclosure

4.5.6 The cooling capacity of the enclosure TCU shall be dimensioned ensure that the operating temperature of the telecommunications equipment does not exceed the maximum operating temperature of the equipment class specified for the enclosure under maximum ambient temperature conditions.

4.5.7 Notwithstanding requirement 4.5.6 the enclosure TCU shall be capable of providing a ΔT of at least $10^{o}C$ where

$$\Delta T = T_{ambient} - T_{inlet}$$

4.5.8 The enclosure TCU may be installed on the front door or the rear of the enclosure producing the airflow indicated in **Figure 2**. Side mounted TCU may be proposed but are not preferred by SEC.

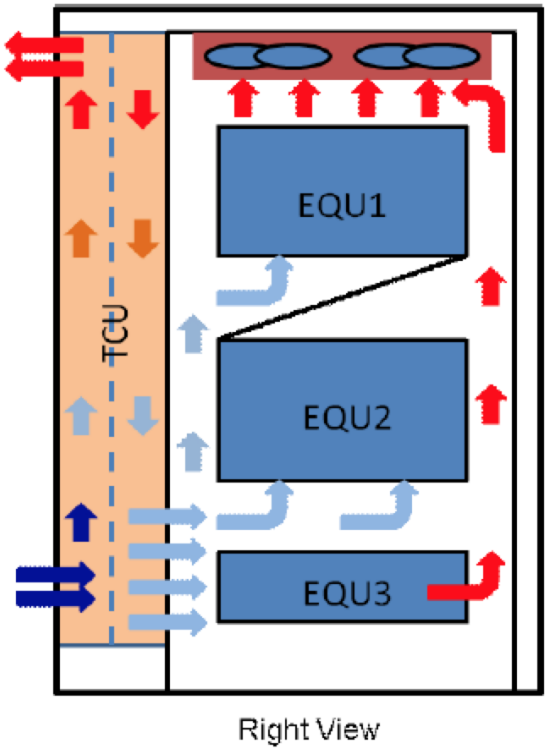
4.5.9 The enclosure shall be designed to allow equipment and associated cables and cross-connects to be installed in the enclosure without obstructing the internal air flow.

4.5.10 The enclosure shall be provided with zonal cooling where specified. Zonal cooling shall be provided using a separate TCU for each zone with independent airflow.

4.5.11 The enclosure shall be fitted with one or more sensors to measure the following internal environmental parameters.

i. Internal temperature (T_{inlet} and $T_{exhaust}$)
ii. Internal humidity
iii. Correct operation of the TCU

Figure 2 Airflow – Door mounted TCU



4.6 Acoustic Noise Emission

4.6.1 The acoustic noise emitted by a fully populated enclosure shall be within the limits specified in ETS 300753 to include the total noise produced by the enclosure environmental systems and the internal telecommunications equipment.

4.7 Electrical and EMC

4.7.1 The bonding configurations and earthing of the miscellaneous outdoor enclosure should be in accordance with the ITU-T Recommendation K.35.

5 Testing and inspection

5.1 Type (Design) Approval

5.1.1 The following type (design) approval tests shall be conducted in accordance with relevant IEC Standards or other equivalent ITU-T & EIA/TIA Standards. The appropriate tests shall be applied to each separate enclosure design covered by this specification. In Lieu of SEC

specific design tests, suppliers may submit certified test reports on design tests previously conducted on identical product.

i. Environmental Testing: Environmental tests for telecommunications equipment shall be performed in accordance with ETSI EN 300 019.
ii. Vibration (Sinusoidal) Test: This test shall be performed on telecom cabinets & racks per IEC 61300-2-1.
iii. Change of Temperature Test: This test shall be performed on telecom cabinets & racks as per IEC 61300-2-22.
iv. Damp heat (Steady State): It shall be carried out on telecom cabinets & racks as per IEC 61300-2-19.
v. Salt Mist Test: It shall be carried out on telecom cabinets & racks as per IEC 61300-2-26.
vi. Mechanical Impact resistance test for the degree of protection provided by enclosures for electrical equipment against external mechanical impacts, shall be performed in accordance with IEC 62262
vii. Ingress Protection (Water & Dust Ingress): Dust ingress and liquid protection test shall be carried out on enclosures as per IEC 60529.

6 Packaging and Marking

6.1 All product shall be individually shall be individually packed and wrapped in a protective re-sealable plastic and placed in a box together with any required test results or inspection data. The quantity of product in each shipping carton shall be either;

i. Specified by SEC through the contract or purchase order, or
ii. Proposed by the supplier for approval by SEC.

6.2 Each individual package and multi-packed carton shall be marked in Arabic and English on at least two sides of the package with the information stated in **Table 1**. The package markings shall also include a standard QR code with the same information.

Table 1 – Packaging Information

Parameters	Requirements
Company	SEC Distribution
Category	FTTx Equipment
Item description	Description of the component
DMSS document Number	DMSS ”xxxxxxx”
Manufacturer Name	“xxxxxxxx”

Parameters	**Requirements**
Manufacturer Part Number	“xxxxxxx”
SEC Part Number	xxxx
Type Approval Certificate Number	00/00
SEC Contract/PO Number	"xxxxxxxx"
Manufacturer Order Number	"xxxxxxxx"
Production Date (mmm-yyyy)	"Month - Year"
Items Quantity	(Numbers) Each
Weight (Kg)	"xxxxxxxx" kg

TECHNICAL DATA SCHEDULE

FIBER OPTIC CONNECTIVITY COMPONENTS

Enquiry No. _____ **Item No. _____**

Ref No.	Description	Unit	Specified values	Vendor proposed values
	Enclosure type		*	
	Construction materials used			
	Enclosure finish		*	
	Dimensions	mm	*	
	Drawing supplied	yes/no	*	
	Type and quantity of TCU fitted		*	
	Zonal cooling		*	
	Max cooling capacity	$W/^oC$	*	
	ΔT at max ambient temperature	^oC	*	
	ΔT at typical ambient temperature	^oC	*	
	No Equipment shelves/zones		*	
	Max equipment capacity	Rack units	*	
	Number and positioning of cable entries		*	