

**OPTICAL DISTRIBUTION FRAMES, ANCILLARY EQUIPMENT AND
ACCESSORIES FOR FIBRE OPTICAL CABLES - TECHNICAL
SPECIFICATIONS**

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1. PASSIVE OPTICAL COMPONENTS TECHNICAL SPECIFICATION OPTICAL DISTRIBUTION FRAMES

1.1. Scope

This section details the technical requirements for Optical Distribution Frames (ODF) to be used in the Company's optical fibre network.

1.2. General

1.2.1. Definitions

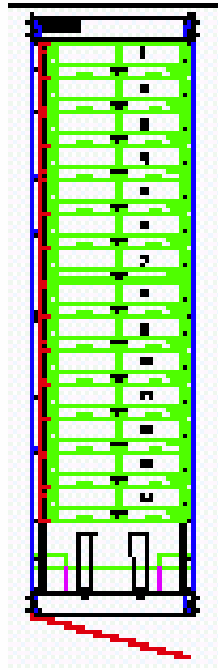
Throughout this section the following definitions will be used:

- Splicing and Patching Trays (SPT): Optical Splice Organisers (trays or cassettes) for the indoor termination of optical cables on SC/PC adaptors.
- Optical Distribution Shelves (ODS): Shelves equipped with a number of Fibre Termination Modules as above, installed on racks (Optical Distribution Frames).
- Optical Distribution Frames (ODF): Racks on which a number of Fibre Distribution Shelves (above) are installed.

1.2.2. Description

The Optical Distribution Frames (ODF) shall provide the interface between the Trunk Network and the transmission or access equipment. It shall be built as a modular rack system and shall be used for housing the Optical Distribution Shelves, described below. They shall provide termination for polyethylene sheathed monomode optical fibre cables. Connection between the external

fibres and the transmission equipment shall be effected by connecting the SC/PC adaptors, on which the fibres are terminated, with patch cords (optical jumpers).



Picture 1 – ODF -

1.2.3. Structure

The mechanical design of the ODF shall be such as to exhibit flexibility in rack arrangement and modularity in the construction with uniform appearance, permitting easy access to the individual modules for maintenance, adjustment and calibration purposes.

Tenderers shall offer racks conforming to ETSI standard ETS 300-119 with dimensions of 600mm width, 300mm depth and 2200mm height.

During installation, the ODF shall be accessible from all sides, whereas during operation full access at both sides of the connectors shall be possible. Secure and flexible means for the entering and securing incoming (external) optical fibre cables and patchcords shall be provided. The frames shall be designed and

constructed to provide environmental and mechanical protection to the fibres and fibre joints.

The ODF shall restore the integrity of the sheath, provide mechanical continuity of the cable strength member and provide electrical continuity and grounding of the metal parts of the sheath and strength members of the cable. The ODF itself, shall have an earth connection (grounding) point for an earth conductor for grounding one or several ODF and the metal parts of the cables.

The ODF shall be equipped with a hinged door to prevent accidental damage of the SC/PC patch cords. Routing of the patch cords shall be effected in an organized manner.

The ODF shall be equipped with enough space to house the slack patch cords length. The space shall be constructed such as to store at least 5m of each patch cord (one for every incoming fibre as stated in par. 1.2.4 below) per ODF, ensuring at the same time a minimum 30mm fibre bending radius. The patch cords shall preferably be stored in separate side ducts (attached to the ODF), which shall adequately protect the stored patch cords from accidental damage.

Tenderers shall provide detailed drawings with dimensions for the frames, the associated optical distribution shelves and the modules.

Tenderers shall state the total estimated time to terminate a 48-fibre cable on the ODF.

1.2.4.Capacity/Requirements

Each ODF shall have space for the installation up to 14 Optical Distribution Shelves with capacity of minimum 48 fibres, as shown in the picture 1. Anyway, maximum ODF capacity must allows an easily jump and patchcords handling.

1.2.5.Cable Entry

At least 20 external optical cables, with polyethylene sheath and 22mm maximum external diameter, shall be terminated on the ODF.

The external cables shall enter the frames at the floor level or the ceiling level and the patch cords shall enter the frames at the ceiling level. The cable entries from the top must be able to withstand a tension force of at least 100N per optical cable.

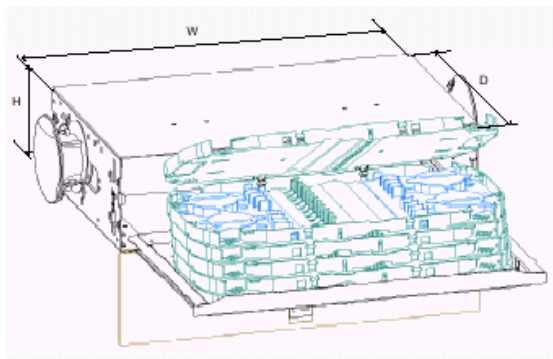
The ODF shall be fully equipped with all the accessories needed for the secure attachment of the cables on the frames, for cable support and strain relief, and for ensuring a minimum cable bend radius.

1.2.6.Expandability

The capacity of the ODF shall be expandable by adding more ODFs side-to-side or back-to-back to the original one. Extensions and reconfiguration shall be easily possible and with minimum technical complexity, by adding incorporated modules or exchanging individual modules.

The Tenderers shall elaborate on the method employed for the interconnection between fibres terminated on different frames.

1.2.7.Optical Distribution Shelves



Picture 2 – Optical Distribution Shelf –

1.2.7.1. General

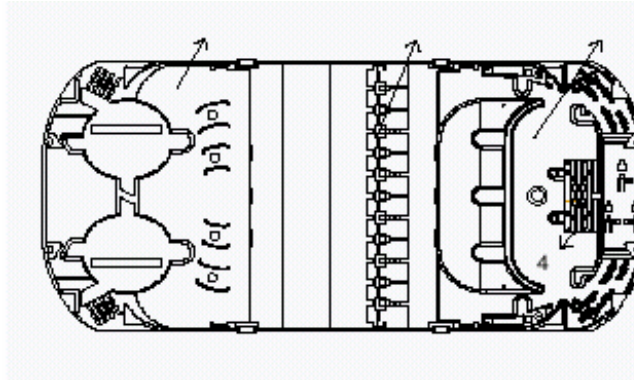
The Optical Distribution Shelves shall be used to equip the ODF described above. The shelves shall be equipped with a necessary number of splicing and patching trays (SPT) up to six trays and shall allow the installation and re-arrangement of cables and trays without causing transmission degradation to any previously installed circuits in the same or any other shelf.

1.2.7.2. Accessibility

The shelves shall be fully and easily accessible and their construction shall be such that maintenance and

upgrading operations shall be performed without any danger of interruption of the working fibres.

1.2.8.Splicing and Patching Trays



Picture 3 – Splicing and Patching Tray -

1.2.8.1. General

The splicing and patching trays (SPT) shall be designed to splice and store the fibres on a horizontal plane. They shall be designed to accommodate up to twelve spliced primary coated fibres i.e. to accommodate all the fibres of a loose tube. Each tray shall terminate the optical fibres on SC/PC adaptors through pigtail cords. The SPT shall be provided by the successful Tenderer fully assembled and ready for installation.

1.2.8.2. Structure

Each splicing and patching trays (SPT) shall be suitable to splice and patch (to patchcords) loose-tube cables, non-pre-connectorized interfacility cables and non pre-connectorized breakout cables. Full access at both sides of the connectors as well as connection and reconnection to other positions in the same tray or shelf without uncontrolled overlengths should be ensured. Termination of the fibres on the SC/PC connectors shall be effected by fusion splicing them with the pigtail cords.

1.2.8.3. Fibre Protection

The splicing and patching trays (SPT) shall protect and provide strain relief of the bare fibres and splices. Their construction shall be such that excessive handling of the fibres during installation is minimized. The SPT design shall ensure that the fibres are neither pinched nor cut during the assembly process, nor subjected to micro or macro bending. The SPT construction shall ensure a minimum 30mm fibre bend radius throughout the unit.

1.2.8.4. Slack Storage

The SPT shall provide slack fibre storage necessary for the initial splicing of the fibres and for future re-cleaving and re-splicing of the fibres. The stored slack fibre shall be protected and accessible when needed. The minimum fibre reserve shall be 1.5m.

1.2.8.5. Accessibility

The SPT shall organise the splices, providing a neat physical arrangement, while simplifying installation and maintenance. When re-entering a splice point, technicians must be able to readily identify the splices located in each SPT. This arrangement shall allow a particular SPT to be removed without disturbing adjacent SPT carrying traffic.

Each SPT shall incorporate a label holder, with a removable label, for identifying the splices.

1.2.9. Performance Characteristics/ Test Procedures

1.2.9.1 Visual Examination

Each ODF shall be inspected for flaws, defects, pinholes, cracks and inclusions visible with the naked eye.

1.2.9.2 Residual Loss Test

This is the criterion test for optical measurements. Measurement shall be carried at 1550nm, as this is more sensitive to bending losses than 1300nm.

Residual Loss is defined as the measured attenuation that is exhibited by stable transmission measurements

taken before and after a test. It shall be measured by using an optical source and a detector operating at 1550nm.

Test samples shall be equipped with organiser trays. Fibres shall be arranged in the trays with at least one fibre from each cable element being spliced to another fibre in such a way that light will sequentially flow through the selected fibres. Splices shall be made using good-quality fusion splices. At least two pigtails shall be spliced to the optical link to make external connections to a light source and an optical power meter.

The sample shall pass the test if the Residual Loss is less than 0,1dB per incoming fibre.

1.2.9.3. Damp Heat

The purpose of this test is to assess the effect of temperature and humidity on the functional performance of the product. Testing shall be according to IEC 68-2-3, Test Ca.

The sample under test shall be placed in a climatic test chamber. Special attention shall be paid to the routing of the optical cables to the optical test equipment.

Samples shall be supported in racks during testing in such a way that they are thermally isolated. There shall be free circulation of air both between specimens and between the specimens and the chamber surfaces.

The samples shall be subjected to a temperature of 40°C and a relative humidity of 93% for 96 hours.

After completion, the samples shall be examined with the unaided eye for damage, which would impair functionality and shall be subjected to the residual loss test described in par.2.4.8.2.

1.2.9.4. Environmental Cycling Test

This is an accelerated aging test designed to highlight possible material incompatibility. It is also a lifetime simulation of optical performance. The test shall be in accordance with IEC 68-2-14, test Nb.

The installed ODF shall be placed in an environmental test chamber or temperature controlled water bath and subjected to ten temperature cycles as specified below:

- 70min -10 to 60°C
- 3hrs at 60°C
- 70min +60°C to -10°C
- 3hrs at -10°C

After completion of the cycles, the sample shall be subjected to the residual loss test described in par. 2.4.8.2.

1.2.9.5. Shock Test

This test checks the effect of sudden, sharp movements on fibre and splice storage. Testing shall be according to IEC 68-2-27, Test Eb.

Samples shall be strapped onto a vibration bank and subjected to 3 shocks in each direction (up and down) for 3 mutually perpendicular axes. Shocks shall have a half-sine waveform and an acceleration of 150m/s² and duration of 11ms.

After completion, the samples shall be examined with the unaided eye for damage, which would impair functionality and shall be subjected to the residual loss test described in par. 2.4.8.2.

1.2.9.6. Vibration Test

This test simulates cable movement in the ports and tests the performance of the seals. The conditions relate to vibration caused by traffic and other resonance effects. The effect on fibre and splice storage is checked. The test shall be in accordance with IEC 68-2-6, test Fc.

The samples shall be mounted in a vibration apparatus and shall be subjected to a sweep frequency of 5-200Hz at 1 octave/minute with the following parameters:

- Crossover Frequency: 9Hz
 - Severity below 9Hz: 3,5mm
-

- Severity above 9Hz: 10m/s² (~ 1g)

The cables shall be immobilised such that they do not interfere with testing.

The testing shall be carried out for three (3) mutually perpendicular axes, 10 cycles per axis.

After completion, the samples shall be examined with the unaided eye for damage, which would impair functionality and shall be subjected to the residual loss.

1.2.9.7. Cable Retention Test

This test is designed to simulate the effect of pulling accidentally on the cables during installation or re-entry.

The ODF shall be clamped and a force of maximum 70N shall be applied on each extending cable and pigtail for a period of 10min.

After completion, the cables and pigtails shall be inspected for probable displacement and the ODF shall be subjected to the residual loss test described in par. 2.4.8.2.

1.2.9.8. Re-Entry

This test checks the mechanical performance of a shelf during several opening/closing operations.

The self shall be removed and replaced 100 times.

Appearance shall be checked every 10 removal/replacements when samples shall be examined with the unaided eye for evidence of damage, which would impair functionality.

1.2.10. Ancillary Equipment and Accessories

Any ancillary equipment and accessory that is essential for the operation and/or installation of the ODF shall be quoted and detailed in the tender, and its use must be fully explained and justified.

2. PASSIVE OPTICAL COMPONENTS TECHNICAL SPECIFICATION ANCILLARY EQUIPMENT AND ACCESSORIES

2.1. Scope

This section details the technical requirements for various ancillary equipment and accessories necessary for the installation and operation of the optical passive components.

2.2. Patch Cords



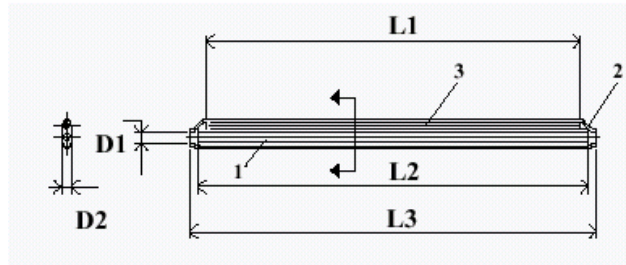
Picture 4 - SC/PC connector-

The required patch cords shall be terminated on SC/PC connectors (in accordance with CECC spec) at both ends, and shall be used for the jumpering between incoming and outgoing cable. They shall consist of a jacketed 10/125 μ m monomode fibre having a buffer layer of reinforcing aramid-polymer, covered with a PVC jacket. The overall nominal diameter shall be 2,5 mm.

Tenderers shall state the insertion and return loss. In any case the insertion loss shall not be more than 0,5 dB maximum while the return loss shall not be less than 40dB minimum (1300 nm).

Adequate lengths shall be given for jumpering within a single frame, and jumpering between different frames in case of modular expansion.

2.3. Splice Protection Sleeves



Picture 5 – Splice Protection Sleeve –

The fusion splices shall be protected with thermoshrinkable splice protection sleeves. The splice protector's length (L3) shall be at least 45 mm. The Tenderers shall indicate the dimensions and describe the splice protectors, which are suitable to be used in the offered trays/cassettes and quote for them separately.