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This is a translation of an original document in Swedish. The translation is for informational purposes only. In case of discrepancies, the Swedish version prevails.

Product Specification: Skanova Placement

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1 Introduction

1.1 General information

The placement of operator-owned equipment is executed at Telia Company's technology sites according to the current basic level of physical security applicable for each site. The properties of the technology site in terms of power supply, cooling and ventilation is set out in paragraphs 2 and 3. At sites with shared areas, the Operator has access to these as well.

Two variants of the product Placement are available: Placement Standard and Placement Premium.

Placement provides access to Skanova's entire range of products.

Placement Standard entails that operator-owned equipment is placed in the same space as other operators' equipment and/or together with Telia Company equipment.

Placement Premium entails that operator-owned equipment is placed physically separate from other equipment. The space is accessible 24 hours a day, 7 days a week.

1.2 Marking of equipment

Station cable and cable owned by the Operator shall be marked by Skanova. The Operator is responsible for ensuring that other Operator-owned equipment is marked in a manner specified by Skanova.

1.3 Environmental requirements

The equipment placed by the Operator on Telia Company's premises shall not contain such substances prohibited by law or included on The Telia Company Black List (list of prohibited substances). Substances included on The Telia Company Grey List (list of substances to be avoided) should be avoided as far as possible. The Telia Company Black List and The Telia Company Grey List are accessible at www.skanova.se [at the time of translation www.teliawholesale.se]

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2 Placement Standard [Swe: Inplacering Standard]

2.1 Power, cooling and ventilation

2.1.1 General information

Most major telecom stations are equipped with emergency power systems. Also see section 2.1.3 below.

UPS is normally not included, but a tender can be provided for arranging this service. Also see section 2.1.4.2 below.

Normally, power supply is dimensioned for a maximum of 2000 watts per cabinet.

Dual power supply (e.g., A and B feed) cannot be provided.

Additional power can be included subject to acceptance of a special tender.

An order to Skanova must always be submitted when new devices are connected to the distribution network that result in previously agreed power output being exceeded.

2.1.2 400/230 V AC mains voltage

Mains voltage 400/230 V AC (TN-S system), frequency 50 Hz. Normal tolerances for the mains voltage from the public power grid are +6%-10%.

Interruptions of the 400/230 V AC feed occur during maintenance and power outages in the public power grid and, where applicable, during test runs of emergency power systems. Also see section 2.1.3 below.

Supply is normally with Schuko 10/16 A 1-phase sockets or CEE connectors 16 A 3-phase sockets.

2.1.3 Emergency power systems

Some buildings with technology facilities have stationary emergency power systems.

Voltage 400/230 VAC, frequency 50 Hz. Normal tolerances for the voltage from the emergency power systems are +6%-10%.

Interruptions of less than 1 minute to the 400/230 V AC feed occur during the time the emergency power system starts and phases in.

Test runs of emergency power systems with this type of interruption to the power supply are carried out regularly.

2.1.4 Power supply 48 V DC and UPS

2.1.4.1 48 V DC

The voltage is in the range of 40.5 to 60 V with the plus pole connected to earth. In case of interruptions in the public power grid, the 48 V DC voltage will not be affected in telecom stations with emergency power systems.

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In telecom stations without an emergency power system there is battery backup for 4 hours of operation. A mobile emergency power system is connected to telecom stations without an emergency power system if necessary (prolonged interruption of power).

The maximum permissible continuous load output per feed is 1000 W. The maximum permissible fuse size is 32 A (16 A for smaller buildings with technology facilities). Feeds must not be connected in parallel.

Connection capabilities for the equipment shall be provided for at least 10 mm² conductors for 32 A fuses and at least 2.5 mm² for 16 A fuses.

2.1.4.2 230 V AC UPS

230 V AC UPS is optional and can only be offered at certain technology sites.

Skanova may, if applicable, provide 1-phase connection to the 230 V AC UPS as follows:

- One or more Schuko 10/16 A 1-phase sockets with 10 or 16 A fuses (C characteristics).
- The UPS is shared with other Operators.
- Protective earthing and protective equipotential bonding.
- Voltage levels 230 (+6/-10%) V AC, 50 Hz.
- Battery backup for at least 10 minutes.

Where applicable, emergency power system supply by the power grid as described in section 2.1.3 above.

2.1.5 Earthing

Skanova provides connection to the telecom station's main earthing bar, directly or via a protective equipotential bonding bar. Other earthing/interconnection installations are paid for by the Operator.

2.1.6 Environmental and climatic conditions

2.1.6.1 General information

The temperature in the room is measured at at least one point about 1.5 meters above the floor (on the side of the equipment where the cooling air is taken in). In some cases, in smaller spaces, the temperature is measured directly adjacent to the battery of the power supply. The temperature in the room is continuously measured by alarm sensors on the walls, and alarms for high room temperature are transmitted to the operations manager at Telia Company .

2.1.6.2 Climate system with cooling machines

In cases where the site has advanced cooling using cooling machines (units containing refrigerant) or rock bed collectors, the temperature varies between 5-35 °C.

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2.1.6.3 Climate system with fans

In cases where sites only have free cooling using a fan or other similar technical solution, the temperature varies between 5-40 °C.

3 Placement Premium [Swe: Inplacering Premium]

3.1 Skanova Placement Premium

3.1.1 Room standard

Enclosure walls i.e. exterior walls delimitating other spaces or technology premises in the building or actual exterior walls are compliant with at least EI 60 according to BBR. Room height is normally between 2.4 to 3.0 meters, measured from the concrete floor to the ceiling. Local deviations may occur.

Raised floors may occur.

3.1.2 Security (in addition to basic level of physical security)

The wall surfaces of enclosures are equivalent to protection class 2 according to SSF 200. Burglar alarms equivalent to alarm class 2 according to SSF 130 are installed either in the enclosure area of the technology premises or in the placement area. If a burglar alarm is preferred on own door with the Cage or Solid options, a tender can be provided by Skanova for this.

Automatic fire alarm according to RUS 110:5. Carbon dioxide hand fire extinguishers are located in a common corridor. If the space for the placement exceeds 300 sqm, separate carbon dioxide fire extinguishers are also installed there.

Automatic fire extinguishing systems are not included in the product. If Premium Solid is ordered, Skanova can tender fire extinguishing systems on request. However, Telia Company assesses on a case-by-case basis whether such a system is possible to install.

Access control systems are set up at entrances to the placement site. The operator is not entitled to install any kind of own access control system.

Skanova ensures that safety and evacuation markings are in place in both public spaces as well as in the Operator's separate spaces.

3.1.3 Cable routing

All cable routing takes place at the ceiling.

3.1.4 Premium Open

Premium Open means placement in a Space common to multiple Operators. That only cabinets of ETSI standard are allowed with maximum outer dimensions: height 2200 mm, width 600 mm depth 800 mm.

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3.1.5 Premium Cage

Premium Cage provides the capability to separate placed equipment by enclosing it in a cage enclosure with a lockable door. The cage sections and door are constructed of rib-mesh metal, minimum 3 mm diameter, with mesh size 50 x 70 mm. Opening dimensions for door: min. b x h 970x2250 mm. Set of cage sections and door is included in the Product. Hardware/cable channels are included in accordance with the standard that Telia Company normally builds at technology sites. Hardware placement is discussed in conjunction with each individual order.

3.1.6 Premium Solid

Premium Solid provides the ability to separate placed equipment by enclosing the space with plaster walls with a lockable door. Solid is available with or without a firewall.

Firewalls comply with EI 60 according to BBR and protection class 1 according to SSF 2004 or protection class 2 according to SSF 2004 depending on customer requirements. Opening dimensions for door: min. b x h 970x2250 mm. Set of cage sections and door is included in the Product.

Hardware/cable channels are included in accordance with the standard that Telia Company normally builds at technology sites. Hardware placement is discussed in conjunction with each individual order.

3.2 Power, cooling and ventilation

3.2.1 General information

Installed equipment may only be connected to designated power outlets.

3.2.2 400/230 V AC mains voltage

Mains voltage 400/230 V AC (TN-S system), frequency 50 Hz. Normal tolerances for the mains voltage from the public power grid are +6%-10%.

Interruptions to the feed occur during maintenance and power outages in the public power grid and, where applicable, during test runs of emergency power systems. Also see section 3.2.3 below.

3.2.3 Emergency power systems

In all buildings where Placement Premium can be offered, there are emergency power systems. The emergency power systems have redundancy of n+1 or a mobile emergency power system can be connected to the low voltage switchgear.

Interruptions of less than 1 minute to the 400/230 V AC feed occur during the time the emergency power system starts and phases in.

Test runs of emergency power systems with this type of interruption to the power supply are carried out regularly.

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3.2.4 Power supply 48 V DC and UPS

In order to provide power, regardless of interruptions on the public power grid, the power supply systems (48 V DC and 230 V AC) are connected to backup power in the form of rechargeable, stationary lead batteries and emergency power systems.

The uninterruptible power supply systems are dimensioned for a total load of between 400-1000 W/m².

3.2.4.1 48 V DC

The -48 V DC system (the rectifier system) has a redundancy of n+1.
The rectifier system includes a rectifier rated for more than the load requires.

Dual power supply from, for example, both the A and B sides cannot be offered. Each customer has an own dedicated distribution panel where consumed power or output can be measured.

Skanova offers connection to power supply -48 V DC as follows:

- One or more distribution panels installed near the customer's equipment with up to 63 A distribution fuses. (Multiple distribution feeds may not be connected in parallel.)
- The power supply system (rectifier, batteries, DC distribution) is shared with other customers.
- Plus earthing.
- Voltage levels, etc. ETSI EN 300 132-2 [1].
- The backup solution described above, together with batteries with 1 or 3 hours backup time (1 hour for n+1 backup systems, otherwise 3 hours).

3.2.4.2 230 V AC UPS

UPS systems for 230 V AC are available.

UPS distribution consists of a main distribution panel (junction box) equipped with fuses. The fuses supply an insulated bar system ("KB channel").

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Bar system ("KB channel") with pluggable sockets

Each bar has its own (main) fuse and each bar's energy consumption is measured individually.

On the insulated bar system (the "KB channel"), pluggable sockets can be connected. Each socket is fused. Standard is Schucko 1-phase sockets with fuses of 10 and 16 A. If the Customer expressly prefers, an industrial outlet 16 A (1-phase) can be installed instead of Schuko 10/16 A.

Skanova provides connection to power supply 230 V AC as follows:

- One or more pluggable 1-phase sockets (10 or 16 A) mounted on a bar system near the customer's equipment.
- The power supply (UPS including batteries) is shared with other customers.
- Protective earthing.
- Voltage levels 230 (+6/-10%) V AC, 50 Hz.
- Backup power system described above, together with batteries with 10 or 30 minutes of backup time (at least 10 minutes for n+1 emergency power system, otherwise about 30 minutes).

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3.2.5 Environmental and climatic conditions

3.2.5.1 Climate system with low-impulse device

The temperature in the premises is kept to 18-27 °C. The temperature in the premises is measured at at least one point about 1.5 meters above the floor (on the side of the equipment where the cooling air is taken in). The temperature in the room is continuously measured by alarm sensors on the walls, and alarms for high room temperature are transmitted to the operations manager at Telia Company.

3.2.5.2 Climate system with forced cooling (raised floor)

The supply air under the raise floor is kept to 18-27 °C. The equipment is placed on a hole in the raised floor. A circulation unit supplies the volume under the raised floor with air with a constant overpressure.

4 Location of cabinets and equipment in Telia Company's technology room (telecom station)

4.1 Operator's cabinet

Placement is only allowed for cabinets that meet the requirements of the ETSI standard, see reference [4] and with a maximum size of 600 x 800 x 2200 (wxdxh).

4.2 Equipment placed in TeliaWholesale's cabinet

Telia Wholesale's cabinets have the size 600 x 600 x 2100 (wxdxh) and meet the requirements of the ETSI standard (adaptation to 19 inches can be provided by Telia). The cabinet can be rented in its entirety or as part of the cabinet with heights of 525, 1050 and 1575 mm.

Placing equipment in part of cabinets may mean that the Operator shares the cabinet with other operators.

5 Technical requirements for equipment

Technical, energy related, requirements for equipment that the Operator installs on Telia Company's premises

5.1 Power supply 48 V DC

The equipment must be capable of being powered according to ETSI EN 300 132-2 [1] with the plus pole connected to earth.

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5.2 Earthing

The equipment must be earthed and protected according to ETSI EN 300 253 [2] to a main earthing bar or a protective levelling bar located in the vicinity of the equipment. The equipment is connected to Telia Company's earthing system/reference plane in the relevant premises.

5.3 EMC

The equipment shall comply with the requirements for test methods and limit values according to standard ETSI EN 300 386 [3]. The Operator shall be able to demonstrate, by means of documentation, that all relevant requirements are met.

5.4 Cooling

Skanova provides cooling in the premises including local coolers or other refrigeration equipment.

In order for optimal cooling to be achieved, equipment must not be placed and executed in such a way that the emitted hot air from the equipment adversely affects the conditions of the premises. In general, all equipment should always be executed in such a way that cold cooling air enters at the equipment front and heated exhaust air is evacuated to the rear and upwards.

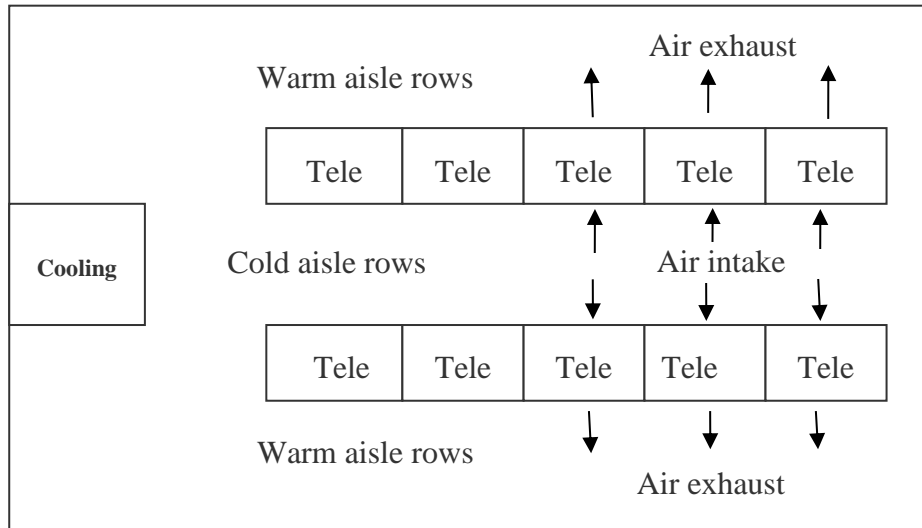
In cases where there are installation floors in the premises, the Operator and Skanova shall jointly prepare a setup plan for expansions for optimal cabinet placement with respect to efficient cooling. The Operator shall ensure the correct placement of technical equipment in these cabinets with regard to internal cooling in the cabinets.

In order to achieve optimal cooling, the installation of new (and if possible existing) telecom equipment shall be executed in such a way that the air from the local cooler efficiently cools the telecom equipment; see the following figure:

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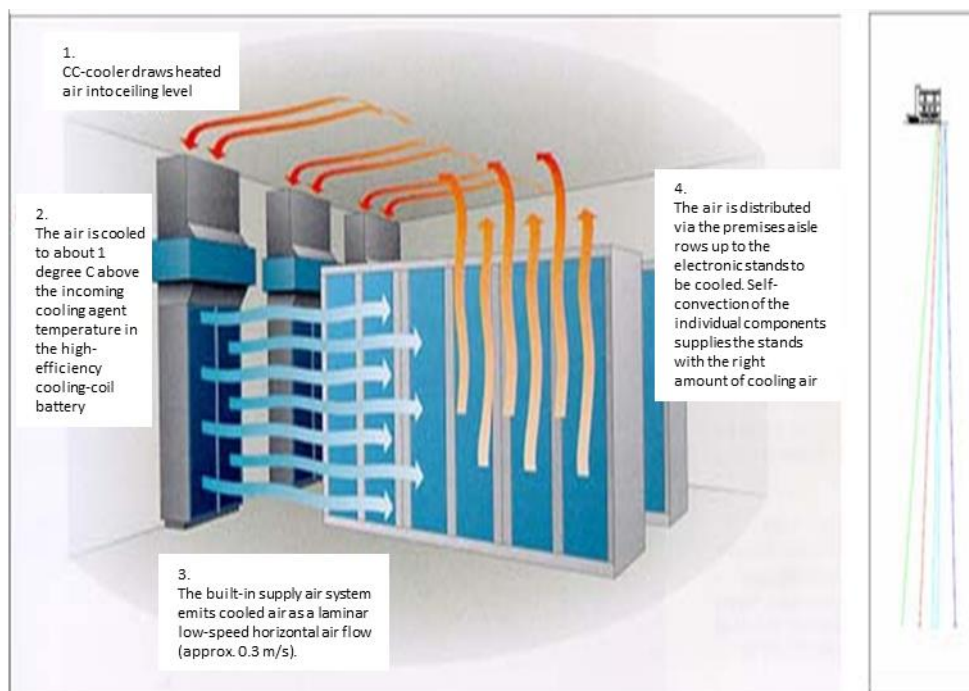
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Airflows inside and outside new /additional (and if possible existing) cabinets shall be checked, which entails, among other things:

- All equipment inside a cabinet shall be positioned so that the equipment takes in and blows out the air in a controlled manner; see the following example.
- Unused spaces inside the cabinet are covered with cover plates to direct the cold air to the equipment inside the cabinet.



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Mechanical cooling, via a centrally located cooling system, controls the room climate. The climatic environment can normally withstand up to a power density of 400–1000 W/m², depending on the product and local conditions.

Low-impulse local coolers distribute the cooling air in the room. If data floors exist, the cooling air is distributed under the raised floor and up through openings in the floor (under or between cabinets).

6 Access to the Operator's non-shared space

The Operator shall, if necessary, grant Telia Company access to enclosed spaces. Access shall be provided subject to the following conditions:

1. *Normal operation, service and maintenance:* Telia Company notifies the Operator of the contractor's personnel engaged to carry out work. The Operator generally gives registered personnel access to the space on weekdays at. 07:00–17:00
2. *Inspection by authorities:* Telia Company notifies the Operator no later than 14 days in advance
3. *Disruptions to service or other technical faults:* Personnel from Telia Company or Telia Company's contractor enter the space without prior notification. Afterwards, notification of the completed action is submitted to the Operator as soon as possible.

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7 Connection between the Operator's space and the external networks

Connection between the Operator's technical equipment located in or outside Telia Company's premises and Skanova's cross connection (KK) or optical distribution frame (ODF)

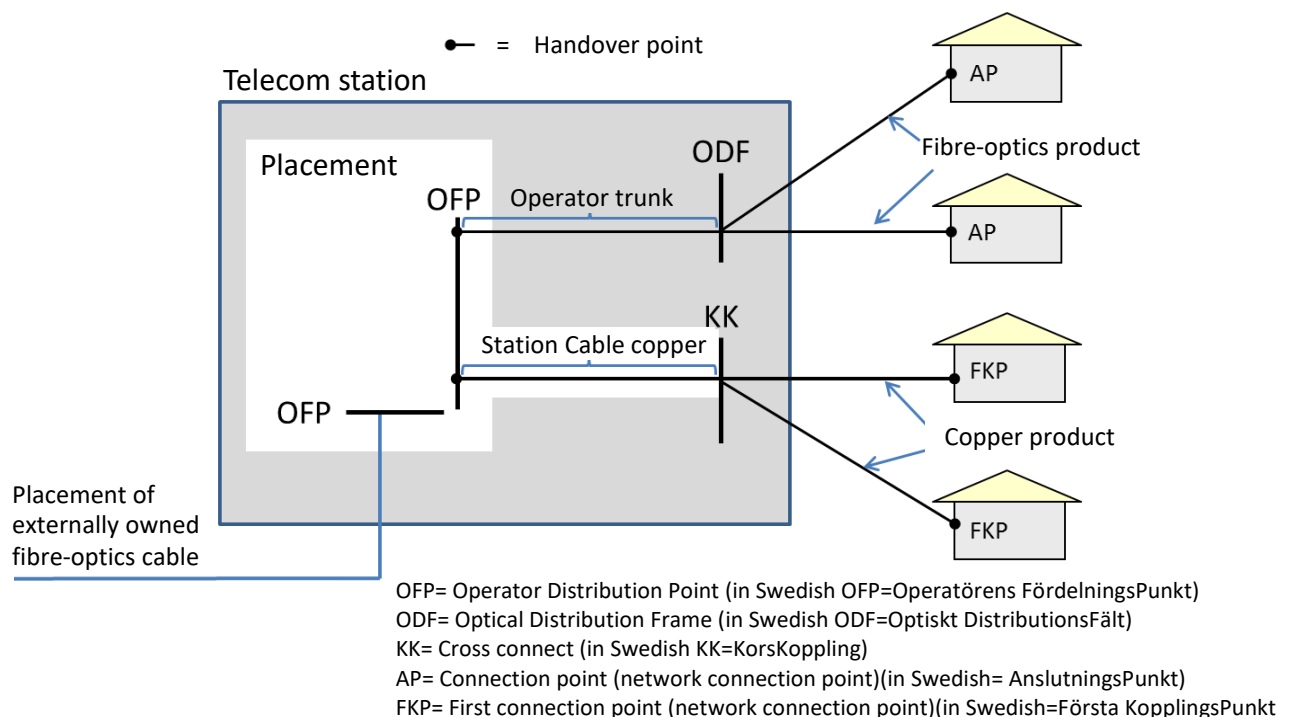


Figure 1

7.1 Station Cable copper

7.1.1 General information

Station Cable copper is used for connection of operator distribution point (OFP in Swedish = Operatörens FördelningsPunkt) to Skanova's cross connection. See Figure 1 above.

The product consists of a copper cable system (without active network components) that connects the Operator's equipment to Skanova's cross connection. Cables on Telia Company's premises are installed and maintained by Skanova or the party engaged by Skanova. The Operator has access to the copper pairs included in the Station Cable.

All connection tasks in Skanova's cross connection are carried out by Skanova or the party engaged by Skanova.

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Skanova is responsible for the facility up to and including the connected cable end in the operator distribution point. The Operator makes the connection directly to the Station Cable's terminal block in the operator distribution point. Skanova is responsible for connecting cabinets that are not located together. If the Operator wishes to arrange own cross-connection in connection with the operator distribution point, this must be ordered by Skanova.

The operator distribution point is arranged in the Operator's cabinet or, if agreed, at another location designated by Skanova adjoining the Operator's equipment. Cable from the Operator's equipment to the operator distribution point is not included in Station Cable copper.

7.1.2 Technical specification

Station Cable consists of shielded flame-retardant polyethylene insulated indoor cable, 100 pairs, with aluminium shielding. The cable is made of strands with 10 pairs in each strand. The cable's colour marking, on the cable's 10-pair strands, corresponds to the first ten colour combinations of IEC 60189-2 [5]. Note that in some geographical regions, the first pair in the cable is registered as pair 0, i.e. so-called 0-count is applied.

The cable is supplied connected with Krone LSA terminals with break function 2/10 at both ends.

It is supplied in size 100 pairs. Nominal conductor diameter is 0.5 mm.

Skanova registers the termination points for Station Cable at Skanova's cross connection in the administrative support system. Registration information for the cable will be provided to the Operator upon delivery. Station Cable is marked after the numbering and designation it has at Skanova's cross connection. This registration data is used to communicate when ordering Copper Access with interconnection performed in Skanova's cross connection.

7.2 Operator Trunk/Station Cable Fibre

All connection of connections from the Operator's equipment, with the exception of Copper Access, is made via the product Operator Trunk. Station Cable Fibre can be used when leasing certain fibre products. See each product's product specification for additional information. Also see Figure 1.

7.3 Placement of externally owned cable

If the Operator wants to run in an externally owned cable to the Placement, the Operator shall order Placement of externally owned cable. A maximum of one cable with 24 fibres or two cables with 12 fibres each may be run in.

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The Operator is responsible for running cable via a cable inlet and up to the connection point at Telia Company's site designated by Skanova.

The Operator is responsible for obtaining and maintaining the necessary permits from the relevant property owners (right-of-use contract) to run the cable to the building where the Access Point is located.

The Operator owns and has maintenance responsibilities for the cable. All connection tasks in the operator distribution point are carried out by the Operator. Skanova performs maintenance at Telia Company's sites.

8 Change information

Section 4: Placement in Telia Wholesale's cabinet added.

9 References

In the case of new establishment, the latest version of the standard shall apply

[1] ETSI EN 300 132-2

Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (DC)

[2] ETSI EN 300 253

Environmental Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres.

[3] ETSI EN 300 386

Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements

[4] ETSI EN 300 119, Part 1-4

[5] IEC 60189-2. Low-frequency cables and wires with P.V.C. insulation and P.V.C. sheath. Part 2: Cables in pairs, triples, quads and quintuples for inside installations.

[6] Swedish directive regarding telecom cables, SS 424 16 22, Telekablar – Cell-PE-isolerade, PE-mantlade, skärmade, vasilinfyllda kablar, typ EUALEV

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