Content

GENERAL REQUIREMENT

For all materials, suppliers must provide the Supplier's declaration of conformity according EN ISO/IEC 17050 in Slovenian and Croatian language.

All optical fibres (pigtails, splitters, etc) in this document are referred of ITU-T G.657A1 type.

1. LOT 1: MANHOLE TYPES

General

Several types of manholes and manhole closures will be used for the RUNE project depending on the requirements that must be met with regard to the area where they will be mounted, depending on existing or planed underground telecommunication infrastructure capacity and depending on material of which it is made.

According to the area where it is mounted there will be a need for two types of manholes/manhole closures:

- 150 kN for mounting outside public roads, and
- 400 kN for mounting in public roads.

According to the capacity of existing or planned underground telecommunication infrastructure, two types of manholes/manhole closures will be needed:

- D1, and
- D2.

According to the material of which it is made, manholes can be:

- plastic, or
- concrete.

1.1. D1 150 kN rectangular or round

Technical characteristics

Manholes

D1 150 kN rectangular or round manhole type will be most commonly used in the RUNE project. As set out in the section 1, manholes can be made of plastic or concrete, but both must meet the stated endurance requirements of the material.

The minimum outer dimensions of the manhole must be:

- 80 cm diameter if it is round and made of plastic, or
- 74x100 cm if it is rectangular and made of concrete,

but recommended minimum usable depth is 80 cm.

The duct entries of the PVC inserts must be closed with PVC shields to prevent penetration of dirt into the manhole through empty duct entries that are not filled by ducts.

Manhole closures

Above the concrete manhole wall is placed a square cover set that can withstand a load of 150 kN and it consists of:

- frame and
- plate (cover)

Both, the frame and plate (cover), must be made of cast iron with min dimension of clear opening:

- min. 60x60cm if it is square or
- min. 77x51cm if it is rectangular
- min. diameter 60 cm if it is round

Above the plastic manhole wall is placed a round cover set that can withstand a load of 150 kN and it consists of:

- frame,
- plate (cover) and
- reinforced supporting element

The reinforced supporting element must withstand the same load as manhole cover, and the frame and plate (cover) must be made of cast iron with a min. dimension of clear opening of 60 cm in diameter.

In both the above mentioned cases, plate (cover) must have a simple locking mechanism (without key), all other markings according to applicable standards, and must be appropriated for the opening by T-handle Manhole Key.

Manhole closures with RUNE inscription are preferred, no other inscriptions (Telecom or similar) are acceptable.

Reliability

Manhole static characteristic

Assembled and mounted cast iron cover with frame must withstand load without deformation of 150 kN with an impact point at the center of the cover.

Manhole closures static characteristic

Assembled and mounted manhole with cast iron plate and frame must withstand load without deformation of 150 kN with an impact point at the center of the cover.

Quality

Manhole production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Manhole closures production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Manholes and manhole closures offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

1.2. D1 400 kN rectangular or round

Technical characteristics

Manholes

D1 400 kN rectangular or round manhole type will be used in the RUNE project. As set out in the section 1, manholes can be made of plastic or concrete, but both must meet the stated endurance requirements of the material.

The minimum outer dimensions of the manhole must be:

- min. 80 cm diameter if it is round and made of plastic, or
- min. 74x100 cm if it is rectangular and made of concrete,

but both must have the minimum usable depth of 80 cm.

The duct entries of the PVC inserts must be closed with PVC shields to prevent penetration of dirt into the manhole through empty duct entries that are not filled by ducts.

Manhole closures

Above the concrete manhole wall is placed a square cover set that can withstand a load of 400 kN and it consists of:

- frame and
- plate (cover)

Both, the frame and plate (cover), must be made of cast iron with min dimension of clear opening:

- min. 60x60cm if it is square, or
- min. 77x51cm if it is rectangular,
- min. diameter 70 cm if it is round.

Above the plastic manhole wall is placed a round cover set that can withstand a load of 400 kN and it consists of:

- frame,
- plate (cover) and
- reinforced supporting element

The reinforced supporting element must withstand the same load as manhole cover, and the frame and plate (cover) must be made of cast iron with a min. dimension of clear opening of 70 cm in diameter.

In both the above mentioned cases, plate (cover) must have a simple locking mechanism (without key), all other markings according to applicable standards, and must be appropriated for the opening by T-handle Manhole Key.

Manhole closures with RUNE inscription are preferred, no other inscriptions (Telecom or similar) are acceptable.

Reliability

Manhole static characteristic

Assembled and mounted cast iron cover with frame must withstand load without deformation of 400kN with an impact point at the center of the cover.

Manhole closures static characteristic

Assembled and mounted manhole with cast iron plate and frame must withstand load without deformation of 400 kN with an impact point at the center of the cover.

Quality

Manhole production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Manhole closures production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Manholes and manhole closures offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

1.3. D2 150 kN rectangular

Technical characteristics

Manholes

D2 150 kN rectangular manholes type will be used in the RUNE project where the dimension of D1 manholes are too small for existing or planed underground telecommunication infrastructure capacity. Unlike the previous one, D2 manholes can be made only of concrete but they also must meet the stated endurance requirements of the material.

The minimum outer dimensions of the manhole must be 108x118 cm with the minimum usable depth of 80 cm.

The duct entries of the PVC inserts must be closed with PVC shields to prevent penetration of dirt into the manhole through empty duct entries that are not filled by ducts.

Manhole closures

Above the concrete manhole wall is placed a square cover set that can withstand a load of 150 kN and it consists of:

- frame and
- plate (cover)

Both, the frame and plate (cover), must be made of cast iron with min dimension of clear opening 154x102cm.

In both the above mentioned cases, plate (cover) must have a simple locking mechanism (without key), all other markings according to applicable standards, and must be appropriated for the opening by T-handle Manhole Key.

Manhole closures with RUNE inscription are preferred, no other inscriptions (Telecom or similar) are acceptable.

Reliability

Manhole static characteristic

Assembled and mounted cast iron cover with frame must withstand load without deformation of 150 kN with an impact point at the center of the cover.

Manhole closures static characteristic

Assembled and mounted manhole with cast iron plate and frame must withstand load without deformation of 150 kN with an impact point at the center of the cover.

Quality

Manhole production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Manhole closures production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Manholes and manhole closures offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

1.4. D2 400 kN rectangular

Technical characteristics

Manholes

D2 400 kN rectangular manholes type will be used in the RUNE project where the dimension of D1 manholes are too small for existing or planed underground telecommunication infrastructure capacity. Unlike the previous one, D2 manholes can be made only of concrete but they also must meet the stated endurance requirements of the material.

The minimum outer dimensions of the manhole must be 108x118 cm with the minimum usable depth of 80 cm.

The duct entries of the PVC inserts must be closed with PVC shields to prevent penetration of dirt into the manhole through empty duct entries that are not filled by ducts.

Manhole closures

Above the concrete manhole wall is placed a square cover set that can withstand a load of 400 kN and it consists of:

- frame and
- plate (cover)

Both, the frame and plate (cover), must be made of cast iron with min dimension of clear opening 154x102cm.

In both the above mentioned cases, plate (cover) must have a simple locking mechanism (without key), all other markings according to applicable standards, and must be appropriated for the opening by T-handle Manhole Key.

Manhole closures with RUNE inscription are preferred, no other inscriptions (Telecom or similar) are acceptable.

Reliability

Manhole static characteristic

Assembled and mounted cast iron cover with frame must withstand load without deformation of 400kN with an impact point at the center of the cover.

Manhole closures static characteristic

Assembled and mounted manhole with cast iron plate and frame must withstand load without deformation of 400 kN with an impact point at the center of the cover.

Quality

Manhole production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Manhole closures production, tolerance and material characteristic

All production processes, tolerances and material used in manufacturing manholes must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Manholes and manhole closures offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

2. LOT 2: PATCH PANELS

Description

Assembled telescopic patch panels for fiber optic telecommunication cables described in these technical conditions are intended for use in the RUNE telecommunication network. They will be used to terminate or connect standard types of single mode G.657A1 fiber optic cables such as underground, retractable, installation and self-supporting cables and they must disable access to rodents inside the patch panel.

Abovementioned patch panel must be 2U 19-inch rack mount type for 96 fibers and must be fully equipped with the equipment listed below.

Technical characteristics

Specified patch panel for use in RUNE project must have the following characteristics:

- Rack mountable
- 2U 19" standard size
- Equipped with:
    - 48 LC/APC duplex adapters, mounted at approx. 40degrees angle (24 left and 24 right)
    - 96 LC/APC G.657A1 900 µm loose tube pigtails with a length of 1,5m
    - 4 splice cassettes (24 splices each) for standard splice protection sleeves and a storage capacity for 3 meters long fibre with primary coating
    - cable glands
    - complete material required for installation
    - 96 adequate splice protection sleeves
- Full opening telescopic rails
- Cable entries in a back part of a panel
- Adjustable side holders
- Holder for the strength element of cable
- Max depth: 300 mm
- Port identification on front panel
- Material: Galvanized Steel with powder coat
- 2m corrugated protecting sleeve/
- One Multi Tube Cable Divider (to divide large cables into sub-sections, before inserting the sub-sections into a patch-panel) must be supplied for each 3 patch panels.

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Assembled telescopic patch panel 19" 2U for 96 fibers and all its parts and equipment offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

3. LOT 3: FIBRE SPLICE CLOSURES

Description

Fibre splice closures for fiber optic telecommunication cables described in these technical conditions are intended for use in the RUNE telecommunication network. They will be used to connect standard types of single mode G.657A1 fiber optic cables such as underground, retractable, installation and self-supporting cables.

All splice closures must have direct access to splice trays which means that splice trays are hinged to allow adjacent trays to be flipped clear (Refer to Fig.1). Depending on the size, the fiber optic closure capacity must be up to 24, 48, 96, 144, 216 or 288 fibers.

Splice closures must have the possibility of aerial application or in the manholes. They must have oval entry ports for looped (uncut) cable and round ports for drop cables entry/exit.

Figure 1. Splice trays

Technical characteristics

24 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 24
- Splice trays capacity: 12 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 M Ω ,
- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
    - Internal cable organizer

  - Clamp
  - Installation clamp
  - Seal
  - 1 Splice tray holder (capacity up to 4 splice trays)
  - 24 adequate splice protection sleeves
  - 2 Splice trays
  - Seal kit for round ports and oval port
  - Wall-mounting adapter
  - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
  - Velcro tapes for cable tubes arrangement

48 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 48
- Splice trays capacity: 12 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 MΩ ,
- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
  - Internal cable organizer
  - Clamp
  - Installation clamp
  - Seal
  - 1 Splice tray holder (capacity up to 4 splice trays)
  - 48 adequate splice protection sleeves
  - 4 Splice trays
  - Seal kit for round ports and oval port
  - Wall-mounting adapter
  - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
  - Velcro tapes for cable tubes arrangement

96 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 96
- Splice trays capacity: 12 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 MΩ,
- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
    - Internal cable organizer
    - Clamp
    - Installation clamp
    - Seal
    - 2 Splice trays holder (capacity up to 4 splice trays)
    - 96 adequate splice protection sleeves
    - 8 Splice trays
    - Seal kit for round ports and oval port
    - Wall-mounting adapter
    - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
    - Velcro tapes for cable tubes arrangement

144 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 144
- Splice trays capacity: 24 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 MΩ,

- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
    - Internal cable organizer
    - Clamp
    - Installation clamp
    - Seal
    - 3 Splice trays holder (capacity up to 4 splice trays)
    - 144 adequate splice protection sleeves
    - 6 Splice trays
    - Seal kit for round ports and oval port
    - Wall-mounting adapter
    - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
    - Velcro tapes for cable tubes arrangement

216 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 216
- Splice trays capacity: 24 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 M Ω ,
- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
    - Internal cable organizer
    - Clamp
    - Installation clamp
    - Seal
    - 6 Splice trays holder (capacity up to 4 splice trays)
    - 216 adequate splice protection sleeves
    - 8 Splice trays
    - Seal kit for round ports and oval port
    - Wall-mounting adapter
    - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
    - Velcro tapes for cable tubes arrangement

288 Fibre splice closure

Specified splice closure for use in RUNE project must have the following characteristics:

- Number of splices: 288
- Splice trays capacity: 24 splices
- Minimal diameter for round ports [mm]: 12
- Range of cable diameter for oval port [mm]: 8-25
- Minimal number of cable entrances (oval + round): 6+1
- Port sealing: thermic
- Environment temperature: -40°C - +70°C,
- Airproof performance: Airing pressure inside box 100 Kpa pointer
- immovability after 24 hours or no air bell within 15 min when parked in the common temperature water.
- Re-encapsulation performance: no change in the index of air-proof performance after three times of repeat encapsulation,
- Insulation resistance: $\geqslant$ 2 X 104 MΩ,
- Water tightness rating in accordance with IP 68,
- Built-in organizer for fiber optic tubes
- Fully equipped with:
    - Internal cable organizer
    - Clamp
    - Installation clamp
    - Seal
    - 6 Splice trays holder (capacity up to 4 splice trays)
    - 288 adequate splice protection sleeves
    - 12 Splice trays
    - Seal kit for round ports and oval port
    - Wall-mounting adapter
    - Accessories set (clip with glue, sand paper, aluminium tape, insulating tape, cable ties)
    - Velcro tapes for cable tubes arrangement

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Splice closures offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

4. LOT 4: PAN CABINETS

General

RUNE is willing to accept offers for plastic cabinets, to be mounted both on the ground and on the poles and must be accessible from the front. All materials must be UV resistant, and have an expected lifetime of at least 25 years. The cabinets will be exposed to the natural elements. Cabinets should be closed with a lock with a uniform key for each type of RUNE cabinet.

Cabinets must have adequate resistance to moisture, dust, temperature changes, and mechanical stresses, which in certain defined limits must not affect the mechanical and portable properties of all incorporated components. These properties must be minimal in accordance with the requirements of IEC 529, (IP 54).

Cabinets should have "RUNE" logo. The logo position is in the middle of the front side of the cabinet door of distribution part.

Cabinets must have a capability for cable entry from below.

There are three groups of cabinets “Passive Access Node” (PAN) which contains ODF and splitters on the field, “Pole mounted splice closure” which contains only splice cassettes (aerial cable splice closure), and a “Customer Optical Distribution Box”.

4.1. PASSIVE ACCESS NODE (PAN)

The group called “Passive Access Node” (PAN) has three different types of cabinets:

- **Type 1** - PAN for outdoor installation on a pole and/or wall with capacity of minimum 72 connections
- **Type 2** - PAN for outdoor installation on the ground (as stand-alone) with capacity of minimum 108 connections
- **Type 3** - PAN for outdoor installation on the ground (as stand-alone) with capacity of minimum 360 connections

4.1.1. Type 1 - PAN for outdoor installation on a pole and/or wall with capacity of minimum 72 connections

Description

Type 1 PAN should be an outdoor cabinet for the reception of fiber optic cables and distribution and connection of optical fiber. It is intended for outdoor installation on a pole and/or wall. It is used for accommodation of the primary network cables and distribution of distributive cables to multi-dwelling or family houses, and it is also used to directly connect users by drop cables suitable for external applications (underground or self-supporting).

PAN must allow access to and replacement of all components without interruption of service to users, as well as easy access and manual connection of the connectors.

PAN must provide accommodation and mechanical protection of optical fibers, for both types of connections (welded or connector), splitter and other passive components.

All parts of PAN must meet the conditions for proper cable management; such as minimum permissible bend radius, simple and secure access to all joints, the possibility of re-coupling and switching without disturbing the characteristics of other joints.

PAN must be made as a single unit and consist of two physically separated parts:

- Part 1 for distribution
- Part 2 for connection of fiber optic cables

Reference

All production processes, tolerances and used materials must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

PAN offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

Technical characteristics

Expected external dimensions of the distribution part (part 1) are 300(W)x350(H)x213(D)mm, while the expected external dimensions of the connection part (part 2) are 300(W)x490(H)x213(D)mm.

Temperature range of use in exploitation from -40^{o}C to + 70^{o}C.

Splice cassettes must accept the standard types of protection sleeves, have the capacity of 24 splices with a storage capacity of at least 3m of fiber per connection.

The distribution part (part 1) must have a capacity of minimum 72 connections and be equipped as follows:

- 56 pigtails LC/APC G.657.A1 min. 2m long
- 28 adapters LC/APC duplex
- front panels with port identification
- space for max. 4 splitters 1/16 (box type)
- pole mounting brackets
- cable guide rings
- lock with a uniform Type 1 RUNE key

The connection part (part 2) must have a capacity of minimum 72 splices and be equipped as follows:

- cable entry PG36
- holder for the strength element of fiber optic cable
- fiber optic tubes guide rings
- 3 splice cassettes (24 splices each)
- possibility of accommodation for one additional splice cassette
- lock with a uniform Type 1 RUNE key

4.1.2. Type 2 - PAN for outdoor installation on the ground (as stand-alone) with capacity of minimum 108 connections

Description

Type 2 PAN should be an outdoor cabinet for the reception of fiber optic cables and distribution and connection of optical fiber. It is intended for outdoor installation on the ground (as stand-alone). It is used for accommodation of the primary network cables and distribution of distributive cables to multi-

dwelling or family houses, and it is also used to directly connect users by drop cables suitable for external applications (underground or self-supporting).

PAN must allow access to and replacement of all components without interruption of service to users, as well as easy access and manual connection of the connectors.

PAN must provide accommodation and mechanical protection of optical fibers, for both types of connections (welded or connector), splitter and other passive components.

All parts of PAN must meet the conditions for proper cable management; such as minimum permissible bend radius, simple and secure access to all joints, the possibility of re-coupling and switching without disturbing the characteristics of other joints.

PAN must be made as a single unit and consist of two physically separated parts:

- Part 1 for distribution
- Part 2 for connection of fiber optic cables

Reference

All production processes, tolerances and used materials must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

PAN offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

Technical characteristics

Maximum external dimensions of the distribution part (part 1) are 460(W)x350(H)x213(D)mm, while the maximum external dimensions of the connection part (part 2) are 460(W)x1000(H)x213(D)mm.

Temperature range of use in exploitation from -40^{o}C to + 70^{o}C.

Splice cassettes must accept the standard types of protection sleeves, have the capacity of 24 splices with a storage capacity of at least 3m of fiber per connection.

The distribution part (part 1) must have a capacity of minimum 108 connections and be equipped as follows:

- 56 pigtails LC/APC G.657.A1 min. 2m long
- 28 adapters LC/APC duplex
- front panels with port identification
- possibility of accommodation for one additional front panel
- space for max. 6 splitters 1/16 (box type)
- cable guide rings
- lock with a uniform Type 2 RUNE key

The connection part (part 2) must have a capacity of minimum 72 splices and be equipped as follows:

- holder for the strength element of fiber optic cable
- fiber optic tubes guide rings
- 3 splice cassettes (24 splices each)

- possibility of accommodation for two additional splice cassettes
- lock with a uniform Type 2 RUNE key

4.1.3. Type 3 - PAN for outdoor installation on the ground (as stand-alone) with capacity of minimum 360 connections

Description

Passive Access Node (PAN) should be an outdoor cabinet for the reception of fiber optic cables and distribution and connection of optical fiber. It is intended for outdoor installation on the ground as a stand-alone. It is used for accommodation of the primary network cables and distribution of distributive cables to multi-dwelling or family houses, and it is also used to directly connect users by drop cables suitable for external applications (underground or self-supporting).

PAN must allow access to and replacement of all components without interruption of service to users, as well as easy access and manual connection of the connectors.

PAN must provide accommodation and mechanical protection of optical fibers, for both types of connections (welded or connector), splitter and other passive components.

All parts of PAN must meet the conditions for proper cable management; such as minimum permissible bend radius, simple and secure access to all joints, the possibility of re-coupling and switching without disturbing the characteristics of other joints.

PAN must be made as a single unit and consist of two physically separated parts:

- Part 1 for distribution
- Part 2 for connection of fiber optic cables

Reference

All production processes, tolerances and used materials must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

PAN offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

Technical characteristics

Maximum external dimensions of the distribution part (part 1) are 460(W)x650(H)x213(D)mm, while the maximum external dimensions of the connection part (part 2) are 460(W)x1000(H)x213(D)mm.

Temperature range of use in exploitation from -40^{o}C to + 70^{o}C.

Splice cassettes must accept the standard types of protection sleeves, have the capacity of 24 splices with a storage capacity of at least 3m of fiber per connection.

The distribution part (part 1) must have a capacity of minimum 360 connections and be equipped as follows:

- 336 pigtails LC/APC G.657.A1 min. 2m long
- 168 adapters LC/APC duplex
- front panels with port identification
- space for max. 20 splitters 1/16 (box type)

- cable guide rings
- lock with a uniform Type 3 RUNE key

The connection part (part 2) must have a capacity of minimum 360 splices and be equipped as follows:

- holder for the ducts
- holder for the strength element of fiber optic cable
- fiber optic tubes guide rings
- 15 splice cassettes (24 splices each)
- possibility of accommodation for one additional splice cassette
- lock with a uniform Type 3 RUNE key
- insulation from moisture penetration from the ground

4.2. POLE MOUNTED SPLICE CLOSURE

Description

Pole mounted splice closure should be an outdoor cabinet for the reception and connection of aerial fiber optic cables. It is intended for outdoor installation on a pole and used as a protection for welded connections (splices) on aerial fiber optic cable.

All parts of pole mounted splice closure must meet the conditions for proper cable management; such as minimum permissible bend radius, simple and secure access to all joints, the possibility of re-coupling and switching without disturbing the characteristics of other joints.

Reference

All production processes, tolerances and used materials must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Pole mounted splice closure offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

Technical characteristics

Maximum external dimensions of the pole mounted splice closure are 300(W)x350(H)x213(D)mm mm.

Pole mounted splice closure must have a capacity of minimum 96 splices and be equipped as follows:

- holder for the strength element of fiber optic cable
- fiber optic tubes guide rings
- 2 splice cassettes for 24 splices each
- possibility of accommodation for two additional splice cassettes
- lock with a uniform Type 1 RUNE key
- pole mounting bracket

4.3. CUSTOMER OPTICAL DISTRIBUTION BOX

Description

The following specification covers the minimum standards and requirements for the construction, properties and testing of the optical distribution box intended for the installation internally in residential premises, wall mounted/hung in the building.

Customer optical distribution box will be used for buildings with few residential units in order to avoid installing primary cable for each unit separately; therefore it will be used customer optical distribution box to distribute only one primary incoming cable to each residential unit with a secondary cable that will be distributed through the building to customers' homes.

Characteristics

Customer optical distribution box

Abovementioned customer optical distribution (meant to be installed in/for multi-dwelling units) box must have the following characteristics:

- Approximate size: 300(H)*30(W)*130(D)mm
- Protection Grade: IP54
- Installation Method: wall mount possibility
- Working Environment: Outdoor and indoor
- Equipped with:
    - 1 splice cassette (24 splices), possibility of accommodation for one additional splice cassette;
    - Free space for 2 splitters 1:16 or 3 splitters 1:8 (see other section of this document for size);
    - Equipped with 24 LC/APC duplex adapters, with additional space for up to 48 LC/APC adapters;
    - Equipped with 24 LC/APC pigtails (1m length);
    - At list 8 cable inputs (10mm opening);
    - Lock with a uniform Type 1 RUNE key.

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Customer optical distribution box offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

5. LOT 5: CUSTOMER OPTICAL TERMINATION BOX

Description

The following specification covers the minimum standards and requirements for the construction, properties and testing of the optical termination box intended for the installation internally in residential premises, wall mounted/hung in the building.

In RUNE project, customer optical termination box will be used for the jointing fiber cable and pigtails, protect fiber optic splices and distribution through customer's home.

Technical characteristics

Abovementioned customer optical termination box must have the following characteristics:

- Max size: 120x100x25mm
- Min capacity of splice: 2
- Min number of heat shrink splice protector holders: 2
- Ability to allow cables to enter from rear, bottom or top of the unit
- Flip tray to allow access to connectorized tails and cable entry
- Ports size: 1xSC/2xLC
- Flame retardant
- Type: wall mount
- Equipped with:
    - 1 x heat shrink splice protector
    - 1 x LC/APC duplex adapter with one port closed in a way to prevent unintentional plugging (only one LC/APC connector will be active)
    - 1 x LC/APC Single mode fiber 9/125µm G.657A1 pigtail (1m)

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Customer optical termination box offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

6. LOT 6: PLC SPLITTERS

Description

These minimum technical specifications are related to the manufacture, testing, delivery, storage and construction, geometric, optical and transmission features of broadband planar optical splitters (PLC Splitters).

Since PLC Splitters will mainly be used in the outdoor cabinets, PLC splitters should be in the form of plastic module cassette (an ABS box packaging) with ruggedized fiber jackets of 1.8mm (all I/O ports must be on the same side of the box body) and with the wall mount possibility (with screw holes).

For PLC splitter it should be used G.657.A1 single-mode fiber connectorized with LC/APC connectors clearly marked on PLC splitter box body and on each fiber.

Except in outdoor cabinets, only two types of PLC splitters (1:2 and 1:4) will also be used in the Active Access Node (AAN) and the only difference will be in input port pigtail length which will be 6 m, while the output port pigtail length will be 3 m.

Technical characteristics

Optical characteristics

Optical characteristics such as Operating Wavelength, Insertion Loss, Loss Uniformity, Return Loss and other characteristics, must correspond to those given in the following Table:

Port configuration	**1 x 2**	**1 x 4**	**1 x 8**	**1 x 16**	**1 x 32**	**1 x 64**
Operating Wavelength (nm)	1260-1660					
Insertion Loss - max. (db) with connector - on 1310 and 1550 nm	3,3	6,6	10,2	13,2	16,5	19,8
Loss Uniformity (dB)	0,5	0,6	0,8	1,2	1,5	1,8
Return Loss - min. (dB) with APC connector	55,0	55,0	55,0	55,0	55,0	55,0
PDL (dB)	0,2	0,2	0,2	0,3	0,3	0,3
Pigtail Length - input (m)	6,0		0,8			
Pigtail Length - output(m)	3,0		0,8			
Fibre Type	Singlemode G.657A1					
Operating Temperature (^{o}C)	~40~85					
Storage Temperature (^{o}C)	~40~85					
Humidity Range	5% to 85%					
Packaging Size (L x W x H) (mm)	100x80x9	100x80x9	100x80x9	120x80x18	120x80x18	140x114x18

Quality

Mechanical characteristics

All mechanical characteristic such as tensile strength, vibration resistance, shock resistance, and fiber bending radius must comply with applicable EN (European) standards.

Environmental characteristics

PLC Splitters should have stable characteristics regardless of temperature and humidity changes and they must comply with applicable EN (European) standards.

Life Time

PLC Splitters offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

7. LOT 7: ADSS EQUIPMENT AND OTHER POLE FITTINGS

Description

All materials in this section must be compliant with EN 50483-1:2009.

Technical characteristics

All dead-end clamps and pass-through support clamps for ADSS cable must have at list the following properties:

- Climatic ageing test according to EN C-20-540 standard
- Corrosion test according to EN 60068-2-52
- Mechanical test according to France Telecom FT R&D/7890 or similar
- Vibration test according to EN 50289-3-13
- Insertion loss < 0.2 dB.

Life Time

Life-time expectancy for materials of this section must be at list 25 years without detriment to the operation characteristics.

7.1. ADSS MICRO CABLE (3mm external diameter) SUPPORTS

Supports and cables used for 4F user drop (last few 100 meters), maximum span 50 meters.

ADSS cable clamp for 4F micro cable (user drop) (like TELENCO ACADSS 6 or similar)	Expected quantity 725.000 pieces

Expected quantity in 3 years.

7.2. ADSS MIDI CABLE (6-8mm external diameter) SUPPORTS

ADSS cable end support (clamp) for 12F to 48F mini cable for medium load (like TELENCO ACADSS 10 or similar)	Expected quantity 93.400 pieces
ADSS pass through support for 12F to 48F mini cable for medium load (like TELENCO Suspension device DS8 or similar)	Expected quantity 93.400 pieces

Expected quantity in 3 years.

7.3. ADSS HEAVY LOAD SUPPORTS

ADSS spiral clamp for 48F heavy load (like TELENCO GSDEM AR 1680-17 or similar)	Expected quantity 5.000 pieces
ADSS spiral clamp for 96F heavy load (like TELENCO GSDEM AR 1680-17 or similar)	Expected quantity 2.500 pieces
ADSS pass through support for 48F cable for heavy load (like TELENCO Suspension device DS12 or similar)	Expected quantity 5.000 pieces

ADSS pass through support for 96F cable for heavy load (like TELENCO Suspension device DS12 or similar)	Expected quantity 2.500 pieces

Expected quantity in 3 years.

7.4. ADSS CABLE LOOP SUPPORTS

Supports are used to conveniently store an extra length of cable along the ADSS cable run for later use. Furnished as pairs (kit contains two Fiber Storage Units and two sets of hanger brackets), these FSUs are constructed from all dielectric UV stabilized thermoplastic. All basic hardware for attachment to the ADSS cable is provided.

ADSS cable loop support (like PLP FDC8, TelTek 2116-SAPSS, AFL FOS17ADSS or similar)	Expected quantity 100.000 pieces

Expected quantity in 3 years.

7.5. POLE MOUNTING ACCESSORIES

All materials in this section must be compliant with EN 50483-1:2009. The equipment must be safe, and tested according to DIN, EN or IEC standards, based on the use.

Technical characteristics

All pole mounting acessories for ADSS cables must have at list the following properties:

- Climatic ageing test according to EN C-20-540 standard
- Corrosion test according to EN 60068-2-52
- Mechanical test according to France Telecom FT R&D/7890 or similar
- Vibration test according to EN 50289-3-13

Life Time

Life-time expectancy for materials of this section must be at list 25 years without detriment to the operation characteristics.

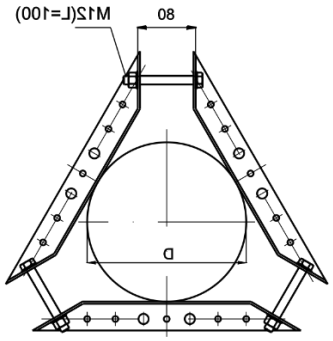
7.5.1. MOUNTING RING FOR POLE/MAST

Used for installation of self supporting cables on the poles. Metallic parts are warm zink protected. Plastic solutions are allowed.

Technical characteristics

All mounting holes must be at list 12mm wide. Pole width as specified in this document.

Sample photo:



Life Time

Life-time expectancy for materials of this section must be at list 25 years without detriment to the operation characteristics.

7.5.2. PROTECTION COVER FOR CABLE

Technical characteristics

Cable cover (like “Korito ZK3”):

- Material PVC;
- - UV resistant for external installation;
- Mechanical protection IP 44 / IP 54;
- Colour RAL 7035
- Dimensions 500x60. For height of 1,5m, 5 pieces are use;
- To be fixed on wooden poles or walls with screws, to concrete poles or FR poles with aluminum bands (with fasteners).

Sample photo:

Life Time

Life-time expectancy for materials of this section must be at list 25 years without detriment to the operation characteristics.

8. LOT 8: POLES

Description

These minimum technical specifications are related to the manufacture, testing, delivery, storage and other characteristics of telecommunications poles to be used in RUNE project.

All poles will be wooden or plastic (FCR), in three different sizes: 6m, 7m and 8m.

Technical characteristics of wooden poles

Specified wooden poles for the use in RUNE project must meet the following conditions:

- all poles must be wooden (pine, fir, spruce) and impregnated on the principle of substituting fresh wood juice with boron, copper and chromium-based salt solutions
- wood for poles must be completely healthy, firm, free of knots and cracks and without any other flaws, should not be bent or stranded
- the tree must be completely fresh and impregnated immediately after logging or at the latest 10 days after logging
- the tree bark must be removed just before impregnation but before removing the bark, care must be taken to ensure that the coagulation layer is damp
- the edges at the lower end of the poles need to be slightly rounded, and the thinner end on the top need to be smoothly cut in the form of a two-sided roof. The angle at the top should be between 90° and 130°
- poles need to be chemically protected in order to meet the conditions of toxicity on tree borers, durability, efficiency, handling harm and ecological abilities
- poles must be marked with plates of non-corrosive material attached at the height outside the arm's reach but at the height at which it is possible to read the data well
- the marking plate must contain the "TK" mark, length, year of the pole production, code of used protective agent and impregnation procedure
- the poles impregnated with boron, copper and chromium-based salt solutions must have a minimum period of ageing of 30 days to achieve good absorption of salt solutions into the wood
- the poles can be delivered only after 28 days after the end of fixing process is completed, but this period even may be longer depending on weather conditions
- temperatures below 0°C are not counted in the time required for fixing

The following table gives the height and thickness ratio of the wooden poles with the horizontal load parameters:

Pole length (m)	Thickness at the 30 cm from the top of the pole (tolerance ± 1 cm) (cm)	Permissible horizontal load of the top of the pole (kp)
6	14	144
7	14	136
8	15	155

Technical characteristics of plastic (FCR) poles

Specified plastic poles for the use in RUNE project must meet the following conditions:

- all poles must be wood-resembling (we accept optional grey colored)

- the edges at the lower end of the poles need to be slightly rounded, and the thinner end on the top need to be smoothly rounded or in the form of a two-sided roof or otherwise protected on the top.
- poles need to be UV protected in order to meet the conditions for durability, efficiency, handling harm and ecological abilities, and self-extinguishing/not highly flammable
- poles must be marked with plates of non-corrosive material attached at the height outside the arm's reach but at the height at which it is possible to read the data well
- the marking plate must contain the "RUNE" mark, length, year of the pole production, and pole material type

The following table gives the height and thickness ratio of the plastic poles with the horizontal load parameters:

Pole length (m)	Thickness at the 30 cm from the top of the pole (tolerance ± 1 cm) (cm)	Permissible horizontal load of the top of the pole (load in head) (kp)
6	14	310
7	14	315
8	16	320

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Reference

Wooden pole must be designed, manufactured and tested according to the standard "Structural timber - Wood poles for overhead lines" (EN 14229:2010)

Plastic poles must be designed, manufactured and tested according to UNE ESPECIFICACION 0059 : 2017 „FIBERGLASS REINFORCED POLYESTER POLES FOR OVERHEAD POWER DISTRIBUTION LINES AND TELEPHONY LINES" standard or similar.

Life Time

Poles offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.

9. LOT 9: PATCHCORD

Description

In RUNE project Patchords will only be used at customers' homes for connections between ONTs to customer termination boxes so for that use will be used standard Patchords of 1m with the details given in the technical characteristics.

Technical characteristics

All abovementioned Patchords must have the following characteristics:

- Cable Type: Duplex
- Colour: yellow
- Connector Style/polish or ferule interface type: LC/APC – SC/APC
- Cable Diameter: 2.8 mm
- Outer Jacket: LZSH
- Single mode fiber, 9/125µm G.657A1
- Insertion Loss IlMAX against MASTER ACC. IEC 61300-3-4 $\leqslant$ 0.20 dB
- Insertion Loss IlTYP against MASTER ACC. IEC 61300-3-4 $\leqslant$ 0.16 dB
- Return Loss ACC. IEC 61300-3-6 $\geqslant$ 65 dB

Quality

All abovementioned parts as well as production processes, tolerances, characteristics and material used in manufacturing must respect all legal requirements and comply with applicable EN (European) standards.

Life Time

Patchords offered in compliance with these specifications must be capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics.