



# Amendments

## Robust Fiber

### instructions Corrections and additions

03/04/2018

Revision history:

Date	Version	Revised by	Remarks
01/07/2016	1.0	The project	Robust fibre installation
22/02/2017	1.1	Jimmy Persson, Robust Fiber Lars Björkman, Robust Fiber	
10/03/2017	1.1.1	Jimmy Persson, Robust Fiber	Correction of printing errors. Page breaks. Appendix 2
13/03/2017	1.1.1	Jimmy Persson, Robust Fiber	Clarification of texts. Appendix 3
15/03/2017	1.1.1	Jimmy Persson, Robust Fiber	Correction of printing errors. Page breaks. Appendix 4
01/04/2018	1.2	Technical Council, Robust Fiber	Amendments, supplements and corrections
03/04/2018	1.2	Technical Council, Robust Fiber	Amendments, supplements and corrections Appendix 4 Sites and nodes

Applicable version for each document:

Appendix	Applicable version	Amended date
Main document	V1.2	01/04/2018
Appendix 1: Terms and definitions	V1.2	01/04/2018
Appendix 2: Robust networks	V1.2	01/04/2018
Sub-appendix 2.1 Robust networks, Attenuation measurement	V1.2	01/04/2018
Appendix 3: Robust routing methods	V1.2	01/04/2018

Appendix 4: Robust sites and nodes	V1.2.1	03/04/2018
Appendix 5: Documentation	V1.2	01/04/2018
Appendix 6: Inspection	V1.2	01/04/2018
Sub-appendix 6.1: Checklists, inspection	V1.2	01/04/2018
Appendix 7: Fibre installation projects	V1.2	01/04/2018

### Amendments: Amendments of Instructions for Robust Fiber carried out on 13 March 2017

Date 13/03/2017		
Document	Previous text	Addition or revised text
<b>Appendix 4: Robust sites and nodes</b>	Chapter 2.2.5 Electricity supply The electrical system in sites and nodes must be executed in accordance with applicable laws and electrical safety regulations.	The electrical system in sites and nodes must be executed in accordance with applicable laws and regulations for electrical installations.
	Chapter 2.2.5.1 Electrical system <b>Minimum requirements regarding electrical system:</b> <ul style="list-style-type: none"> <li>• Distribution boards in the site must be adapted for 230/400V as a TN-S system and supplied with residual current devices</li> <li>• Distribution boards must be grouped and fused for each group.</li> <li>• Service outlets must be supplied with RCBOs.</li> </ul> Recommendations: <ul style="list-style-type: none"> <li>• At racks, electric outlets must be installed so that they are easily accessible and evenly distributed between three phases.</li> </ul>	<b>Minimum requirements regarding electrical system:</b> <ul style="list-style-type: none"> <li>• Distribution boards in the site must be adapted for 230/400 V as a TN-S system.</li> <li>• Distribution boards must be grouped and fused for each group.</li> <li>• Service outlets must be supplied with RCBOs.</li> </ul> Recommendations: <ul style="list-style-type: none"> <li>• At racks, electric outlets must be installed so that they are easily accessible and evenly distributed between three phases.</li> <li>• In larger sites and nodes, the installation must be supplied with residual current devices.</li> </ul>

### Amendments: Amendments of Instructions for Robust Fiber carried out on 13 March 2017

Date 13/03/2017		
Document	Previous text	Addition or revised text
<b>Appendix 3: Robust routing methods</b>	Chapter 3.9 Warranties Local regulations for restoration vary between different local authorities, land owners and road operators. Always check applicable local rules and regulations. With certain land owners, the contractor itself can perform the restoration and then provides a warranty. At others, the land owner itself will conduct restoration, and the client will often also have to pay a fee for future maintenance. According to the land AMA, the warranty period is 5 years, which most land owners normally comply with.	Local regulations for restoration vary between different local authorities, land owners and road operators. Always check applicable local rules and regulations.  With certain land owners, the contractor itself can perform the restoration and then provides a warranty. At others, the land owner itself will conduct restoration, and the client will often also have to pay a fee for future maintenance.  The warranty period is regulated in AB 04 General conditions of contract for building and civil engineering works and building services, Chapter 4 Section 7, as well as ABT 06 General conditions of contract for design and construct contracts for building, civil engineering and installation works, Chapter 4 Section 7.  AB 04 states that the Warranty period is 5 years for the contractor's work performance and 2 years for materials and goods.  ABT 06 states that the Warranty period is 5 years for the contract. For specific material or specific goods (makes) prescribed by the client, the Warranty period is 2 years.
	Chapter 4.1 Microtrenching and other end milling Minimum requirements in the case of microtrenching: <ul style="list-style-type: none"> <li>• Ground-penetrating radar must be used</li> <li>• Backfill height in accordance with "Instructions for Robust Fiber"</li> </ul>	Minimum requirements in the case of microtrenching: <ul style="list-style-type: none"> <li>• The contractor must define the depth of existing infrastructure, ideally performed using ground-penetrating radar or physical inspection by means of excavation before starting the work.</li> <li>• Backfill height in accordance with "Instructions for Robust Fiber"</li> </ul> Point 1, point 4.1.1, point 4.2.1 and point 4.2.6 are also supplemented with the text "or physical inspection by means of excavation" after requirement for ground-penetrating radar.

## Amendments: Amendments of Instructions for Robust Fiber carried out on 10 March 2017

Date 10/03/2017																																							
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Appendix 2: Robust networks	Chapter 2.3.3 Minimum backfill height	<table border="1"> <thead> <tr> <th colspan="4">Generella krav på minsta fyllningshöjd:</th> </tr> <tr> <th>Yta</th> <th>Fyllningshöjd</th> <th>Metod</th> <th>Information</th> </tr> </thead> <tbody> <tr> <td>Tomtmark intill bostadshus</td> <td>30 cm</td> <td>Alla</td> <td></td> </tr> <tr> <td>Körbana och gång/cykelväg</td> <td>25 cm</td> <td>Mikrotrenching Spårfräsning</td> <td>Ytterligare 10 cm vid ej belagd yta (grusväg).</td> </tr> <tr> <td>Gång/cykelväg</td> <td>30 cm</td> <td>Alla</td> <td></td> </tr> <tr> <td>Körbana</td> <td>45 cm</td> <td>Alla</td> <td></td> </tr> <tr> <td>Orörd mark (ej åkermark)</td> <td>45 cm</td> <td>Alla</td> <td></td> </tr> <tr> <td>Grönyta utanför tomtmark</td> <td>45 cm</td> <td>Alla</td> <td></td> </tr> <tr> <td>Åkermark</td> <td>70 cm</td> <td>Alla</td> <td>Hänsyn måste tas till eventuell dränering.</td> </tr> </tbody> </table>		Generella krav på minsta fyllningshöjd:				Yta	Fyllningshöjd	Metod	Information	Tomtmark intill bostadshus	30 cm	Alla		Körbana och gång/cykelväg	25 cm	Mikrotrenching Spårfräsning	Ytterligare 10 cm vid ej belagd yta (grusväg).	Gång/cykelväg	30 cm	Alla		Körbana	45 cm	Alla		Orörd mark (ej åkermark)	45 cm	Alla		Grönyta utanför tomtmark	45 cm	Alla		Åkermark	70 cm	Alla	Hänsyn måste tas till eventuell dränering.
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## Amendments: Amendments of Instructions for Robust Fiber carried out on 22 February 2017

Date 22/02/2017		
Document	Previous text	Addition or revised text
Main document		Description of fibre installation project removed. Information contained in appendices is removed. Rearrangement of headings.
Appendix 1: Terms and definitions	Chapter 2.3 Ducting Ducting is an arrangement that provides space and protection for cables. The term Ducting includes all components that jointly make up an arrangement for the protection of cables, e.g. ducting pipes, optical pipes, micropipes, cable pipes, wells, search string. Ducting pipes are also known as ducts or cable protection.	Revised text: Ducting is an arrangement that provides space and protection for cables. The term Ducting includes all components that jointly make up an arrangement for the protection of cables, e.g. ducting pipes, optical pipes, micropipes, cable pipes, wells, search string. <b>Ducting pipes are also known as ducts.</b>
	Chapter 2.9 Pressing Can also be referred to as auger boring. Presses a steel pipe (casing pipe) from one point to another. The pipe remains in the ground and becomes the outermost ducting, into which ducting pipes are then inserted. This method is only used for short distances.	<b>Pressing Can also be referred to as auger boring. A steel pipe (casing pipe) is pressed from one point to another. The pipe remains in the ground and becomes the outermost ducting, into which ducting pipes are then inserted. This method is only used for short distances.</b>
Appendix 2: Robust networks	Chapter 2.2.1 Ducting pipes	Addition <b>Marking of ducting</b> Marking of ducting will aid traceability of ducting in the network. Traceability is achieved through coloured or numbered ducting pipes so that the pipes can be distinguished in the event they are excavated or damaged, and in the event of optical cables being blown in from outdoor splice cabinets.
	Chapter 2.2.1 Ducting pipes <b>Micropipes</b> Micropipes are thin-walled pipes (sub-ducting or for indoor use) or thick-walled pipes (for direct routing in the ground, water or air), with inner dimensions from approx. 3 mm up to approx. 12 mm. Micropipes are used to blow (in certain cases also to pull) micro-cables or blow fibres.	Revised text <b>Micropipes</b> Micropipes are thin-walled pipes (sub-ducting or for indoor use) or thick-walled pipes (for direct routing in the ground, water or air), with inner dimensions from approx. <b>3 mm up to approx. 18 mm. 18/12, 16/12 and 7/3.5 mm are common.</b> Micropipes are used to blow (in certain cases also to pull) micro-cables or blow fibres.
	Chapter 2.2.2.2 Outdoor splice cabinets	Addition <b>Minimum requirements regarding outdoor splice cabinets:</b> <b>☑ The cabinet must be of corrosion class C3.</b>
	Chapter 2.2.2.2 Outdoor splice cabinets	Addition <b>For this reason, the following requirements must also be satisfied:</b>

		<p>☒ In the case of thick-walled micropipes that are bundled through a plastic casing, this must be cut during installation in the outdoor splice cabinet, see image below.</p>
	<p>Chapter 2.3.2 Underground routing <b>Minimum requirements for underground routing:</b></p> <ul style="list-style-type: none"> <li>In snowy areas or in the case of dense vegetation, outdoor splice cabinets must be supplied with a marker rod to avoid collision damage and to make the cabinets easier to find.</li> </ul>	<p>Revised text/Addition. <b>Minimum requirements for underground routing:</b></p> <ul style="list-style-type: none"> <li>In snowy areas or in the case of dense vegetation, outdoor splice cabinets must be supplied with a marker rod (white/green) to avoid collision damage and to make the cabinets easier to find.</li> <li>Outdoor splice cabinets must not be labelled.</li> </ul>
	2.3.2.2 Positioning of wells and cabinets	<p>Addition <b>Minimum requirements when positioning cable wells:</b></p> <p>☒ Instructions from the supplier must be complied with when positioning cable wells.</p>
	2.3.2.2 Positioning of wells and cabinets	<p>Addition <b>Minimum requirements when positioning outdoor splice cabinets:</b></p> <p>☒ Instructions from the supplier must be complied with when positioning outdoor splice cabinets.</p>
	<p>Chapter 2.3.2.5 Collocation Collocation means that pipes and cables that are owned by several network owners are routed in the same trench. Agreement regarding terms and conditions for collocation is reached between the parties on a case-by-case basis. The requirements regarding collocation must be at least in accordance with "Instructions for Robust Fiber".</p>	<p>Revised text. Collocation means that pipes and cables that are owned by several network owners are routed in the same trench. Agreement regarding terms and conditions for collocation is reached between the parties on a case-by-case basis. The requirements regarding collocation must be at least in accordance with "Instructions for Robust Fiber". It is important to consider different colour markings in the event of collocation.</p>
	<p>Chapter 2.3.3 Minimum backfill height <b>General requirements regarding minimum backfill height:</b> Farmland 55 cm.</p>	<p>Revised text <b>General requirements regarding minimum backfill height:</b> Farmland 70 cm.</p>
	<p>Chapter 2.3.3 Minimum backfill height <b>Supplementary requirements regarding backfill height:</b></p> <ul style="list-style-type: none"> <li>Where ducting crosses smaller roads, such as farm roads, country roads or forest roads, the backfill height must be at least 70 cm.</li> <li>When pressing through a road or railway embankment, the road operator's and the Swedish Transport Administration's regulations must be followed.</li> </ul> <p>At intersections with other lines, optical cables are normally routed above power cables, water and sewage pipes as well as district heating. Additional protection around the ducting may be required.</p>	<p>Revised text <b>Supplementary requirements regarding backfill height:</b></p> <ul style="list-style-type: none"> <li>Where ducting crosses smaller roads, such as farm roads, country roads or forest roads, the backfill height must be at least 70 cm.</li> <li>When pressing through a road or railway embankment, the road operator's and the Swedish Transport Administration's regulations must be followed.</li> </ul> <p>At intersections with other lines, optical cables are normally routed above power cables, water and sewage pipes as well as district heating. Additional protection around the ducting may be required. A risk analysis is recommended to ensure that the correct measures are implemented.</p>
	<p>Chapter 2.3.4.1 Intake of ducting above ground level in property <b>Minimum requirements regarding intake of ducting pipes above ground level:</b></p> <ul style="list-style-type: none"> <li>For introduction into the property, a hole must be drilled at an incline of at least 10°, with the highest point inside the property.</li> </ul>	<p>Revised text/Addition <b>Minimum requirements regarding intake of ducting pipes above ground level:</b></p> <ul style="list-style-type: none"> <li>For introduction into the property, a hole must be drilled at an incline of at least 30°, with the highest point inside the property.</li> <li>Ducting pipes must be sealed against the optical cable in the fibre outlet to prevent water leaking in from the pipe.</li> <li>In the case of overhead cables, connections must be made in accordance with the manufacturer's instructions.</li> </ul>

	Chapter 2.5.1 The ends of all non-connected cables must be sealed.	The ends of all non-connected cables must be sealed.
	Chapter 2.5.2 In order to position the optical cable correctly in the cable well or outdoor splice cabinet where a loop is to be created, careful preparation and handling are required. The cable's properties are changed if the cable is twisted, and this can easily happen during looping if this is not done correctly. Comply with the cable manufacturers instructions regarding looping. For example, some cable types may need to be looped in the form of a figure of eight. Checking whether the optical cable is twisted can be performed by inspecting that the cable's longitudinal labelling is in the same direction. A cable length of approx. 20 metres is suitable as a loop length.	In order to position the optical cable correctly in the cable well or outdoor splice cabinet where a loop is to be created, careful preparation and handling are required. The cable's properties are changed if the cable is twisted, and this can easily happen during looping if this is not done correctly. Comply with the cable manufacturers instructions regarding looping. For example, some cable types may need to be looped in the form of a figure of eight. Checking whether the optical cable is twisted can be performed by inspecting that the cable's longitudinal labelling is in the same direction. A cable length of approx. 20 metres is suitable as a loop length.
	Chapter 2.5.6 Termination means that the fibres in an optical cable are made accessible via connectors in a connection panel. The connection panel is part of an ODF unit (Optical Distribution Frame), see below.	Termination means that the fibres in an optical cable are made accessible via connectors in a connection panel. The connection panel is part of an ODF unit (Optical Distribution Frame), see below.
	Chapter 2.7 As regards cable wells, there are a great many different types of locks, e.g. lockable inner hatches or specific "opening tools". If a cable well is placed below ground level, i.e. with backfill material above the well cap, no locking device is required. The same applies if the well cap is so heavy that it makes unauthorised access difficult.	As regards cable wells, there are a great many different types of locks, e.g. lockable inner hatches or specific "opening tools". If a cable well is placed below ground level, i.e. with backfill material above the well cap, no locking device is required. The same applies if the well cap is so heavy that it makes unauthorised access difficult.
<b>Appendix 3: Robust routing methods</b>	Chapter 4.8.1	New text: In the case of directional drilling, it is important to measure the location of the actual pipe, not that of the pilot. The position of these can vary quite considerably.
<b>Appendix 4: Robust sites and nodes</b>	2.2.6.1 Lightning protection <b>Minimum requirements for lightning protection:</b> <ul style="list-style-type: none"> <li>The site must be properly earthed, for example with an earthing rod or earthing ring.</li> </ul>	Revised text <b>Minimum requirements for lightning protection:</b> <ul style="list-style-type: none"> <li>The site must be properly earthed.</li> </ul>
	2.2.9.2 Sabotage protection <b>Minimum requirements for sabotage protection:</b> <ul style="list-style-type: none"> <li>Towing and lifting eyelets must be removed from technical shelters or climate cabinets.</li> </ul>	Revised text <b>Minimum requirements for sabotage protection:</b> <ul style="list-style-type: none"> <li>If possible, towing and lifting eyelets must be removed from technical shelters or climate cabinets.</li> </ul>
	2.2.10.1 Burglar alarm	Revised text <b>Minimum requirements if a burglar alarm is present:</b> <ul style="list-style-type: none"> <li>Alarms must be wired</li> </ul>
	2.2.11 Biological damage <b>Minimum requirements for protection against biological damage:</b> <ul style="list-style-type: none"> <li>Where optical cables or ducting pipes are exposed to pests, such as rodent attacks, they must be supplied with rodent protection.</li> </ul>	Revised text <b>Minimum requirements for protection against biological damage:</b> <ul style="list-style-type: none"> <li>Where optical cables or ducting pipes are exposed to pests, such as rodent attacks, they must be supplied with rodent protection, e.g. by means of additional metal reinforcement or pipes and optical cables treated with repellent.</li> </ul>
	Chapter 2.2.12.1 Fire extinguishing equipment <b>Minimum requirements regarding fire extinguishing equipment:</b> <ul style="list-style-type: none"> <li>Personnel who work in the site or node must have access to hand-held CO<sub>2</sub> extinguishers of at least 6 kg.</li> </ul>	Revised text <b>Minimum requirements regarding fire extinguishing equipment:</b> <ul style="list-style-type: none"> <li>Personnel who work in the site or node must have access to hand-held CO<sub>2</sub> extinguishers of at least 6 kg in the premises.</li> </ul>

<b>Appendix 5: Documentation</b>	Chapter 2.3.3.5 Measurement report Measurement reports from delivery measurements in the form of attenuation measurements and/or OTDR measurements must be included in the documentation.	Revised text Measurement reports from delivery measurements in the form of attenuation measurements <b>or</b> OTDR measurements must be included in the documentation.
<b>Appendix 6: Inspection</b>	Chapter 2 Inspection An inspector is appointed by the client and must be approved by the contractor. The inspector must not be disqualified. Pre-inspection and final inspection are paid for by the client, while any post-inspection is paid for by the contractor.	Revised text <b>An inspector is appointed by the client.</b> The inspector must not be disqualified. Pre-inspection and final inspection are paid for by the client, while any post-inspection is paid for by the contractor.
	Chapter 2.1 Review with the client prior to implementation <b>If a review with the client is conducted prior to implementation, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>Review of contract documents, e.g. contract agreement, equipment list and timetable, as well as agreements regarding labelling and documentation.</li> </ul>	Revised text <b>If a review with the client is conducted prior to implementation, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>Review of contract documents, e.g. contract agreement, equipment list and timetable, as well as <b>requirements</b> regarding labelling and documentation.</li> </ul>
	Chapter 2.3 Visual inspection with land owners prior to implementation <b>Minimum requirements for visual inspection prior to implementation:</b> <ul style="list-style-type: none"> <li>A report must be drawn up setting out the inspected sections. Deviations from normal conditions must be noted.</li> </ul>	Revised text <b>Minimum requirements for visual inspection prior to implementation:</b> <ul style="list-style-type: none"> <li>A report must be drawn up setting out the inspected sections. <b>Faults and deficiencies</b> must be noted.</li> </ul>
	Chapter 2.4 Normative inspection <b>If a normative inspection is performed, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>Check that the employed routing method corresponds with the agreement.</li> <li>Review that pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height correspond with the agreement.</li> <li>Check that used equipment corresponds with the agreement.</li> <li>Check that labelling has been carried out in accordance with the agreement.</li> </ul>	Revised text <b>If a normative inspection is performed, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>Check that the employed routing method corresponds with the <b>requirements.</b></li> <li>Review that pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height <b>satisfy the requirements.</b></li> <li>Check that the employed equipment <b>satisfies the requirements</b></li> <li>Check that labelling has been carried out in accordance with the <b>requirements</b></li> </ul>
	Chapter 2.5 Visual inspection after implementation <b>If a visual inspection after implementation is carried out, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>A report must be drawn up setting out the inspected sections. Deviations from normal restoration (e.g. deficiencies in respect of gravel, asphalt, slabs and grass) must be noted.</li> </ul>	Revised text <b>If a visual inspection after implementation is carried out, the minimum requirements are as follows:</b> <ul style="list-style-type: none"> <li>A report must be drawn up setting out the inspected sections. <b>Faults and deficiencies</b> must be noted.</li> </ul>

	<p>Chapter 2.6 Final inspection</p> <p><b>Minimum requirements in respect of final inspection:</b> Review with representatives of the client and the contractor:</p> <ul style="list-style-type: none"> <li>• Check that the selected routing methods correspond with the agreement.</li> <li>• Review of notes regarding deviations in respect of pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height. The inspection plan is supplemented with a check of deviations that are to be rectified.</li> <li>• Review of notes regarding deviations from normal restoration (e.g. deficiencies in respect of gravel, asphalt, slabs and grass).</li> </ul>	<p>Revised text</p> <p><b>Minimum requirements in respect of final inspection:</b> Review with representatives of the client and the contractor:</p> <ul style="list-style-type: none"> <li>• Check that the selected routing methods correspond with the <b>requirements</b>.</li> <li>• Review of notes regarding <b>deficiencies</b> in respect of pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height. The inspection plan is supplemented with a check of <b>deficiencies</b> that are to be rectified.</li> <li>• Review of notes regarding <b>deficiencies</b> from normal restoration (e.g. deficiencies in respect of gravel, asphalt, slabs and grass).</li> </ul>
	<p>The inspection plan is supplemented with a check of deviations that are to be rectified.</p> <ul style="list-style-type: none"> <li>• Check that used equipment corresponds with the agreement.</li> <li>• Check that labelling has been carried out in accordance with the agreement.</li> </ul> <p>If a normative inspection and/or visual inspection before/after implementation have not been carried out, the following will be added during the inspection in the field:</p> <ul style="list-style-type: none"> <li>• Check with the contractor that employed routing methods correspond with the agreement.</li> <li>• Review with the contractor that pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height correspond with the agreement.</li> <li>• Checking of deviations from normal restoration (e.g. deficiencies in respect of gravel, asphalt, slabs and grass).</li> <li>• Check that used equipment corresponds with the agreement.</li> <li>• Check that labelling has been carried out in accordance with the agreement.</li> </ul>	<p>The inspection plan is supplemented with a check of <b>faults and deficiencies</b> that are to be rectified.</p> <ul style="list-style-type: none"> <li>• Check that used equipment corresponds with the <b>requirements</b>.</li> <li>• Check that labelling has been carried out in accordance with the <b>requirements</b>.</li> </ul> <p>If a normative inspection and/or visual inspection before/after implementation have not been carried out, the following will be added during the inspection in the field:</p> <ul style="list-style-type: none"> <li>• Check with the contractor that employed routing methods correspond with the <b>requirements</b>.</li> <li>• Review with the contractor that pipe bedding, number of ducting pipes, cable marking, backfilling and backfill height correspond with the <b>requirements</b>.</li> <li>• Check of <b>faults and deficiencies</b> from normal restoration (e.g. deficiencies in respect of gravel, asphalt, slabs and grass).</li> <li>• Check that employed equipment corresponds with the <b>requirements</b></li> <li>• Check that labelling has been carried out in accordance with the <b>requirements</b>.</li> </ul>
	<p>Chapter 2.7 Inspection report Approval: Adopting a stance in respect of approval/rejection.</p>	<p>Revised text</p> <p>Approval: Adopting a stance in respect of approval/rejection <b>from both parties with a written signature, digital signature or e-mail signature</b></p>



**Amendments:** Amendments of Instructions for Robust Fiber carried out on 01/04/2018

Date 01/04/2018		
Document	Previous text	Addition or revised text
<b>General</b>	MINIMUM REQUIREMENTS	All minimum requirements are indicated with green text.
<b>General</b>	IMAGES	Supplementary images and updated illustrations are generally included to create clarity. Some images have been moved to other positions.
<b>Main document</b>	1.4 About the instructions	Updated list of appendices
<b>Main document</b>	1.6 Limits	1.6 Network topology and limits The chapter has been supplemented with a network overview
<b>Main document</b>	1.6.1 – 1.6.5	Updated information. Image altered national networks.  1.6.4 MINIMUM REQUIREMENTS In the event the access node constitutes a connection point between various network owners, the linking of the fibre connections must take place through a cross-connection.
<b>Main document</b>	1.7	Adjusted body text.
<b>Main document</b>	3.2 3-3	Adjustment of standards and recommendations.
<b>Main document</b>	4.	Additional contributory organisations.
<b>Appendix 1</b>	New terms	Splicing box and Facade box introduced
<b>Appendix 1</b>	2.6	Splicing plan. Corrected text.
<b>Appendix 1</b>	2.9	Adjusted heading
<b>Appendix 2: Robust networks</b>	2.2.1 Ducting pipe. Text regarding ducting pipe and minimum requirements has been moved here from point 2.2.1.3, as well as adjustment of minimum requirements and additional requirements.	Additional minimum requirements: Ducting pipes must be spliced with a sealed splice connection according to the manufacturer's instructions. Corrected additional requirements in respect of longitudinal water sealing. From moisture barrier to longitudinally watertight cable.
<b>Appendix 2: Robust networks</b>	2.2.1.1 Marking of ducting. Point moved and new numbering, 2.2.1.3.	New text
<b>Appendix 2: Robust networks</b>	2.2.1.2 Optical pipes. New text and new minimum requirements. Numbering altered to 2.2.1.1.	Rewritten text and minimum requirements introduced regarding optical pipes. SDR value must be at least 10.
<b>Appendix 2: Robust networks</b>	2.2.1.3 Micropipes. Numbering altered to 2.2.1.2	Size 18/12 removed.
<b>Appendix 2: Robust networks</b>	2.2.2.1 Cable wells 2.2.2.3 Moisture in outdoor splice cabinet	2.2.2.1 Cable wells. New image. 2.2.2.3 New image of slotted casing 2.2.2.3 Supplementary minimum requirements regarding slots in casing for drainage
<b>Appendix 2: Robust networks</b>	2.2.3.1 Position measurement	Minimum requirements adjusted. Removed is recommended under requirements.
<b>Appendix 2: Robust networks</b>	2.2.3.2 Marking	Corrected text in respect of marking.

Appendix 2: Robust networks	2.2.3.2 Marking	Minimum requirements adjusted. The search string's location removed
Appendix 2: Robust networks	2.3.2 Underground routing	<b>Minimum requirements</b> adjusted with regard to labelling of outdoor splice cabinets according to the client's instructions.  <b>Recommendation</b> adjusted. Removed in event of pressing through railway embankment .....
Appendix 2: Robust networks	2.3.2.1 Backfill and pipe bedding	2.3.2.1 Bed in pipes. Dimensioning of spacers New image, pipe bedding and backfill material
Appendix 2: Robust networks	2.3.2.2 Minimum requirements when positioning outdoor splice cabinets	Supplement. Placement of outdoor splice cabinets, opening. According to the manufacturer's instructions. Backfill adjusted.
Appendix 2: Robust networks		2.3.2.6 Backfill material New section regarding grain size of backfill material
Appendix 2: Robust networks	2.3.3 Supplementary requirements	Adjusted. Cleared ditch bottom.
Appendix 2: Robust networks	2.3.4.1 Intake of ducting....	Adjusted minimum requirement: sealing must be performed as close to the inner wall as possible. Cleared ditch bottom.
Appendix 2: Robust networks	2.3.6 Routing on poles	2.3.6 Supplement: • Guys to counteract lateral forces in the event of branching or bends
Appendix 2: Robust networks	2.3.6.2 Requirements regarding height above ground of overhead cables	Requirement regarding EBR K30:04 has been added Image changed.
Appendix 2: Robust networks	2.3.7 Installation at bridges	Minimum requirements adjusted: There must be a cable loop on at least one side of the bridge if the cable is a trunk fibre cable. Customer cables do not need to be looped. Image changed
Appendix 2: Robust networks	2.4.3 Optical cables for indoor routing	2.4.3 Optical cables for indoor routing  Minimum requirements supplemented with Boverket's regulations.
Appendix 2: Robust networks	2.5 Cable management	When blowing micro-cable, a compressor with a moisture separator and the correct filter according to the compressor manufacturer must be used.  Text regarding looping optical cable in cable well amended.
Appendix 2: Robust networks	2.5.2 Minimum requirements regarding routing of optical cable in cable wells and outdoor splice cabinets	<b>Addition:</b> All fibre-optic cables for outdoor use must be able to cope with lying in water.
Appendix 2: Robust networks	2.5.4 Splicing cables	<b>Adjustment:</b> welding splices.

Appendix 2: Robust networks	2.5.5 Splicing units	<p>2.5.5 Splicing units Minimum requirements regarding splicing box and wall box:</p> <ul style="list-style-type: none"> <li>• Splicing boxes and wall boxes for outdoor use must satisfy class IP68 as a minimum</li> <li>• Wall boxes for outdoor use must be able to be locked in the form of a seal.</li> <li>• Wall boxes that are positioned so that they are accessible to the general public must be class IK 8.</li> <li>• Splicing boxes must be UV-resistant</li> <li>• Splicing boxes must be pressure-tight in order to cope with a water pressure equivalent to a 5 m water column</li> <li>• Splicing boxes must withstand the strains to which they are subjected in water-filled wells, installed in the open air or buried directly in the ground.</li> </ul> <p>Supplementing with facade box.</p>
		<p>Minimum requirements regarding splicing cabinet:</p> <ul style="list-style-type: none"> <li>• Splicing cabinets for outdoor routing above ground must be surrounded with an external enclosure that satisfies at least classification IP34. Ensure that the IP classification for the splicing cabinet is sufficient, e.g. in respect of pests and water penetration, for the environment where the splicing cabinet is located.</li> <li>• When outdoors, splicing cabinets must be installed in an outdoor splice cabinet or equivalent enclosure.</li> <li>• Splicing cabinets must be UV-resistant.</li> <li>• Splicing cabinets that are positioned so that they are accessible to the general public must be class IK 8.</li> </ul>
Appendix 2: Robust networks	2.5.6 Termination of cable in node	CPR requirement introduced.
Appendix 2: Robust networks	2.5.9 Termination in property	<p><b>Minimum requirements supplemented:</b> Standalone also means a unit/plate on which a switch is installed and there is a separate space for fibre on the unit/plate.</p>
Appendix 2: Robust networks	2.5.11 Delivery measurement of fibre connections	<p>Revised measurement methods and limit values. Can be found under 2.5.11–2.5.13</p> <p>Passive and active measurement</p>
Appendix 2: Robust networks	2.6 & 2.6.1	<p>2.6 Clarification regarding the ageing and weather resistance of the labelling.</p> <p>2.6.1 Supplementary minimum requirements</p> <ul style="list-style-type: none"> <li>• Ducting pipes must be labelled at both inputs and outputs in wall</li> </ul>

		bushings when connecting a building/property. Exceptions may be made if the ducting pipe is present for an individual customer connection, e.g. connection to a single dwelling unit.
<b>Appendix 2: Robust networks</b>	2.6.4 Minimum requirements regarding labelling of splicing units: <ul style="list-style-type: none"> <li>• On a splice cassette, it must be clear which fibres in an optical cable are spliced in the cassette.</li> <li>• Splice cassettes must be labelled with "Warning: laser".</li> </ul>	2.6.4 Minimum requirements regarding labelling of splicing units: <ul style="list-style-type: none"> <li>• On a splice cassette, it must be clear which fibres in an optical cable are spliced in the cassette.</li> <li>• The splicing unit must be labelled with "Warning: laser".</li> </ul>
<b>Appendix 2.1 Calculating attenuation</b>	2.1 Calculation for calculating attenuation	New appendix
<b>Appendix 3 Routing methods</b>	2.1 General advantages and disadvantages	Adjusted text
<b>Appendix 3 Routing methods</b>	3.2 Prior survey on site 3.3 Collocation	Updating of text.
<b>Appendix 3 Routing methods</b>	3.4 Permits and land issues	Updating of the text on the requisite permits and agreements. Updating of text "Items that often differ between different land owners". As well as cable location.
<b>Appendix 3 Routing methods</b>	3.5 TA plan	Updating of text.
<b>Appendix 3 Routing methods</b>	3.6 Work environment	Updating of text.
<b>Appendix 3 Routing methods</b>	3.8 Subsequent survey on site	Updating of text.
<b>Appendix 4 Robust sites and nodes</b>	2.2.5 Electricity supply	Title changed to Electrical installation The electrical installation in sites and nodes must be executed in accordance with applicable laws and regulations.
<b>Appendix 4 Robust sites and nodes</b>	2.2.5.2 <i>Auxiliary power system</i>	2.2.5.2 <i>Auxiliary power system</i> <b>Minimum requirements regarding auxiliary power systems:</b> <ul style="list-style-type: none"> <li>• Where there is a UPS with batteries, the site must have an externally accessible intake for connecting the auxiliary power unit (emergency power generator).</li> </ul>
<b>Appendix 4 Robust sites and nodes</b>	2.2.12 Fire protection	2.2.12 Fire protection <ul style="list-style-type: none"> <li>• Boverket's building regulations (BBR) handle regulations relating to fire protection.</li> <li>• <b>Minimum requirements regarding fire protection:</b></li> </ul>

		The site's surrounding surface (e.g. walls, floor, roof, doors and windows) must satisfy fire class EI 30 on both sides as a minimum. Changed from 6 kg to 5 kg fire extinguisher.
<b>Appendix 5: Documentation</b>	<i>2.3.2.3 Survey file</i> Example of list of measured coordinates that has been created during geodetic position measurement of the ducting:	<i>2.3.2.3 Survey file</i> Below is an example of a list of measured coordinates that has been created during geodetic position measurement of the ducting. Z indicates the height in metres above sea level (in principle) and can be used to determine the flatness of the ducting's routing.
<b>Appendix 6: Inspection</b>		Appendix 6 has been supplemented with a process image and sentence in relation to AB 04 and ABT 06, as well as linguistic adjustments.
<b>Appendix 6: Inspection</b>	3.7 Final inspection	Minimum requirements adjusted for practical implementation.
<b>Appendix 6.1: Checklists, inspection</b>		The section Checklists has been transferred to a separate document, Sub-appendix 6.1 Checklists, inspection
<b>Appendix 7: Fibre installation projects</b>		Only linguistic adjustments.

**Amendments:** Amendments of Instructions for Robust Fiber carried out on 03/04/2018

Date 01/04/2018		
Document	Previous text	Addition or revised text
<b>Appendix 4 Sites and nodes</b>	Addition 2.2.15 Compilation of requirements and recommendations for sites and nodes	Supplementing with table regarding requirements and recommendations for sites and nodes