

Appendix D Requirements Definition

Project Technical Specification

Delivery will consist of spine fibre infrastructure and end site connections into public sector sites. The scope of the expected spine fibre and end site connections to be delivered are detailed in the attached schedule..

All deployed fibre infrastructure will be provided to Xxxxxx as "Dark Fibre". The fibre will be deployed using Openreach's Physical Infrastructure Access (PIA) and Duct and Pole Access (DPA) products, where possible in order to reduce build costs. The expectation from xxxxM is for PIA / DPA and where this is not possible a detailed breakdown should be provided along with a proposed solution and detail of any additional cost.

Routes should be built using Trial Rod & Rope (TR&R) to test PIA routes and where required Local Authority notices/ approvals for work/ traffic management.

The deployed fibre infrastructure will be delivered with open access 'T-Node' break out points where the sites are located as well as in mid-span joint locations, and other points agreed with Xxxxxx.

The connection should be as a ::

- 1) A point to point dedicated Dark Fibre pair installed between an "A" end Connection point and a "B" end connection point as defined in Appendix 2 for each such connection. Where the "B" end connection point is at a BT Exchange, termination will be in the joint handover chamber associated with that BT Exchange.

The connection may be either:

An "End Site" to Hub Site or BT Exchange.

A Backhaul connection from BT Exchange / Hub Site to BT Exchange / Hub Site.

Each fibre pair that has an "on premise" termination point will terminate at the site in a Supplier-provided Service Demarcation Point to be installed within 25m from the building entry point. There should be some flexibility around this especially in respect of offsetting longer internal fibre runs against ones that are significantly shorter than 25m.

The onsite termination point will be available for a communications provider to connect their service into.

For each site delivery a customer site survey will take place which will confirm the onsite termination point and identify any delivery issues. Where one end of a fibre connection is at an Openreach Exchange, the Spine cable will be left coiled and unterminated in the joint handover chamber.

Provided that a Communications Provider contracted by Xxxxxx has rack presence in the Exchange, the only additional cost to the Communications Provider to connect up service would be the purchase of a cable link product from Openreach. At the Exchange end of the service, the Spine cable will be left coiled and unterminated at the joint handover chamber, ready for connection to the Openreach cablelink.

Where the fibre terminates at a "Hub Site" this will be onto a rack within the Hub Site location.

All fibre deployed will conform to the International Telecommunication Union (ITU-T) G657.A1 standard.

It is anticipated that the project will deliver additional “spare” fibre pairs into the Town Fund Project) in addition to those pairs stipulated in for xxx use:

Any “Spare” fibres delivered will be reported in an open and transparent way to xxxxx Whilst these “spare” fibres will be owned by the fibre provider and available for the fibre provider to benefit commercially from this will be on the understanding that:

- Spare fibres will be made available to third party providers on an Open access basis.
- Any “transit” revenue secured by the fibre provider as a result of selling transit capacity over these “spare” fibres, 25% of this revenue will be provided to xxx for investment in fibre infrastructure or other digital solutions that benefit the Borough.

Spare fibre shall be made available to any Communications Provider (CP) on an open access basis allowing the delivery of data connectivity services. The CP will have the option of taking an unlit or lit service from the Dark Fibre. All responsibility for the supply of any additional connectivity, hardware or services required by that CP to utilise the lit or unlit dark fibre shall wholly be the responsibility of that CP.

The Dark Fibre routes delivered will be updated and provided to xxx on an ongoing basis during the delivery of the project, and where there are any route changes. This information will be provided as a KMZ file for loading into Google Earth.

Indefeasible Right of Use (IRU)

The fibre pairs provided to Xxxxxx in line with those listed in the attached schedule will be delivered by the fibre provider with an IRU. This IRU will be for a 15 Year Period from handover of the connection. The IRU will require the supplier to provide such maintenance services required for the proper functioning of any service delivered over the fibre, as Planned Outages, except in an emergency situation. The IRU will also require the supplier to respond to and fix any fibre issues in line with an agreed market leading SLA. There will be NO ongoing cost to xxx in respect of the IRU. Support cost for the full 15 year period will be included in the project cost.

Problem Handling

Service support will be provided 24/7 365 and the Target Times to Repair (TTTR) for any interruption to the Service, including failure to achieve the transmission parameters detailed in Appendix 1 (Testing and Acceptance), will be from the time of receipt of the Outage Notice by The Supplier and are as follows:

Major Fault	6 hours
Minor Fault	8 Hours

Major fault would be one where any circuit cannot send or receive traffic.

If The Supplier fails to meet the above Time to Repair targets, The Customer shall be entitled to a Service Credit in line with an agreed schedule..

The Customer shall submit a request in writing for payment, within fifteen (15) Working days of the end of the calendar month in which the alleged breach of any SLA occurred. The Customer shall, in respect of each such request, provide to The Supplier such information regarding the alleged breach as The Supplier may reasonably request.

The Customer shall immediately notify The Supplier of any suspected Outage (having made all reasonable enquiry to verify that the underlying fault is the responsibility of The Supplier under the Agreement) by way of an Outage Notice and provide The Supplier with sufficient information and assistance (as required by The Supplier) to enable The Supplier to restore the Service. The Supplier will be entitled to charge the Customer a reasonable service fee at current charging rates on an on-site call-out basis minimum half day rate, if the need for any maintenance results from:

- (i) misuse or neglect of or accidental or wilful damage to the Equipment where such misuse, neglect or damage occurs on the Customer's side of the point of interconnect in the Sites; or
- (ii) failure by the Customer to comply with any of the provisions of the Agreement
- (iii) fault or other problem associated with the Customer Apparatus.

Faults may be reported to The Supplier Network Operations Centre ("NOC") 24 hours a day, 7 days a week at which time a Fault Reference Number will be issued.

The Supplier's target is to respond to The Customer within 30 minutes of receipt of the Outage Notice. The Supplier shall contact The Customer designated technical point of contact. It shall be The Customer's responsibility to provide The Supplier with accurate and up-to-date contact information for such point of contact, including a valid telephone number and/or e-mail address.

The Supplier will following the Outage Notice take all reasonable steps to restore the Service in accordance with the terms of the Agreement.

On notification of a fault by The Customer to The Supplier, The Customer shall perform all reasonable enquiries to verify that the underlying fault is the responsibility of The Supplier under the Agreement to the demarcation point as specified by The Supplier and shall co-operate fully with The Supplier NOC in order to locate any fault.

Appendix 1 – Testing and Acceptance

This section covers the specific testing for the Dark Fibre Additional Connections.

1. DARK FIBRE CIRCUIT TESTING

1.1. Acceptance Testing Specification

1.1.1. The Supplier's overall Dark Fibre design has taken into consideration the transmission parameters set out in the standard ITU-T G657 A1 characteristics of a single mode optical fibre and cable.

1.1.2. The full specification of the Dark Fibre is shown in Annex 1.

1.1.3. Testing will be carried out in accordance with industry standards.

1.1.4. The Customer will be presented with test results for each Connection with the following Transmission Parameters:

Attenuation Limit:

≤ 0.25 dB/km @1550nm

≤ 0.36 dB/km @1310nm

Splice Loss Specification:

≤ 0.20 dB max splice loss on any single splice

Dispersion:

1310 - < 2.8 ps/nm.km

1550 - < 17 ps/nm.km

Connector Loss:

< 0.5 dB per connector

Optical Return Loss:

> -37 dB

2. ACCEPTANCE TESTS

The following key tests will be undertaken by The Supplier and its Sub-contractor:

2.1. Optical Time Domain Reflectometer (OTDR)

2.1.1. OTDR tests shall be performed on each fibre presented to determine the attenuation of the fibre and quality of each splice. The OTDR tests will be carried out bi-directionally at 1310nm and 1550nm from each Connection Point in a Connection via any intermediate cross connect points in the network. The tests will measure the fibre optic length, attenuation coefficient, connector loss and splice losses. Measured losses should not exceed the optical budget requirements detailed in the table above.

2.1.2. The splice loss figure in the applicable performance specification is measured by averaging OTDR step-in traces in both directions at 1310nm and 1550nm.

2.2. Launch Leads

2.2.1. The geometry and overall specification of the fibre within the launch lead should be compatible with that of the optical fibre to be tested. Launch leads intended for connection to OTDR equipment shall be of a length suitable to give unambiguous readings (a calibrated 1km coil) to the optical fibre and cabling components under test. Also the lead should be terminated at one end with a connector of the same design, style and manufacture as used on the fibre optic span to be tested.

2.3. Optical Loss Measurements (Power through measurement)

2.3.1. Optical loss measurements or Insertion Loss Measurements (ILM) to gauge end-to-end attenuation shall be performed **bi-directional** on each fibre at 1310nm & 1550nm. Measured losses should not exceed the optical budget requirements detailed in the table above. The ILM will be performed after acceptance of the OTDR results. This will be carried out from the ODF connectors at both A ends and B ends.

2.3.2. The expected ILM will be calculated at 1550nm as follows:

Route Km x 0.22dB + (No of Joints x 0.2dB) + 1dB connector losses = ILM

The expected ILM will be calculated at 1310nm as follows:

Route Km x 0.35dB + (No of Joints x 0.2dB) + 1dB connector losses = ILM

3. PRESENTATION OF TEST RESULTS

- 3.1. Test results will be presented to The Customer within a completion certificate. The Customer completion certificate will be emailed to The Customer's project lead as described in Schedule 5 Implementation.
- 3.2. Results will contain the following information:
 - The name of the person who performed the tests
 - The type of test equipment and serial number and calibration certificate upon request
 - A unique reference per fibre tested (Connection ID)
 - OTDR trace of each fibre tested
 - From the A-End Connection Point to the B-End Connection Point e From the B-End Connection Point to the A-End Connection Point
 - Event type
 - Attenuation
 - Return loss e Distance in Km
 - Pulse width e Loss measurements
- 3.3. The power loss measurements will be delivered as follows.
 - Calibration results
 - Reference power
 - Reference power variation (before and after measurement).

4. TESTING OF NON-DARK FIBRE CIRCUITS

- 4.1. The Supplier will carry out internet performance (iPerf) testing of each non-dark fibre circuit by connecting an iPerf tester at each end of the circuit to measure the download and upload throughput bandwidths, and any latency, jitter and packet loss levels, of the circuit.
- 4.2. The iPerf tester works by generating data traffic from a computer acting as a client which is sent to the IP address of a computer acting as the server. Bandwidth is measured by Transmission Control Protocol (TCP) tests which are geared to show an actual representation of the network speeds being received.
- 4.3. To carry out the testing, one of The Supplier's field engineer will connects an iPerf tester at one end of the circuit and a second field engineer will connect another iPerf tester at the other end of the circuit.
- 4.4. Measures will be:
 - Bandwidth will be measured in Gigabytes per second (Gbps)
 - Jitter and Latency will be measured in milliseconds (ms)
 - Packet loss will be measured as a percentage of packets lost with respect to packets sent (%)
- 4.5. The bandwidth and jitter, latency and packet loss measurements of the circuit are recorded on an Acceptance Test Certificate and issued to The Customer for approval as described in Schedule 5 Implementation.

5. MI REPORTING

- 5.1. Following Testing and Accepting, The Supplier will support The Customer in completion of the required Management Reporting templates as defined below
[insert reporting requirements]

6. DARK FIBRE SPECIFICATION

Issue D 23rd July 2019 Page 1 of 2

Blown Mini Cable 144f Singlemode



Application

Optical mini cable for installation into microducts by blowing using air at pressures up to 15 bar using industry standard equipment. Examples of installation equipment are the CBS Airstream, Breeze, and Plumettaz MiniJet. Recommended minimum microduct bore 10mm.

Features and Benefits

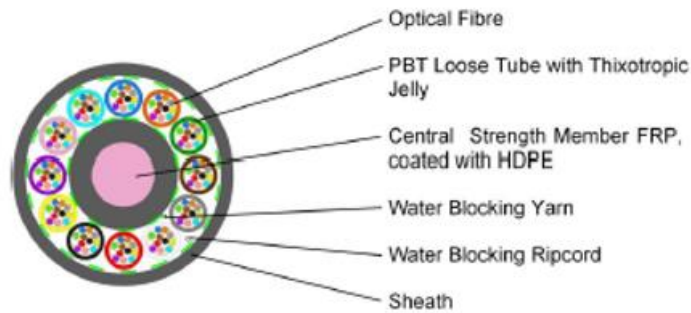
Sheath:	Low friction for improved installation performance
Stripping:	Ripcord provided for quick and easy sheath removal
Colour coding:	Individually colour coded loose tubes for easy identification
Water Blocking:	Dry core with water swellable elements. Gel-filled loose tube.

Technical Data

	Cable Option A	Cable Option B
Fibre Specification	ITU-T G.657A1, G656 or G.652D options available	
Standards	IEC 60794-1-2	
Stranding	SZ	
Central strength member	4.5mm (3mm FGRP with PE sheath)	4.5mm (2.1mm FGRP with PE sheath)
Number of tubes	12	
Loose tubes	1.45mm nominal diameter	
Fibres per tube	12	
Outer sheath	0.5mm minimum thickness, HDPE (nylon option available)	
Outer sheath colour	Black or customer requirement	
Cable outer diameter	8.5 mm nominal	
Cable mass	58 kg/km nominal	
Maximum tensile load	580 N	
Crush resistance	700 N (100 mm plate)	
Minimum bend radius	20 x outside diameter	
Temperatures	Storage/Transport: -20°C to +70°C Installation: -10°C to +50°C Operating: -20°C to +60°C	
Storage Time on Drum	12 months (recommended maximum)	
Fibre Attenuation (20°C)	0.36 dB/km max at 1310 nm and 1383 nm 0.25 dB/km max at 1550 nm	

Note - Cable Option B has been developed with a smaller central strength member making it more flexible, predominantly for the UK market, where the cable runs tend to have more bends. Cable Option A is most suited for blowing into longer straight routes.

CONSTRUCTION



FIBRE AND TUBE IDENTIFICATION

Colours to EIA 598 or customer requirement

No.	1	2	3	4	5	6	7	8	9	10	11	12
Colour	Blue	Orange	Green	Brown	Grey	White	Red	Black	Yellow	Violet	Pink	Aqua

SHEATH MARKING

Marked every 1m with standard Emtelle printing or to customer requirement

Emtelle Fibreflow – <<Year>> – 144f <<Fibre Type>>, <<Product Code>> –<< Batch ID>> – <<Meter Mark>>

PRODUCT CODES

Product Code	Description	Option
90081	144F MINICABLE G657A1 BLACK	A
90317	144F MINICABLE G652D BLACK	A
91143	144F MINICABLE G657A1 BLACK	B
91144	144F MINICABLE G652D BLACK	B

End of Document

DRAFT