

openreach

ISIS Directive

For All FND FTTP survey, build teams & their
internal and external build partners

NWK/LNK/C569

Issue 7, 29-Mar-2023

Use until 29-Mar-2024

Published by Network Optimisation and Health
Team

Privacy- Internal

Process for quality assurance in FTTP network build

Process description of the approach to FTTP Build

About this document ...

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Content approval

This is the Issue 7 of this document.

The information contained in this document was approved on 29-Mar-2023
by Alison Healy, Senior Manager, Construction Management Office

Version History

Version No.	Date	Author	Comments
Issue 7	29-Mar-2023	Melanie Henderson	Minor updates within section 5.1
Issue 6	14-Feb-2023	Melanie Henderson	Inclusion of NGWFMT process and Strategic OTH
Issue 5	07-Jan-2022	Ken Topping	LMTP Quality process expanded across all FTTP SDU Build programmes
Issue 4	17-Dec-2020	Ken Topping	Section 9 – updated to include Auto Toggle process. Section 10.4 on 'Final Set-up for Openreach Lead to Cash Integration. Section 10.5 updated to include Lead to Cash Failure Models.
Issue 3	25-Aug-2020	Ken Topping	Section 10.3 updated to reflect Auto-toggle light testing at splitter/sasa is Mandatory, not Best Practice.
Issue 2	16-Jan-2020	Ken Topping	Initial content reviewed & updated to reflect revised Quality Gating terminology. T-RFS captured as NQC and Commissioning ISIS document ref NWK/LNK/C574. Section 10.2 and 10.3 updated to include reference to light loss port testing methodology.
Issue 1	16-Aug-2019	Ken Topping	Initial issue

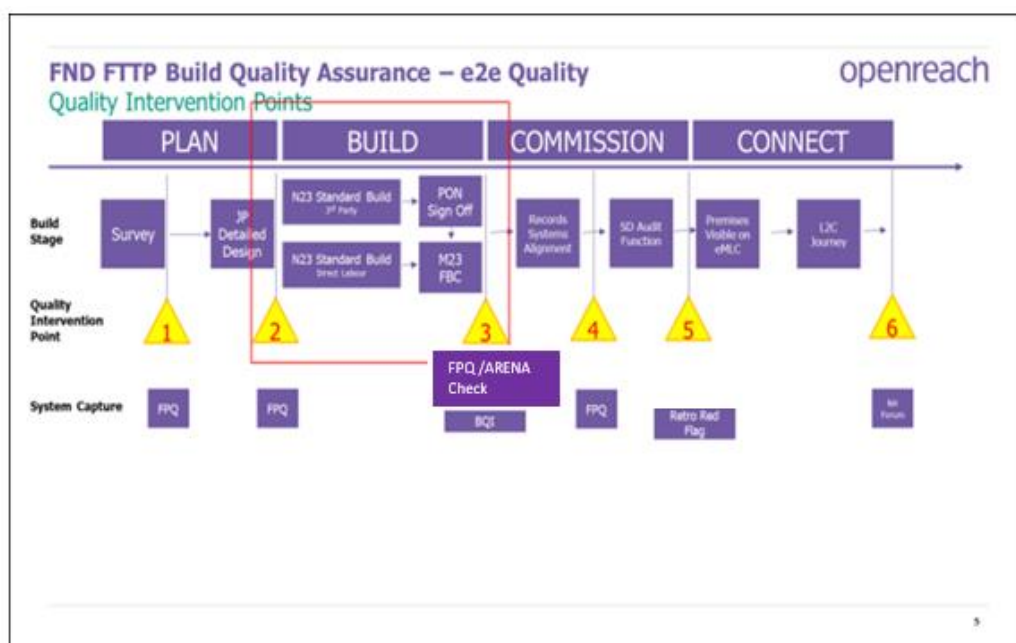
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1 Introduction

This document provides an overview of the process for the future state FTTP build process, how work is passed from 'Plan' into the 'Build' phase and then how the built FTTP network is then handed into the 'Commission' phase.

The scope of this document is bookended by quality intervention points, specifically QIP2 (post-design check), and QIP3 (post-build check). This is described below in the red box –



To enable FTTP Build meet our Openreach Internal Audit November 2018 audit recommendations (Reference – 07/OIA/18-19) the initial iteration of the build policy was specifically designed to be applied only to Fibre Cities build but has now expanded across FTTP SDU Build.

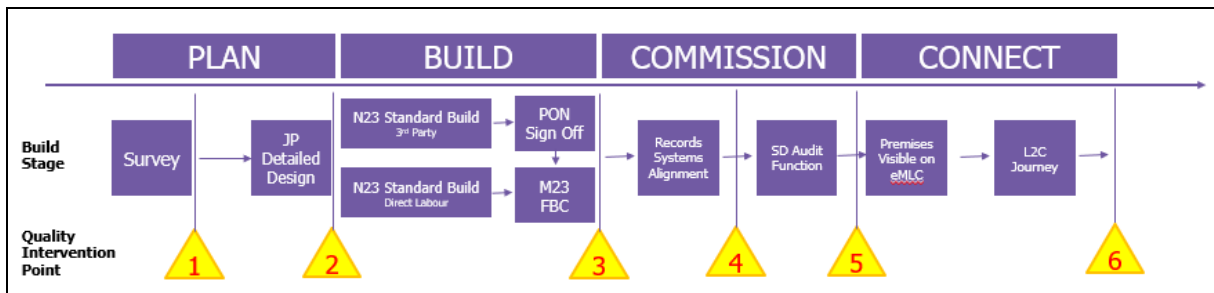
2 Definitions

2.1 Definition summary

Openreach has agreed on the following definitions for the key design and delivery stages –

Plan – Build – Commission – Connect

Showing these sequentially would be as so –



The stage prior to build stage is named the Plan phase and will be covered by another ISIS document (NWK/LNK/C541), the gate at the end of this process is called quality intervention point 2 (QIP2), which the gate that straddles Plan and Build stages.

We then enter the Build phase, which is the scope of this document. The scope of this document is localised to FTTP PON build.

The build activity is owned by FND Fibre Build & Chief Engineer and can be undertaken by their direct labour, or an external 3rd party (such as our key build agent partners).

As we complete the physical build work, we require the Field-Based Co-ordinator (FBC) to complete two distinct FPQ/ARENA checks, to pass to distinct gates of Engineering Complete (EC) and Network Quality Checked (NQC).

The gate at the end of the Build process is called quality intervention point 3 (QIP3), which is the gate that straddles Plan and Build stages.

We then enter the Commissioning phase, which is not the scope of this document but is defined in NWK/LNK/C574.

2.1.1 Plan Phase

Plan Phase Complete – An FTTP PON has been designed and is now ready for build when:

1. The original design brief has been met against the current policy in terms of technology utilised, location of equipment, and distance from premise to headend switch and premise to the CBT have been achieved.
2. The design requirements have been met in terms of the original premises in scope of the PON now have designs to reach these premises or we have captured ORION notes on moved out of scope.
3. The planning FPQ 290 check, has been successfully completed by the responsible Planning team against the required sample rate in the defined plan process document, and has been captured on the FPQ system.

2.1.2 Quality Intervention Point 2 (QIP2)

This is one of our six quality intervention points, which assist Fibre Build illustrate quality throughout the end to end FTTP plan, build and connect process. QIP2 occurs as we conclude the plan phase. The completion of the planning FPQ checks, and Fibre Build's ability to report on volume and outcome of these checks are an illustration of QIP2 operating.

2.1.3 Engineering Complete (EC)

EC- *A premise is engineering complete when:*

- FPQ check 590 or ARENA Mult Work Point (MWP) check has been successfully completed by the responsible Field Based Co-ordinator in the region, and has been captured on the FPQ/ARENA system.

2.1.4 Network Quality Checked

NQC: The FTTP PON is now ready to enter the commissioning phase

An FTTP PON is ready to enter the commissioning phase once NQC has been achieved and the following attributes are achieved:

- Network has been built according to current build policy.
- Each SASA tray within a Splitter has a successful Auto Toggle test completed.
- Each customer port on each CBT has a successful light integrity test.

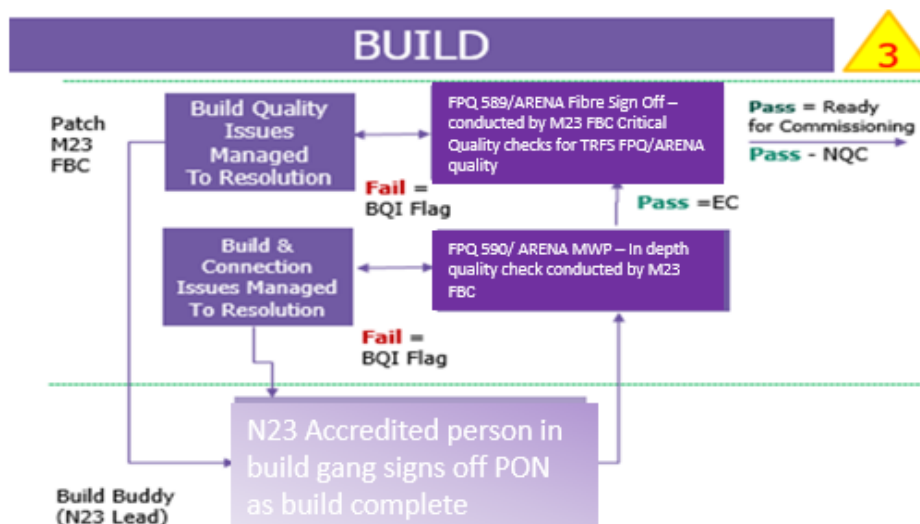
1. Each customer port is only tested when Optical Test head is present in the build.
 2. When Optical Test Head is not present we should light test port 1 on each CBT.
 3. If neither Auto Toggle or Optical Test Head is available you may default to manual light testing.
- Visual build quality check confirmed the existence of the network from aggregation node to CBT.
 - FPQ check 589 or ARENA Fibre Sign Off, has been successfully completed by the responsible Field Based Co-ordinator in the region, and has been captured on the FPQ/ARENA system.

2.1.5 Quality Intervention Point 3 (QIP3)

This is one of our six quality intervention points, which assist illustration of quality throughout the end to end FTTP plan, build and connect process. QIP3 occurs as we conclude the build phase. The completion of FPQ checks 589 or ARENA Fibre Sign Off and 590 or MWP check, and our ability to report on volume and outcome of these checks are an illustration of QIP3 operating.

The main data collection point for illustrative quality is a 'fail' on the FPQ590 or ARENA MWP. A fail on the FPQ590 or ARENA MWP against a PON means that the PON requires going through the PON Sign off process again, this will continue until the FPQ590 or ARENA MWP achieves a 'pass' for the PON. Hence the ability to count failure instances against a single PON illustrates we have achieved the required quality standard.

This is shown below –



The main data collection point for QIP3 is a 'pass' on the FPQ589 or ARENA Fibre Sign Off. We do not expect fails at the FPQ589 or ARENA Fibre Sign Off stage because failure should have been captured & resolved at the FPQ590 or ARENA MWP quality check.

2.1.6 Build Phase Complete

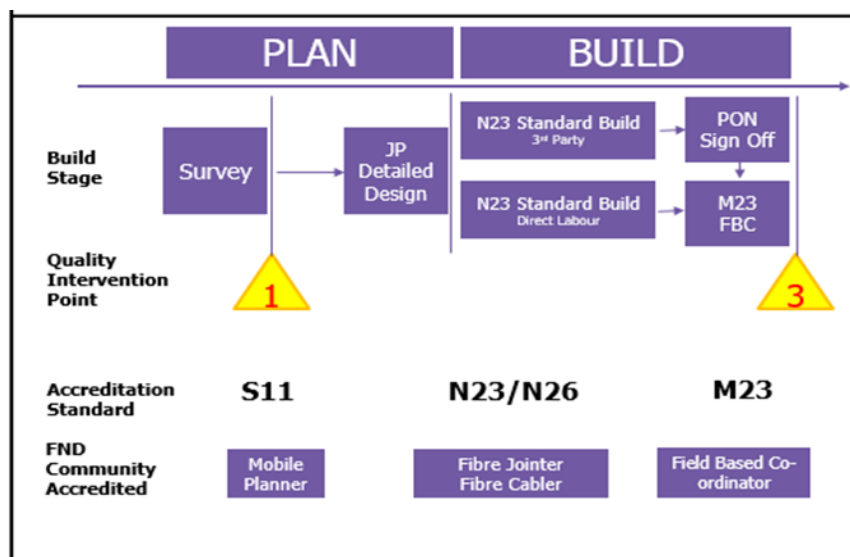
Build Phase Complete – An FTTP PON has been built and is now ready to enter the commissioning phase when

- Both checks 590/MWP, (Engineer Check) and 589/Fibre Sign Off (Network Quality Check) have been successfully completed.

3 Accreditation Required through Build Phase

3.1 Engineer Accreditation Points in e2e Process

Within the 'Plan-Build-Commission-Connect' we have three specific points are accreditation. These are shown below –



The S11, N23 and N26 accreditation can be applied across Openreach direct labour and our partners. Originally, the M23 accreditation could only be

sought and attained by Openreach direct labour however as we move into the Falcon Build Model our 3PPs will attain M23 accreditation as part of this process. The holder of the M23 Accreditation is the single point of responsibility for build quality for each PON that reaches NQC stage.

3.2 N23 – One Fibre Network Build Accreditation, FTTP Build (OH/UG)

The Openreach Accreditation process is an integral part of the Openreach Network Quality Programme (OQP). N23 One Fibre Network FTTP Strategic UG & OH Build Accreditation is designed to focus on the skills and knowledge of individuals who are required to work on the access network.

N23 module confirms FTTP Fibre Joiner's understanding & ability to complete provision of the underground and overhead network from Aggregation node to connectorised BT (CBT) using current working practices and quality standards.

3.2.1 Audience –

The scope of the N23 Accreditation module extends to all Fibre Joiners working in FTTP build, and it is an essential requirement for any Engineer/Contractor carrying out provision on FTTP strategic UG & OH Build.

3.2.2 Accreditation Process Owner –

Chief Engineer Network Quality Standards & Accreditation Specialist Team

3.2.3 Stage to Accreditation –

There are 3 distinct stages to becoming N23 accredited, formal training, on-line questionnaire and a practical assessment; only once all 3 have been completed sequentially does a person become N23 accredited.

3.2.3.1 Formal Training stage for N23 Readiness

Who Needs Trained – All Fibre Connectorised engineers across FTTP build.

New entrant engineers will complete Module OROFN001 as part of Initial Training

Upskill training will module ORNGA203 will be completed by existing engineers

Led by Who – L&D

Length - OROFN001 – 5 days as part of Initial Training
ORNGA203 – 2-day upskilling

3.2.3.2 **N23 Pre-Accreditation Questionnaire**

Who needs to complete the Questionnaire – All Fibre Jointers across FTTP Build who have completed formal training

Led By – Lead Assessors (As approved by Chief Engineers Network Quality and Standards team)

Length – 90 minutes

3.2.3.3 **N23 Accreditation**

Who needs to pass Accreditation – all Fibre Jointers across FTTP Build who have completed N23 Questionnaire

Led By – Lead Assessors (As approved by the Service Delivery Network Reliability Team or Chief Engineers Network Quality and Standards team)

Length – 6 hours

3.2.4 **Repository of Accreditation Status –**

The Accreditation process is managed on its own unique data records management system My Skills Passport - [LD&R - Skills Passport \(bt.com\)](#)

Trending analysis is available via Accreditation Hub

[Accreditation Hub](#)

3.2.5 **Re-accreditation Cycle**

Re-accreditation runs on a 36-month cycle and this requirement will be applied across both Openreach direct labour and Openreach 3rd Party build agents. The Openreach re-accreditation process will be facilitated and completed within a designated workshop location for all Fibre Jointers.

3.3 N26 – One Fibre Network Build Accreditation FTTP Build (UG only)

The Openreach Accreditation process is an integral part of the Openreach Network Quality Programme (OQP). N26 One Fibre Network FTTP Strategic UG Build Accreditation is designed to focus on the skills and knowledge of individuals who are required to work on the access network.

N26 module confirms FTTP Fibre Jointer's understanding & ability to complete provision of the underground network from Aggregation node to connectorised BT (CBT) using current working practices and quality standards.

3.3.1 Audience –

The scope of the N26 Accreditation module extends to all Fibre Jointers working in FTTP build, and it is an essential requirement for any Engineer/Contractor carrying out provision on FTTP strategic UG Build.

3.3.2 Accreditation Process Owner –

Chief Engineer Network Quality Standards & Accreditation Specialist

3.3.3 Stage to Accreditation –

There are 3 distinct stages to becoming N26 accredited, formal training, on-line questionnaire and a practical assessment; only once all 3 have been completed sequentially does a person become N26 accredited.

3.3.3.1 Formal Training stage for N26 Readiness

Who Needs Trained – All Fibre Connectorised engineers across FTTP build.

New entrant engineers will complete Module OROFN001 as part of Initial Training

Upskill training will module ORNGA203 will be completed by existing engineers

Led by Who – L&D

Length - OROFN001 – 5 days as part of Initial Training

ORNGA203 – 2 days upskilling

3.3.3.2 N26 Pre-Accreditation Questionnaire

Who needs to complete the Questionnaire – All Fibre Jointers across FTTP Build who have completed formal training

Led By – Lead Assessors (As approved by Chief Engineers Network Quality and Standards team)

Length – 90 minutes

3.3.3.3 N26 Accreditation

Who needs to pass Accreditation – all Fibre Jointers across FTTP Build who have completed N23 Questionnaire

Led By – Lead Assessors (As approved by the Service Delivery Network Reliability Team or Chief Engineers Network Quality and Standards team)

Length – 6 hours

3.3.4 Repository of Accreditation Status –

The Accreditation process is managed on its own unique data records management system My Skills Passport [LD&R - Skills Passport \(bt.com\)](https://www.bt.com/skillspassport)

Trending analysis is available via Accreditation Hub

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3.3.5 Re-accreditation Cycle

Re-accreditation runs on a 36-month cycle and this requirement will be applied across both Openreach direct labour and Openreach 3rd Party build agents. The Openreach re-accreditation process will be facilitated and completed within a designated workshop location for all Fibre Jointers.

3.4 M23 - One Fibre Network Quality Build Audit

Accreditation, FTTP Specific at Present

3.4.1 Audience –

WF2020 'C'/TMNE3 graded direct labour FTE. We define that ideally the M23 audit role will be undertaken by the Field Based Co-ordinator (FBC) or equivalent within Chief Engineers within the FTTP Build.

3.4.2 Accreditation Process Owner –

Chief Engineer Network Quality Standards & Accreditation Specialist Team

3.4.3 Stages to Accreditation

There are 3 distinct stages to becoming M23 accredited; formal training, online proof of learning followed by practical accreditation assessment, only once all 3 have been completed sequentially does an individual become M23 accredited.

3.4.3.1 Formal Training Stage for M23 Readiness

Who needs trained – All FBCs or WF2020 'C' / TMNE3 graded equivalents across FTTP build.

Led by Who – FND Build FBC M23 Gold Users (as identified by Chief Engineers Network Quality and Accreditation Team)

Length – 1 day workshop, including on-line proof of learning

3.4.3.2 M23 Pre-Accreditation Buddying

Who needs to be Buddied – All FBCs or WF2020 'C' / TMNE3 graded equivalents across FTTP Build who have completed M23 readiness training.

Led by Who – FND Build FBC M23 Gold

Length – 1-month shadowing – update to show FND internal gold users and shadowing

3.4.3.3 M23 Accreditation

Who needs to pass Accreditation – All FBCs and WF2020 'C' / TMNE3 graded equivalents in FTTP Build who have completed M23 buddying.

Led by Who – FND Regional Assessors (identified by Chief Engineers Network Quality and Accreditation Team)

Length – 1-day activity

3.4.4 Repository of Accreditation Status

The Accreditation process is managed on its own unique data records management system My Skills Passport [LD&R - Skills Passport \(bt.com\)](https://www.bt.com/ld&r-skills-passport)

Trending analysis is available via Accreditation Hub

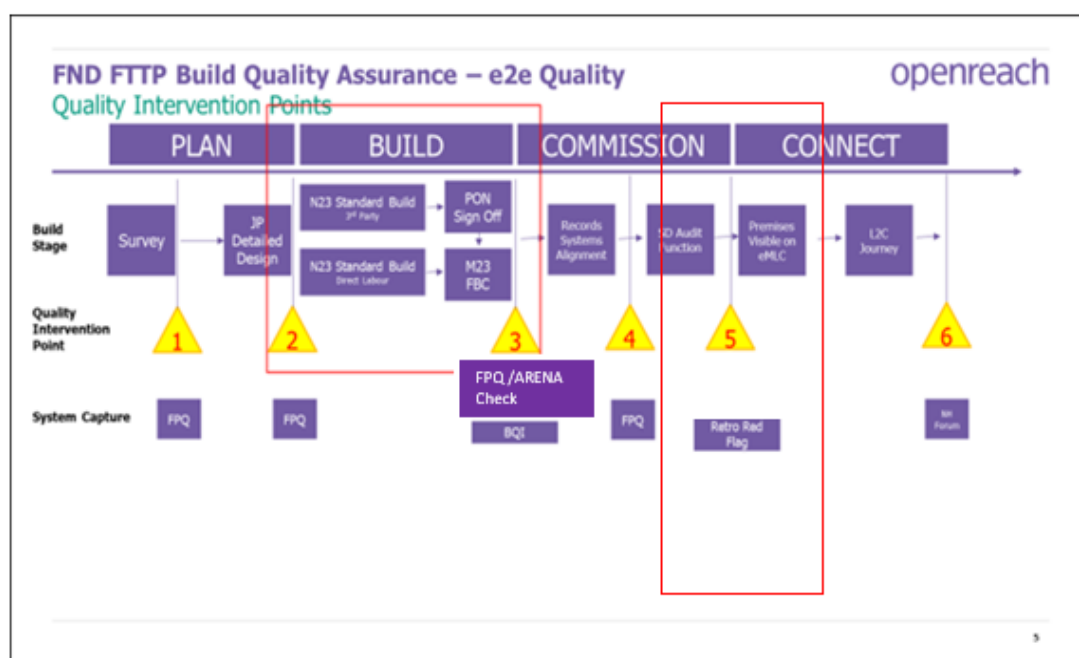
[Accreditation Hub](#)

3.4.5 Re-accreditation Cycle

Re-accreditation runs on a 36-month cycle and this requirement will be applied across both Openreach direct labour and Openreach 3rd Party build agents. The Openreach re-accreditation process will be facilitated and completed within a designated workshop location for all FBCs and WF2020 'C' Graded /. TMNE3 equivalents.

3.4.6 M23 Accredited FTE & QIP5 Interaction

We are migrating to a Network Reliability audit model that will focus on FTTP Build M23 accredited capability. We will utilise the skills and experience of the Network Reliability team to check that our M23 Field Based Co-ordinate individuals are performing to the same standard as the Network Reliability auditors have been to ensure that at the end of the 'Commission' phase, we have built a quality network. Effectively the quality checks that the Network Reliability team undertake on our M23 accredited FTE will form Quality Intervention Point 5 (QIP5).



At QIP5, the Network Reliability team will operate a 'Retrospective Red flag' process and will allocate 25% of their time towards FTTP audits.

4 FTTP PON Sign-Off Process

The key process stage that gates completed physical build work from 'Field' (B graded Field Engineers/ or external 3rd party partner builders of FTTP PONs) to 'Quality Check' (the C graded M23 accredited roles) is the FTTP PON Sign Off process.

This stage is illustrated below.

Diagram 1 illustrates the process all non-Falcon build.

Diagram 2 illustrates the process for Falcon build.

Diagram 1 – Non Falcon

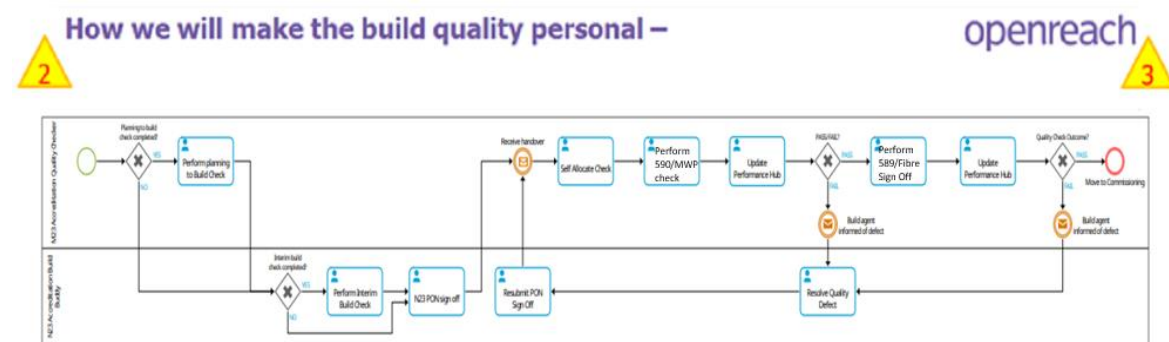
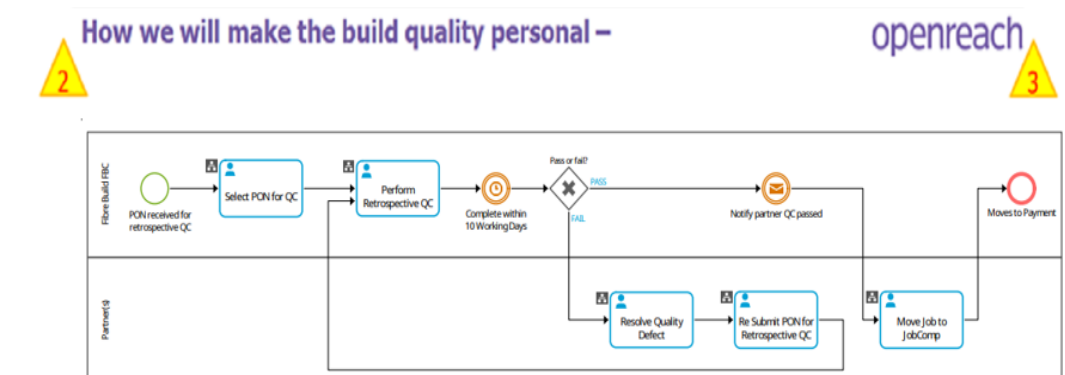


Diagram 2 – Falcon build using NGWFMT



The completion of the FTTP PON Sign off sheet is owned by the N23 accredited member for the responsible build gang. This can be either FND direct labour or can be from our internal and external build partners. The requirement to have attained N23 accreditation status is key and critical for this stage completion.

5 Roles & Responsibilities within the Build Phase

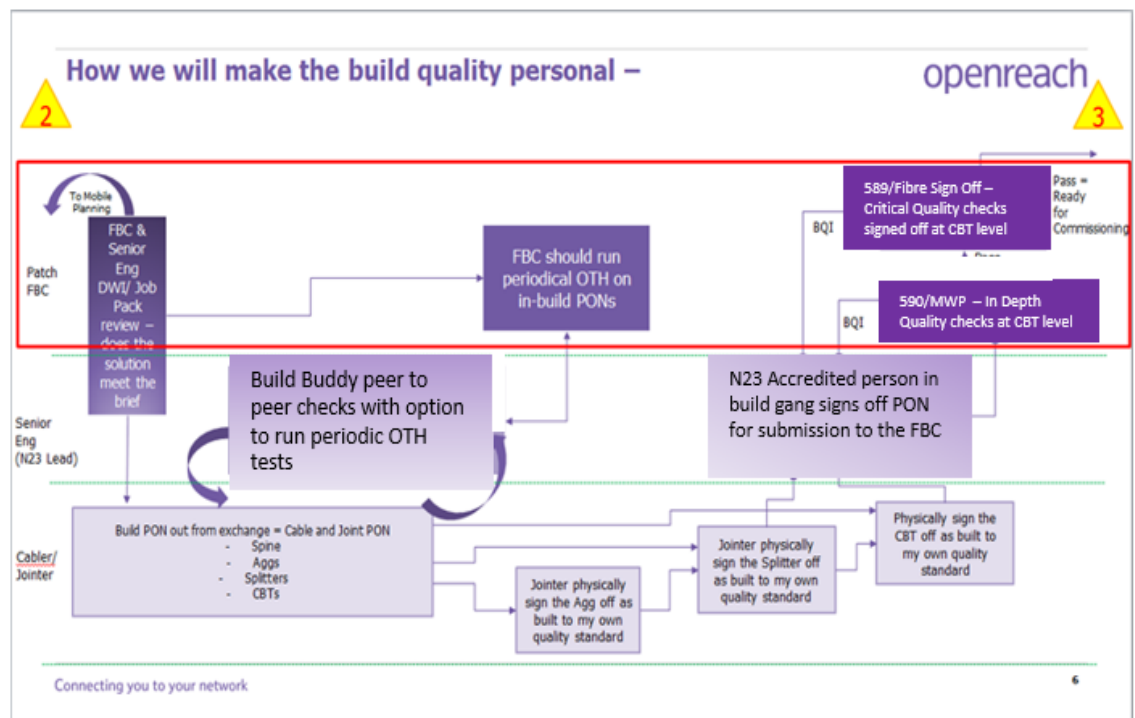
5.1 M23 Accredited Field Based Co-ordinator

The M23 accredited Field Based Co-ordinator (FBC) has responsibility for accepting the PON from the Plan phase, with support from the N23 Build Buddy.

They then have the option for running periodical Optical Test Head tests as the build progresses just to verify the progress by the N23 accredited Build Buddy.

On receipt of the 'PON Sign Off' from the N23 Build Buddy the M23 FBC should physically check the quality at every workpoint where physical work has been undertaken and complete FPQ589/ARENA Fibre Sign Off and 590/MWP, to verify EC - (Engineering Complete) conditions have been met and the FTTP build can now be passed into the Commissioning phase.

This is described pictorially below –



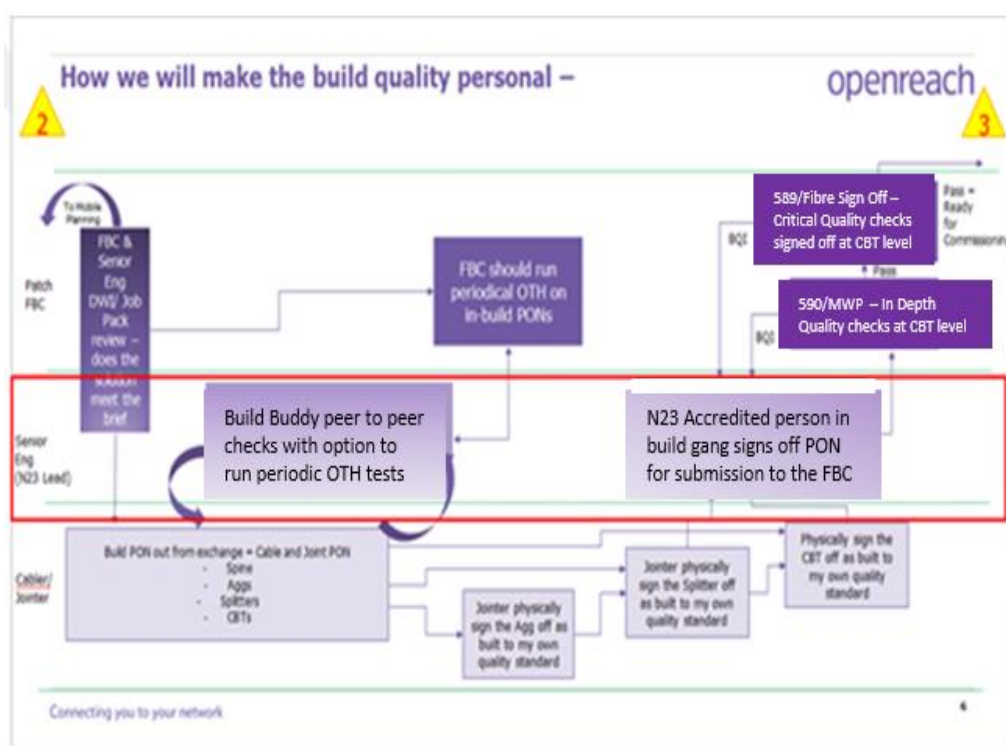
On completion of FPQ590/ARENA MWP and FPQ589 / ARENA Fibre Sign OFF, the FBC is accepting responsibility for the build quality of the PON, as it enters into the commission and connect phases.

5.2 N23 Build Buddy

The N23 Build Buddy is an integral role within the LMTP process. They are responsible for working with the FBC on receipt of the FTTP PON design and verifying that they are happy to proceed.

The N23 Build Buddy then takes a regular role in coaching and supporting the N23 accredited jointers undertaking the actual fibre works. The N23 Build Buddy will complete interim physical [Interim Build Check](#) build checks and have the capability to run periodical Optical Test Head tests, preferably more frequently than the FBC, ideally on a weekly basis against each FTTP PON in build. The outcome of these tests will be captured via a Formwize in Performance Hub. This check simply marks that an OTH test has been run and some degree of visual inspection has been undertaken to assess the fact that the build progress is to N23 level.

As the FTTP PON physical build completes, the N23 Build Buddy will be the person who completes the PON Sign Off stage, to verify that they are happy with what has been built –



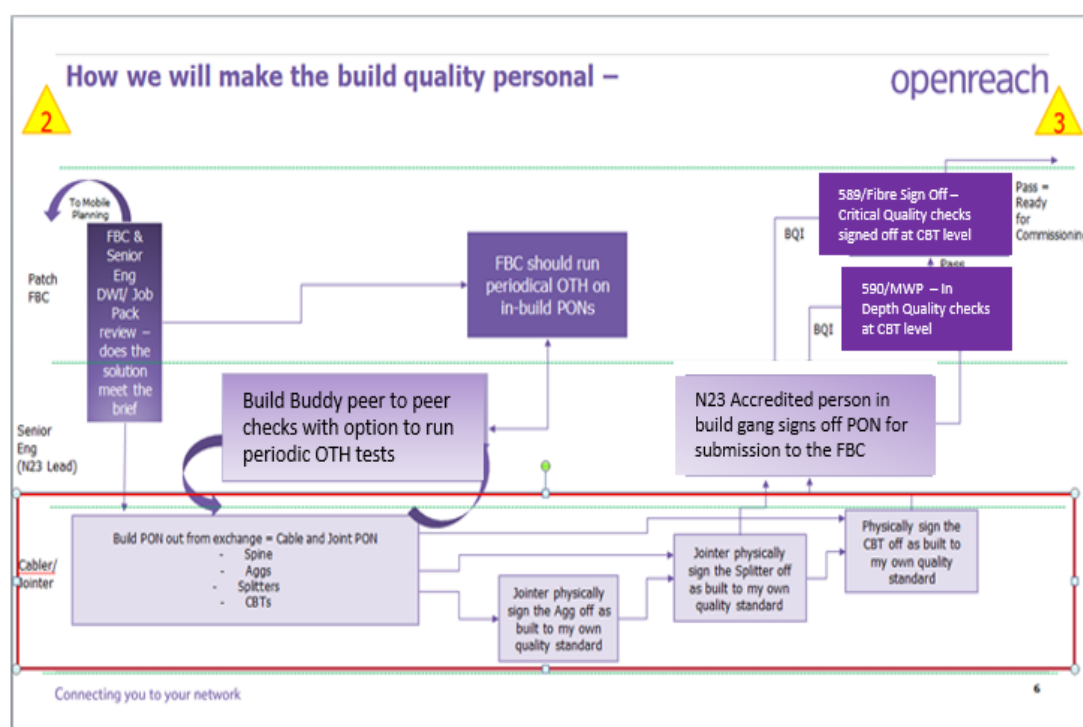
On completion of the PON Sign off stage, the N23 Build Buddy is accepting responsibility of the build quality of the PON they are passing into the M23 sign off stage. They are then responsible for managing and resolving any

arising/identified issues from failed FPQ590 ARENA MWP and FPQ589 ARENA Fibre Sign Off quality checks.

5.3 N23 Accredited Fibre Jointer

The N23 Accredited Fibre Jointers are integral to ensuring the overall quality of the build and are responsible for undertaking actual engineering works. Fibre Jointers will complete provision of the underground and overhead network from Aggregation node to connectorised BT (CBT) using current working practices and quality standards.

The N23 Accredited Fibre Jointers will physically sign off the Agg/Splitter/CBT upon completion as assurance to a quality build.



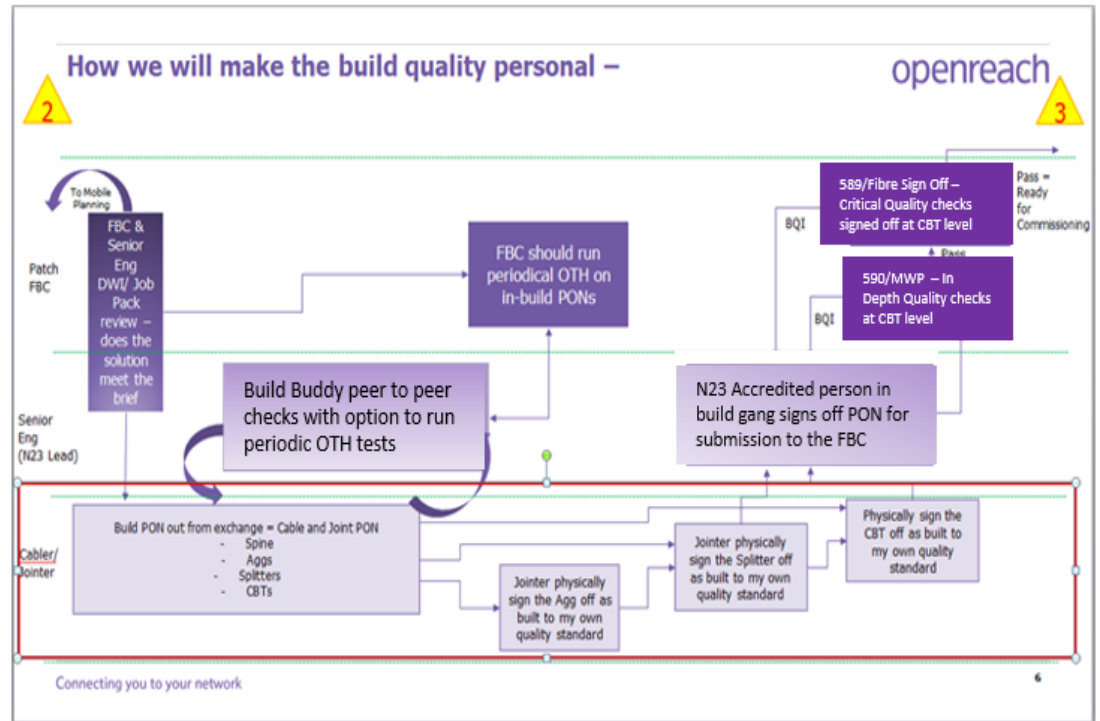
The act of signing their physical built network is the LMTP jointers and cablers taking responsibility for the build quality of what will then form part of the overall PON quality.

5.4 N26 Accredited Fibre Jointer

The N26 Accredited Fibre Jointers are integral to ensuring the overall quality of the build and are responsible for undertaking actual engineering works. Fibre Jointers will complete provision of the underground network from

Aggregation node to connectorised BT (UG CBT) using current working practices and quality standards.

The N26 Accredited Fibre Jointers will physically sign off the Agg/Splitter/CBT upon completion as assurance to a quality build.



The act of signing their physical built network is the LMTP jointers and cablers taking responsibility for the build quality of what will then form part of the overall PON quality.

6 ***Build Stage Audit Sample Rate***

Sample rate at QIP3 will be 100% for all Fibre City FTTP PONs that proceed through the end to end process.

6.1 Required Quality Score

There are two outputs from the FPQ589 or ARENA Fibre Sign Off check. Pass or fail. A PON can only exit the build phase with a 'Pass'. Hence the required quality score is 100%, at a PON level.

7 ***The Role of ORION in the Build Phase***

Orion is a plan and build software package and is currently used within the Plan stages of Fibre Cities. The Orion software is the enabling software for the mobile planners to be mobile as they plan FTTP PONs. It has been developed specifically for the new tablet devices. Orion has the capability to check changes and amendments against planning and build policy rules, enabling our FBCs to check the digital job packs are still within policy. Orion has a further functionality which facilitates a centralised feedback in build changes which improves the accuracy of records.

8 ***The Role of the Optical Test Head in the Build Phase***

The Optical Test Head provides a record of light loss and light trace to all built network elements and requires no manual input. The test can be completed remotely and instantly provides a guarantee light is present at the time of build.

It is now part of our standard FTTP build for Fibre Cities and a test can be conducted multiple times both during and on completion of the PON. Each of accredited FBCs will be able to sign off FTTP build quality confident that light can get from the exchange to CBT.

Optical Test Head test can be utilised by both our DL and 3rd Parties

We have two vendors at present; Viavi and Exfo. For Viavi the test results are currently stored on Viavi's systems and dropped automatically into a central sharepoint and the removal of manual intervention ensures accurate light loss readings are recorded. For Exfo the test results are currently stored on TADDS.

9 *The Role of the Auto-Toggle functionality in the Build Phase*

The Auto-toggle provides a record of light loss and light trace to all network elements and is utilised in conjunction with the Optical Test Head. Auto Toggle determines the correct routing from the SASA to Exchange Headend.

The test is completed by N23/N26 accredited jointers via the online app and is available to both DL and 3rd Party Partners. The Auto Toggle functionality provides light trace certainty

The test removes the need for contact with AOC and light loss results are stored centrally in TADDS.

10 *Light Testing Approach & Success*

There are three approaches to light level testing.

10.1 Manual Testing with Power Meter

This approach needs be done in person and requires co-ordination with our Commissioning team that remotely manage light on our headend ports. This currently has limited data integrity checks built into the overall process flow. The fact this is done manually with a power meter means we can and will introduce contamination as we undertake the activity.

10.2 Auto-Toggle with Power Meter

This approach needs be done in person, however requires no interaction with our team that remotely manage light on our headend ports, as the turning on and off of the light source is achieved via an app on the field engineers/FBC phone. The fact it is done on an app means that we have time stamps, user stamps and this gives the data a higher level of integrity. The primary drawback with auto-toggle as a lifecycle solution is that once you have a single live user on a PON, you can no longer use auto-toggle as you will impact a live customers experience. Each headend port can support up to 4 PONs, and up to 512 live customers, so this drawback is significant, as we start to scale our FTTP platform. The fact this testing approach is still done manually with a power meter means we can and will introduce contamination as we undertake the activity. The following Auto Toggle port testing methodology guidance is outlined below and is an integral element of the LMTP process ensuring high quality light levels.

Auto-Toggle Only						
Stage No.	Stage Name	Owner	Port Testing Scope	Mandatory	Why?	How do we verify activity Happened?
1	In-Build	N23 Build Buddy	Interim Build Integrity check	Best Practice	Ensure Light Quality in built network from exchange	Auto-Toggle TADDs CBT Test Volumes
2	In-Build	N23 Build Buddy & M23 FBC	Key Milestone Check - Light integrity test at splitter/sasa	Mandatory	Prove connectivity from the ODF to OLT and removes wroong SASA Failure Mode	Auto-Toggle TADDs CBT Test Volumes
3	Build Complete	N23 Build Buddy	Port 1 on all CBTs test performed. 1 test per CBT.	Mandatory	Ensures PON Quality	Auto-Toggle TADDs x 1 CBT Test Volumes
4	Quality Check	M23 FBC	Port 1 only on each CBT that are U/G. For O/H, verifies results are on system and line up with Build Buddy results.	Mandatory	Validates Build Buddy Results	Auto-Toggle TADDs CBT Test Volumes
5	Commission	Commission	Verifies results are on system including a toggle on and toggle off .	Mandatory	Final Line of Defence	Auto-Toggle TADDs =>3 CBT Test Volumes

10.3 Optical Test Head

This approach can be done remotely, and like auto-toggle requires no interaction with our desk-based Commissioning team that remotely manage light on our headend ports. This is due to the fact that the turning on and off of, the non-headend based, light source is achieved via an app on the field engineers/FBC phone. The fact it is done on an app means that we have time stamps, user stamps and this gives the data a higher level of integrity. As the light source for the Optical Test Head operates on a different wavelength and external to the headend switch, this approach can be operated through the entire lifecycle of the PON. The Optical Test Head port testing methodology guidance is outlined below and is an integral element of the LMTP process ensuring high quality light levels.

OTH End-State Test Model						
Stage No.	Stage Name	Owner	Port Testing Scope	Mandatory	Why?	How do we verify activity Happened?
1	In-Build	N23 Build Buddy	Interim Build Integrity check	Best Practice	Ensure Light Quality in built network from exchange	OTH System Traces (Multiple)
2	In-Build	N23 Build Buddy & M23 FBC	Key Milestone Check - Light integrity test per SASA tray	Mandatory	Prove connectivity from the OLT to SASA tray And removes wrong SASA Failure Mode	Auto-Toggle TADDs CBT Test Volumes
3	In-Build	N23 Build Buddy & M23 FBC	Splitter Headend Light Path	Mandatory	Align Headend & OTH	OTH System Traces (Multiple)
4	Build Complete	N23 Build Buddy	All CBT ports with moving the single reflector, OTH test performed per port	Mandatory	Ensures All Port Quality for the PON	OTH System Traces (Multiple)
5	Quality Check	M23 FBC	Port 1 only on each CBT	Mandatory	Validates Build Buddy Results	OTH System Trace (One Per CBT) Qlik Light Integrity Dashboard
6	Commission	Commission	Verifies results are on system and FBC accreditation status	Mandatory	Final Line of Defence	Viavi and TADDs System Access

Note 1 – On publication of Issue 5.0 of this document, FND were still seeing a high failure from ‘Wrong SASA’ as a result of feedback from our Service Delivery colleagues. Stage 2 in the above process, if performed correctly, removes ‘Wrong SASA’ as a failure mode. Hence the compliance to performing Stage 2, as well as all the other stages, is key and critical to build quality success. The key difference for Stage 2 is that it is the only non-OTH based stage – it is purely Auto-toggle based – hence our data validation capability is not as strong as OTH based results.

10.4 Optical Test Head – Final Set-up for Lead to Cash

Integration

Missing CBT reflectors introduce inefficiency across Service Delivery, FND and Build Partners. CBT referencing and the Optitap Reflector being left in port 1 enables Service Delivery to complete pre-emptive LLT checks at KCI1 (order receipt) to ensure light integrity.

Therefore, to prevent future failure due to light integrity issues and ensure the ability to test the quality of the fibre network its mandatory after testing all ports that the Optitap Reflector must be put back and left in port 1 and the “Test when leaving the reflector” selected and carried out.

For co-located CBTs, which are located within a 2m radius from one another and served from the same SASA, only the “test when leaving reflector” is required to be completed on 1 of the co-located CBTs. However, the Optitap reflector must be left in port 1 of all the co-located CBTs.

10.5 Lead to Cash Failure Modes

At present we see a small volume of our customer orders fail due to build quality issues. These volumes vary from FTTP technology vintage, to region to other external factors.

The introduction of this process will allow for higher build quality to be achieved, with greater network integrity insight and greater accountability. The current common failure modes in the customer lead to cash journey are –

- Wrong Headend – The customer address key (NAD key) is attached to CBT and/or Splitter that has been spliced to the wrong headend port.
- Wrong or Missing CBT – The customer address key (NAD key) is attached to a CBT that has been spliced incorrectly or has not been built in the recorded position.
- No Light - The customer address key (NAD key) is attached to a CBT port that is not able to get light from the headend switch, due to no end to end lightpath.
- Low Light - The customer address key (NAD key) is attached to a CBT port that is not able to get high enough light levels from the headend switch, due to low end to end lightpath integrity through macro/microbends and bad splices.
- Flashing PON - The customer address key (NAD key) is attached to a CBT port that is not able to get consistent light levels from the headend switch, due

to low end to end lightpath integrity through macro/microbends, bad splices and other transient factors such as network disturbance.

- No Network - The customer address key (NAD key) is attached to a CBT that has not been built in the recorded position.
- Faulty D-Side - The customer address key (NAD key) is attached to a CBT port that is not able to get high enough or any light levels from the headend switch, due to low end to end lightpath integrity through macro/microbends and bad splices.
- The introduction of the new technology will allow the FND network build team to resolve these issues prior to moving the PON into the Commissioning phase.

10.6 Future Resolution Matrix

Considering the different light testing approaches, and what failure reasons we are seeing in lead to cash. The future resolution matrix looks like so –

Lead to Cash Failure Reasons	Root Cause Issue	Live Customer on the PON	Technology to Resolve	Live Customer on the PON	Technology to Resolve	Auditable Results
Wrong Headend	Build Quality	No	Auto-Toggle	Yes	Optical Test Head	Yes
Wrong or Missing CBT	Build Quality	No	Auto-Toggle	Yes	Optical Test Head	Yes
No light	Build Quality	No	Auto-Toggle	Yes	Optical Test Head	Yes
Low/high light	Build Quality	No	Optical Test Head	Yes	Optical Test Head	Yes
Flashing PON	Build Quality	No	Optical Test Head	Yes	Optical Test Head	Yes
No network	Build Quality	No	LMTP	Yes	Optical Test Head	Yes
Faulty D side	Build Quality	No	OTD PTO Process	Yes	Optical Test Head	Yes

From this table it is clear that the greatest quality can be achieved in the build cycle through the utilisation of the Optical Test Head.

Two main elements drive this; reduced contamination introduction through remote testing and ability to light test once we have live customers on the headend port.

11 ***References***

ISIS: NWK/LNK/C212 - Fibre – Spine Planning – Policy

ISIS: NWK/LNK/C541 - FTTP – Brownfield - Scale Architecture Policy

ISIS: NWK/LNK/C574 - FTTP – Overview of the FTTP Commissioning Process

ISIS: EPT/ANS/A040 - One Fibre Network - Build Quality Manual for Engineers

ISIS: EPT/COF/D983 - Auto Toggle Practices & Procedures

ISIS: EPT/COF/D956 - Field Engineer testing practices for the Fibre To The Premises (FTTP) network

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