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NE-3 TERMINATION INSIDE BUILDINGS

(DISTRIBUTED SPLITTING ARCHITECTURE)

IMPORTANT:

This technical normative only applies to the “Distributed Splitting Architecture” of UGG.

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1. INTRODUCTION

This document aims to give a general view of the NE3 termination inside the building and the includes also how is expected to be done the interconnection with the NE4 network (in-building network) of the building.

Other norms focussed on more detail for some parts of the network must prevail over the content of this document in case of conflict.

This document does not detail how must be carried out the civil works, or the cable installation in detail to reach the different optical boxes. For this purpose, there are available other technical normative, that in case of necessity are referenced through the document.

Also, this document does not explain or detail how must be done the NE4 network inside the building (does not include techniques, architecture, topology, materials, etc to be used), but includes some details that must be considered in order to make possible the interconnection between both networks (NE3 and NE4).

1.1 REVISIONS

This document is the first edition.

EDITION	DATE	REVISED SECTIONS	CHANGES	OBSERVATIONS
1 st	DECEMBER 2023			The document is created.

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2. NE3 TERMINATION INSIDE BUILDINGS

For the new Distributed Splitting Architecture have been defined several scenarios (depending on the size of the building (in terms of HPs)) to terminate the NE3 network in different elements (OTB: Optical Terminal Boxes, or Indoor-DPs boxes).

The following table, include the main scenarios that have been identified:

Homes/ Building	Fibers needed	Fibers deployed	Splitter in DP	Splitters in building	OTBs type And Q
1	2	4 (x1)	1:4 + 1:16	-	1 x OTO
2-3	2		1:16	1:4 (x1)	1 x OTB-4
4-7	4		1:16	1:4 (x2)	1 x OTB-8
8 – 15	8 (4+4)	8 (x1)	1:16	1:4 (x4)	2 x OTB-8
16 – 22	12	12 (x1)	1:16	1:4 (x6)	1 x OTB-24
23 – 44	24 (12+12)	12 (x1) + (**)	1:16	1:4 (x12)	1 x OTB-24 + (*)
45 – 60	2	8 (x1)	-	"1:64"	1 x "IndoorDP-64"
> 61	Variable			"1:64" + variable	1 x "IndoorDP-64" + any IDPs/OTBs

In all the cases, the optical boxes defined to be used to terminate the NE3 network has the characteristics of having all the ports connectorized.

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2.1 SDU SCENARIO

In the SDU (Single Dwelling Unit) scenario, the micro-duct (7/4 type) will be finished in an OTB for SDU that is prepared to terminate up to 2 optical fibres into connectors.

The fiber unit used to serve will have 4 fibers, but only 2 are going to be used and **spliced with pigtails** to be terminated connectors (LC/APC type).

The optical network finishes in the OTB (in the basement of the building).

The ONT is expected to be installed:

- **In the same room (basement of the building/house)** at less of 2 meters from the OTB. In that case, the connection between the router and the ONT could be made with an UTP cable (ethernet), in an installation made by the client.

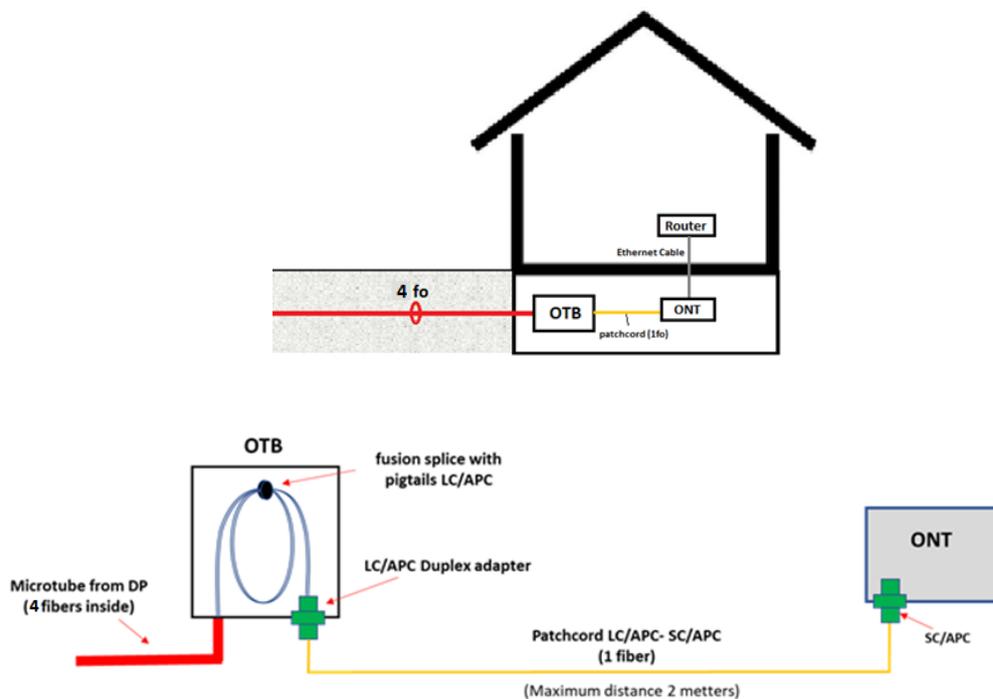


Figure 1. NE-3 termination scheme for SDU (fiber terminated at basement)

The element used to terminate the NE3 network can be seen in the next image:

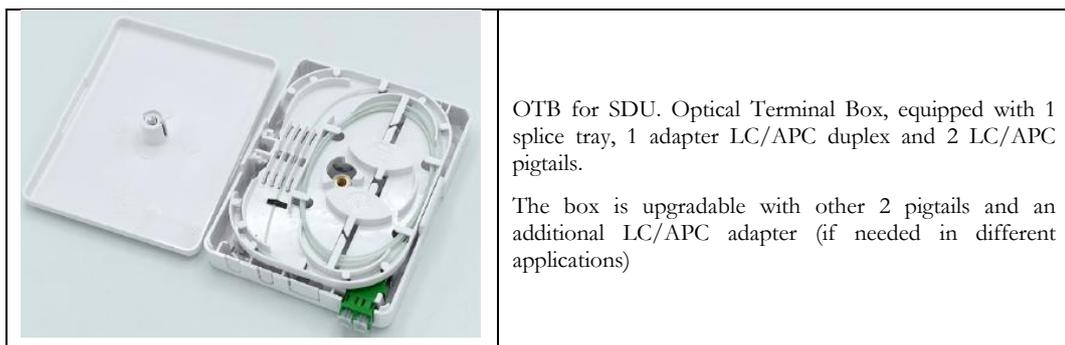


Figure 2. OTB for the NE-3 termination in SDU

- In a different room of the building/house:** If the ONT needs to be installed inside the home of the customer at a long distance, the NE3 network will be finalised in the OTB as in the previous scheme. The prolongation of the fiber network along the building to enter to the indoor stance of the home could be considered as a NE4 network and is expected to be done with a bifiber/duplex drop cable **pre-connectorized** with LC/APC connectors (at least in the OTB side) to be connected directly to the OTB.

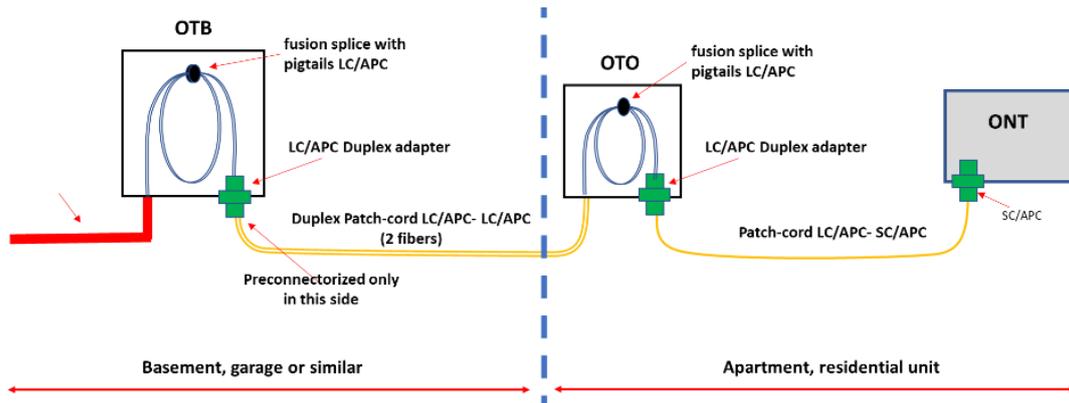


Figure 3. Possible scheme to interconnect the OTB with the OTO



Figure 4. Duplex patch-cord LC/APC recommended for NE4 network to interconnect the OTB and the OTO

NOTE: If in the path considered as NE4 are going to be deployed more than 2 fibers, then it is important to consider that the OTB is designed to be connected only with pre-connectorized cables and that the connection capacity is for 2 LC/APC connectors. If the cable has more than 2 fibers pre-connectorized, then all the fibers over 2, will not be possible to be connected to the OTB.

So, the fiber cable deployed in the NE4 should end in a different box (that can be called, BTB: Building Termination Box, independent to the OTB), if the NE4 network cable has more than 2 fibers, and after do a patching between both boxes: OTB (of the NE3 network), and BTB (for the NE4 network).

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2.2 MDU SCENARIO (WITH UP TO 4 HPS)

In the MDU scenarios (with up to 4 HPs), the NE3 network will finish in an OTB 4_S with capacity to connect to 4 customers.

NOTE: 4 is the maximum quantity of customer connections possible. By design criteria, the limit of use of this scenario can vary by reserving some connections for utility services (instead of residential units).

The fiber unit used to serve will have 4 fibers, but only 1 is going to be used and **spliced with the splitter input of the splitter 1:4 pre-equipped in the OTB 4_S**. The other 3 fibers will remain stored.

NOTE: The OTB_4S can be upgraded to have 2 networks in parallel with the same characteristics if needed by adding on field a new splitter 1:4 pre-connectorized.

The splitter 1:4 pre-equipped from factory in the OTB 4_S has all the outputs pre-connectorized in LC/APC, positioned in a patch-panel designed to make possible the connection of up to 4 duplex cables LC/APC.

NOTE: for more detail, about how must be done the installation of the OTB4_S the technical document: **“TEF-INST-00007 - Installation of OTB with splitters (OTB4-S and OTB8-S)”** must be consulted.

The scheme of termination of the NE3 network, and the expected interconnection with the OTOs (part of the NE4 network) can be seen in the next scheme.

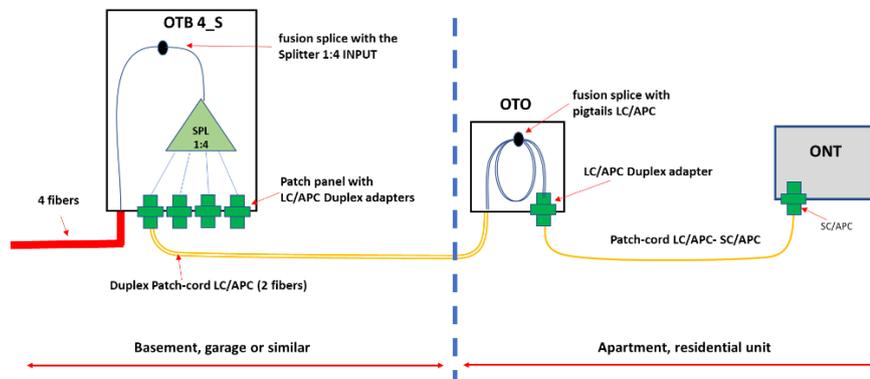


Figure 5. Scheme for NE-3 termination in MDU with up to 4 HPs

In the next image can be seen the OTB 4_S that is going to be used to terminate the NE3 network in the deployments with “Distributed Splitting Architecture”:



Figure 6. OTB 4_S for the NE-3 termination in MDU with up to 4 HPs

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The interconnection with the OTO (path that is considered as NE4 network) is expected to be done with a direct connection made by a bi-fiber duplex cable pre-connectorized as the one that can be seen in the next image:



Figure 7. Duplex patch-cord LC/APC recommended for NE4 network to interconnect the OTB4_S and the OTO

NOTE: If in the path considered as NE4 are going to be deployed more than 2 fibers, then it is important to consider that the OTB4_S is designed to be connected only with pre-connectorized cables and that the connection capacity is for 2 LC/APC connectors per customer (4 LC/APC duplex adapters has its patch panel). If the cable has more than 2 fibers pre-connectorized, then all the fibers over 2, will not be possible to be connected to the OTB.

So, the fiber cable deployed in the NE4 should end in a different box (that can be called, BTB: Building Termination Box, independent to the OTB), if the NE4 network cable has more than 2 fibers, and after do a patching between both boxes: OTB (of the NE3 network), and BTB (for the NE4 network).

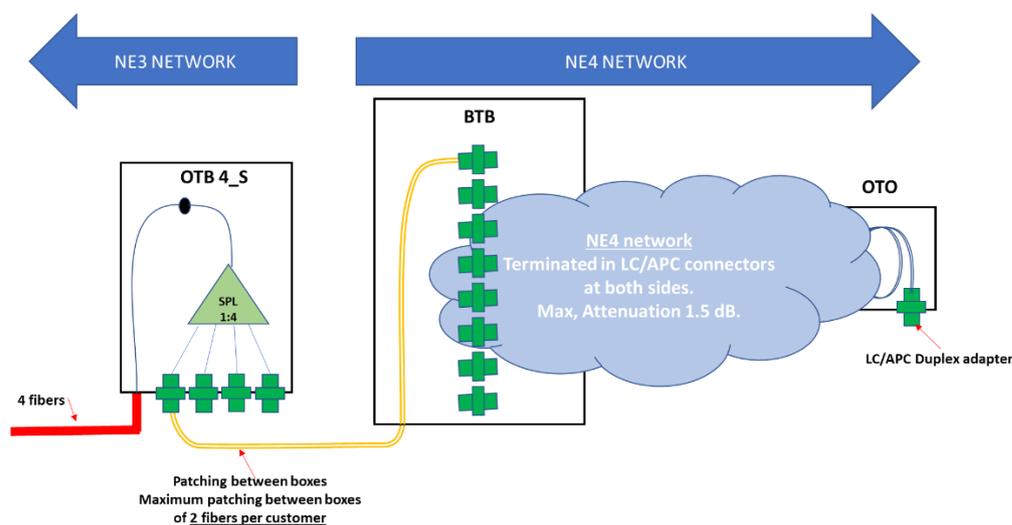


Figure 8. Possible scheme of interconnection between NE3 and NE4 networks in MDU scenarios with less than 4 HPs (if the NE4 has more than 2 fibers per HP deployed).

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2.3 MDU SCENARIO (BETWEEN 5 AND UP TO 8 HPS)

In the MDU scenarios (with up to 8 HPs), the NE3 network will finish in an OTB 8_S with capacity to connect to 8 customers.

NOTE: 8 is the maximum quantity of customer connections possible. By design criteria, the limit of use of this scenario can vary by reserving some connections for utility services (instead of residential units).

The fiber unit used to serve will have 4 fibers, but only 2 are going to be used and **spliced with the splitter's inputs of the two splitter 1:4 pre-equipped in the OTB 8_S.**

The other 2 fibers will remain stored.

NOTE: The OTB_8S can be upgraded to have 2 networks in parallel with the same characteristics if needed by adding on field two new splitter 1:4 pre-connectorized.

The 2 splitters 1:4 pre-equipped from factory in the OTB 8_S have all the outputs pre-connectorized in LC/APC, positioned in a patch-panel designed to make possible the connection of up to 8 duplex cables LC/APC.

NOTE: for more detail, about how must be done the installation of the OTB8_S the technical document: **“TEF-INST-00007 - Installation of OTB with splitters (OTB4-S and OTB8-S)”** must be consulted.

The scheme of termination of the NE3 network, and the expected interconnection with the OTOs (part of the NE4 network) can be seen in the next scheme.

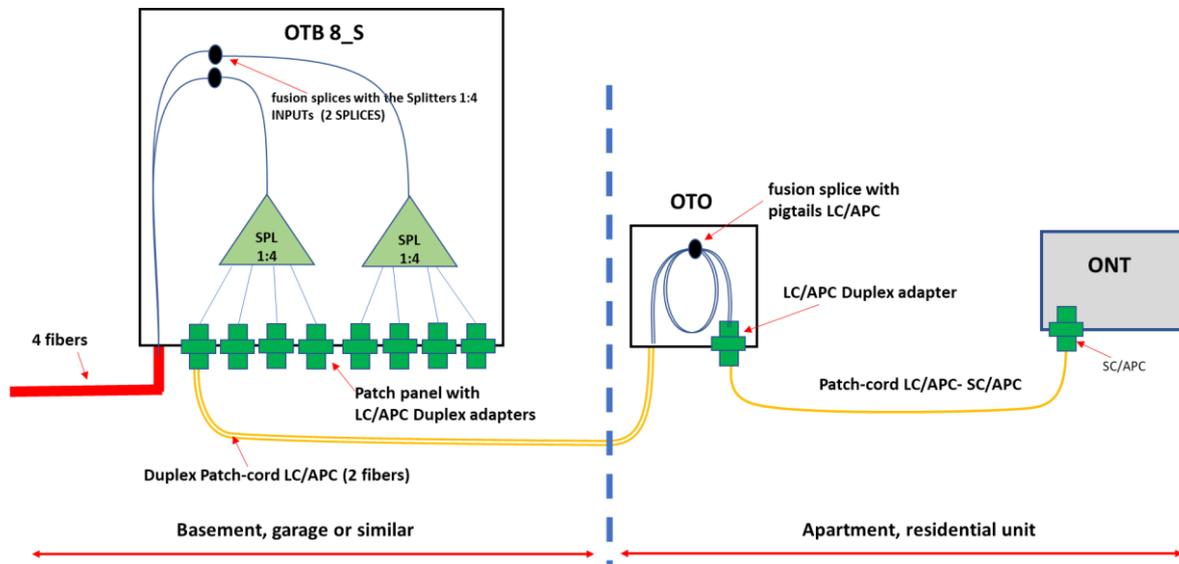


Figure 9. Scheme for NE-3 termination in MDU with up to 8 HPs

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In the next image can be seen the OTB 8_S that is going to be used to terminate the NE3 network in the deployments with “Distributed Splitting Architecture”:



Figure 10. OTB 8_S for the NE-3 termination in MDU with up to 8 HPs

The interconnection with the OTO (path that is considered as NE4 network) is expected to be done with a direct connection made by a bi-fiber duplex cable pre-connectorized as the one that can be seen in the next image:



Figure 11. Duplex patch-cord LC/APC recommended for NE4 network to interconnect the OTB8_S and the OTO

NOTE: If in the path considered as NE4 are going to be deployed more than 2 fibers, then it is important to consider that the OTB4_S is designed to be connected only with pre-connectorized cables and that the connection capacity is for 2 LC/APC connectors per customer (8 LC/APC duplex adapters has its patch panel). If the cable has more than 2 fibers pre-connectorized, then all the fibers over 2, will not be possible to be connected to the OTB.

So, the fiber cable deployed in the NE4 should end in a different box (that can be called, BTB: Building Termination Box, independent to the OTB), if the NE4 network cable has more than 2 fibers, and after do a patching between both boxes: OTB (of the NE3 network), and BTB (for the NE4 network).

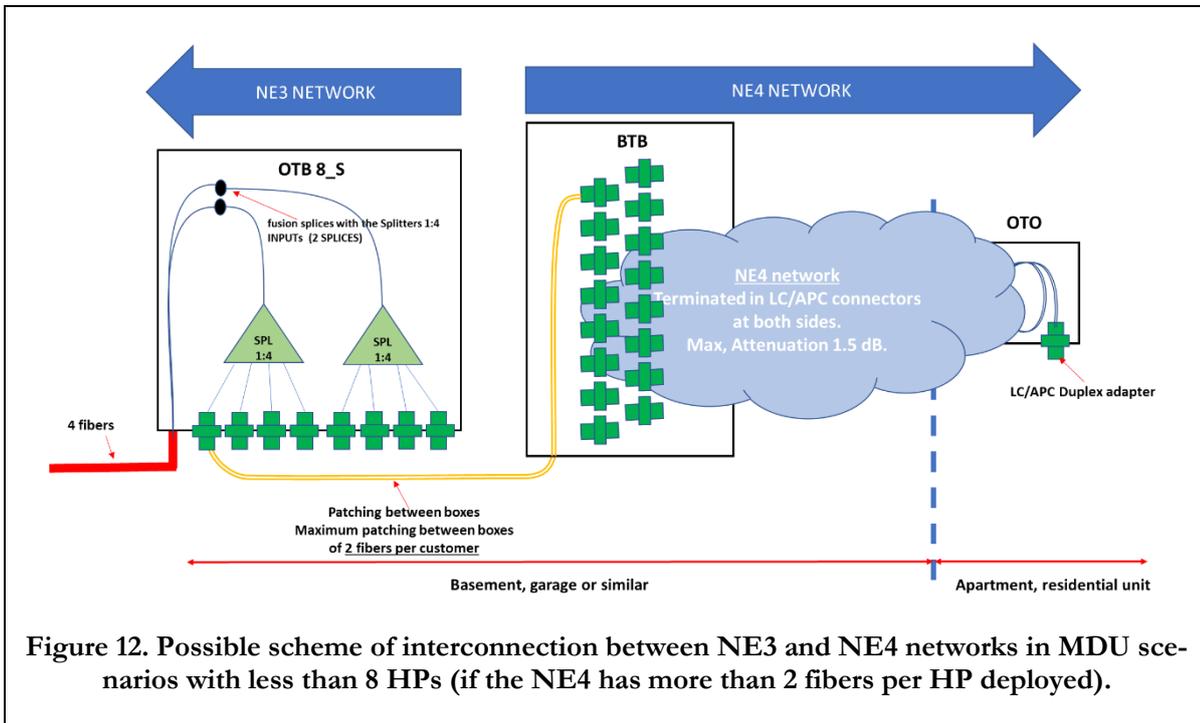


Figure 12. Possible scheme of interconnection between NE3 and NE4 networks in MDU scenarios with less than 8 HPs (if the NE4 has more than 2 fibers per HP deployed).

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2.4 MDU SCENARIO (BETWEEN 9 AND UP TO 16 HPS)

The NE3 network termination in MDU buildings with (between 9 HPs and up to 16 HPs) will be done in the same way that is done in the scenario with up to 8 HP, by using 2 OTB 8_S to terminate the NE3 network.

NOTE: 16 is the maximum quantity of customer connections possible. By design criteria, the limit of use of this scenario can vary by reserving some connections for utility services (instead of residential units).

Other change is that the fiber unit used to serve the OTBs will have 8 fibers, and a mid-span installation will be done in the first OTB 8_S before reaching the second OTB 8_S. The first OTB8_S will take the first 4 fibers from the fiber unit and the second OTB8_S the other 4 fibers.

On each OTB will be made the splices needed to light the splitters required by the project. 2 splices on each box, is the maximum quantity of splices (2 splitters on each box) needed to light all the ports (8+8 = 16) of both boxes (for one network). Nevertheless, if the MDU has less than 12 ports needed, then one of the OTBs, only will require one splice to light only the half of the ports.

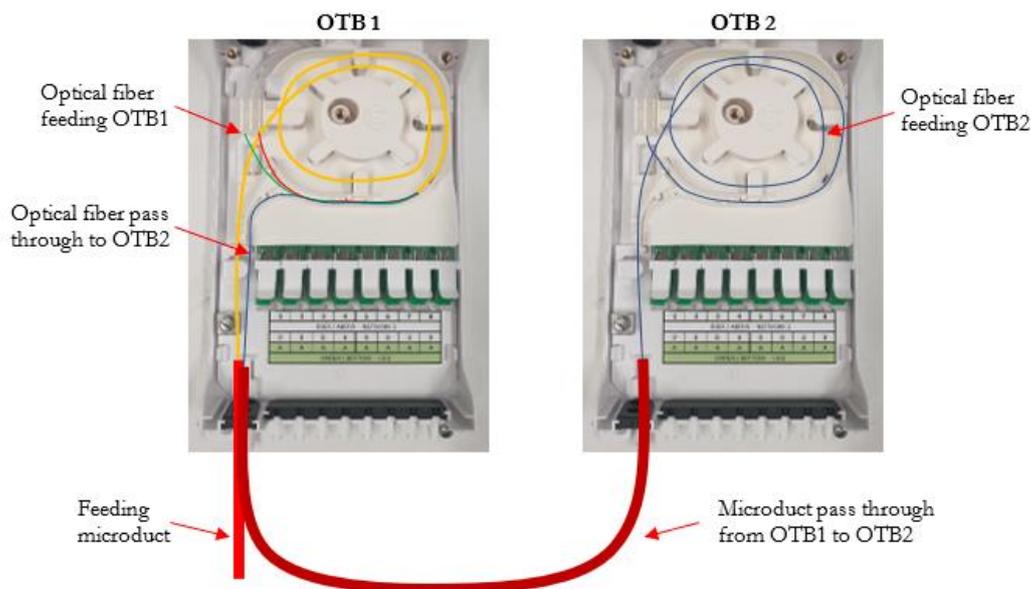


Figure 13. NE3 termination scheme for MDUs with (between 9 and up to 16 HPs)

The connection with the NE4 network is expected to be done in the same way as the scenario with up to 8 HPs. So, the same limitations must be considered when the NE4 network is planned, and if it is needed (due to any reason: difficulties to deploy individual drops from the OTBs to the OTOs, quantity of fibers of NE4 section is more than 2 fibers per HP, etc) an independent box must be deployed to terminate the NE4 network in the building to make possible the patching between boxes to do the customer connections without problems.

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2.5 MDU SCENARIO (BETWEEN 17 AND 24 HPS)

The NE3 network termination in MDU buildings with (between 17 HPs and up to 24 HPs) will be done in the same way that is done in the previous scenarios but using an OTB 24_S that has a capacity of 24 duplex connections.

NOTE: 24 is the maximum quantity of customer connections possible. By design criteria, the limit of use of this scenario can vary by reserving some connections for utility services (instead of residential units).

The fiber unit used to serve the OTB 24_S will have 12 fibers. Only 6 fibers will be used the day one (as only is going to be lighted one network: one port per duplex adapter).

On the OTB 24_S will be made the splices needed to light the splitters required by the project. 6 splices are the maximum quantity of splices (6 splitters 1:4 is preinstalled in the box) needed to light all the ports (6x4 = 24). Nevertheless, if the MDU has less than 20 ports needed, then less splices should be done to light only the maximum quantity of needed ports.

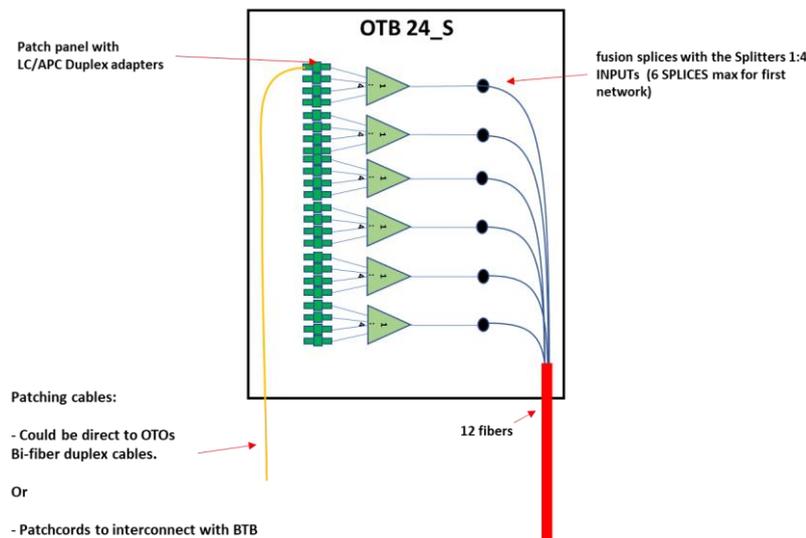


Figure 14. NE3 termination scheme for MDUs with (between 17 and up to 24 HPs)

The connection with the NE4 network is expected to be done in the same way as the scenario with up to 8 HPs. So, the same limitations must be considered when the NE4 network is planned, and if it is needed (due to any reason: difficulties to deploy individual drops from the OTBs to the OTOs, quantity of fibers of NE4 section is more than 2 fibers per HP, etc) an independent box must be deployed to terminate the NE4 network in the building to make possible the patching between boxes to do the customer connections without problems.

Due to the quantity of HPs hanging from the OTB 24_S, it is expected to have more cases with the situation of having the NE4 terminated in a dedicated BTB box (due to the difficulty of passing so many cables 24 through the different floors of the building to reach the customer homes) that direct pre-connectorized duplex drop cables to join with the OTOs.

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2.6 MDU SCENARIO (BETWEEN 25 AND 48 HPS)

The NE3 network termination in MDU buildings with (between 25 HPs and up to 48 HPs) will be done in the same way that is done in the previous scenarios but using 2 OTBs of the size needed to cover the building needs (could be a combination of different OTBs with different sizes and capacities).

In this case each OTB will be feed with an independent microduct from the Urban-DP. The fiber unit used to feed each OTB will have the quantity of fibers needed to cover all the needs of the OTB deployed.

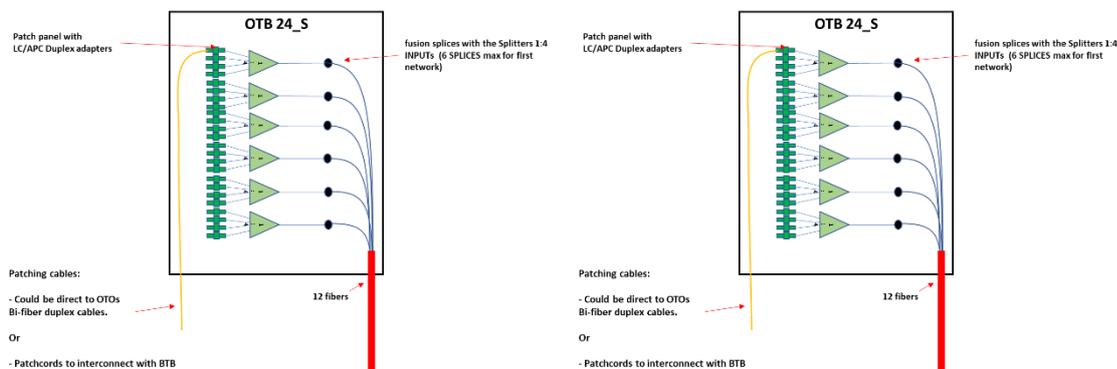


Figure 15. NE3 termination scheme for MDUs with two independent OTBs (example with 2 OTB 24-S)

The connection with the NE4 network is expected to be done in the same way as the scenario explained before on this document for less HPs. So, the same limitations must be considered when the NE4 network is planned, and if it is needed (due to any reason: difficulties to deploy individual drops from the OTBs to the OTOs, quantity of fibers of NE4 section is more than 2 fibers per HP, etc) an independent box must be deployed to terminate the NE4 network in the building to make possible the patching between boxes to do the customer connections without problems.

Due to the quantity of HPs hanging from the OTBs deployed, it is expected to usually have the situation of having the NE4 terminated in a dedicated BTB box [due to the difficulty of passing so many independent cables (between 24 and 48) through the different floors of the building to reach the all the customer homes]. Nevertheless, if it is possible to find different verticals to distribute the fibers of the NE4 through the building, the direct connection of pre-connectorized drops from the OTBs could be an option.

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2.7 MDU SCENARIO (BETWEEN 49 AND 64 HPS)

The NE3 network termination in MDU buildings with (between 49 HPs and up to 64 HPs) will be done in the same way that is done in the previous scenarios but an IndoorDP64 will be used to cover the building necessities.

The IndoorDP64 is an element that includes a complete splitter 1:64 formed by one splitter 1:4 followed by 4 splitters 1:16 inside the same box. The IndoorDP64 has a patch panel equipped with 64 LC/APC duplex adapters.

The IndoorDP64 will be feed with an independent microduct from the Urban-DP. The fiber unit used to feed each IndoorDP64 will have 8 fibers. Nevertheless, the day one, only one fiber will be used to splice to the input of the complete splitter 1:64 and lit it. The rest of the fibers will remain reserved for future use (point to point services, network upgrades, maintenance, etc). If in the future is needed to use more fibers to upgrade the OTB with a second network in parallel (for other operator), the fibers reserved could be used to light the second network splitters.

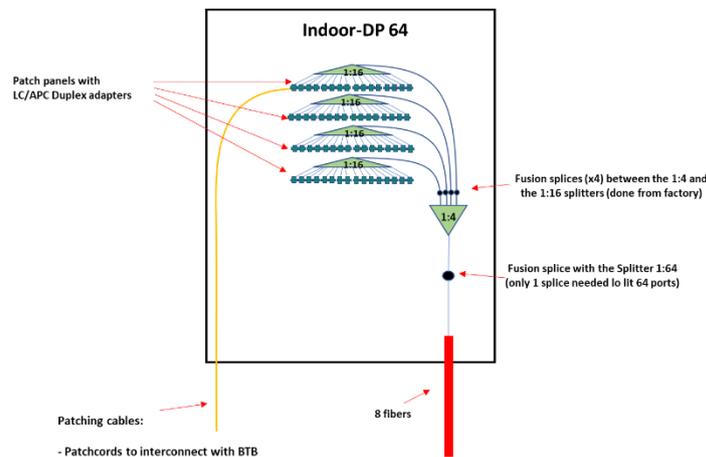


Figure 16. NE3 termination scheme for MDUs equipped with IndoorDP64

The connection with the NE4 network is expected to be done always by the interconnection of the IndoorDP64 (in which the NE3 network is terminated) and the BTB (in which the NE4 network is terminated) with individual or duplex patch-cords LC/APC-LC/APC.

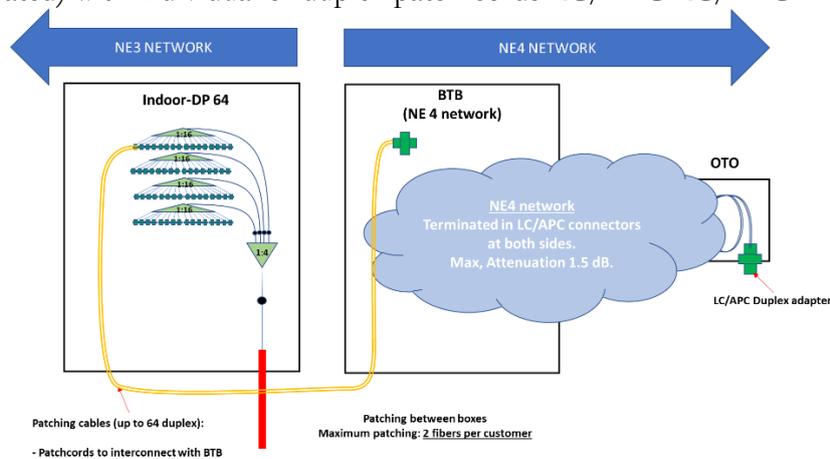


Figure 17. Scheme of interconnection between NE3 and NE4 in MDU equipped with IndoorDP64.

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2.8 MDU SCENARIOS WITH MORE THAN 65 HPS

The MDU buildings with more than 65 HPs, will be treated as a combination of some of the solutions or scenarios presented before on this document. The quantity of microducts to be installed, will depend on the quantity of Indoor-DP64s or OTBs installed in the building.

The indoorDP64 has the capacity of “mid-span” installation, so if needed, 2 indoorDP64 could be installed “in a row” fed by only one microduct and fiber unit cable (a similar scheme to the one used in the scenario of 2 OTBs for MDU up to 16 HPs).

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3. OTHER CONSIDERATIONS

If the NE4 network is terminated in a dedicated BTB (Building Termination Box), the distance to the OTB or to the IndoorDP64 must be close enough to allow the interconnection with a patch-cord of a length of 2 meters.

The path between both boxes (the one to terminate the NE3 and the one to terminate the NE4 network), must be created and protected professionally by using the channels, gutters, or other standard elements to assure a correct laying of the patch-cords between both boxes. The overlength of the patch-cords must be guided and organized professionally avoiding the storing of fiber excess in coils without curvature control, etc.