TECHNICAL CODE

BASIC CIVIL WORKS -
PART 5: LAST MILE FIXED NETWORK TELECOMMUNICATIONS POLE

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Developed by

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Development of technical codes

The Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) ('the Act') provides for a Technical Standards Forum designated under Section 184 of the Act or the Malaysian Communications and Multimedia Commission ('the Commission') to prepare a technical code. The technical code prepared pursuant to Section 185 of the Act shall consist of, at least, the requirements for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with Section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by Section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Bhd ('MTSFB') as a Technical Standards Forum which is obligated, among others, to prepare the technical code under Section 185 of the Act.

A technical code prepared in accordance with Section 185 shall not be effective until it is registered by the Commission pursuant to Section 95 of the Act.

For further information on the technical code, please contact:

Malaysian Communications and Multimedia Commission (MCMC)
MCMC Tower 1
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel : +60 3 8688 8000
Fax : +60 3 8688 1000
Email : stpd@mcmc.gov.my
Website: www.mcmc.gov.my

OR

Malaysian Technical Standards Forum Bhd (MTSFB)
Level 3A, MCMC Tower 2
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel : +60 3 8680 9950
Fax : +60 3 8680 9940
Email : support@mtsfb.org.my
Website: www.mtsfb.org.my

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Committee representation

This technical code was developed by Fixed Network Facilities Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB), which consists of representatives from the following organisations:

Allo Technology Sdn Bhd

ASAASCOM

CelcomDigi Berhad

Malaysia Digital Economy Corporation Sdn Bhd

Maxis Broadband Sdn Bhd

PMW Concrete Industries Sdn Bhd

Redsun Engineering Sdn Bhd

SIRIM Berhad

Terengganu Telecommunications Sdn Bhd

TIME dotCom Berhad

TM Technology Services Sdn Bhd

U Mobile Sdn Bhd

Universiti Teknikal Malaysia Melaka

Universiti Teknologi Malaysia

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Foreword

This technical code for the Basic Civil Works - Last Mile Fixed Network Telecommunications Pole ('Technical Code') was developed pursuant to Section 185 of the Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) by the Fixed Network Facilities Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB).

MCMC MTSFB TC (Last Mile Telecommunications Poles) consists of the following parts, under the general title *Basic Civil Works*:

Part 1: General Requirements

Part 2: Open Trench

Part 3: Micro Trench

Part 4: Horizontal Directional Drilling

Part 5: Last Mile Fixed Network Telecommunications Pole

This Technical Code (Part 5: Last Mile Fixed Network Telecommunications Pole) consist of requirements for fixed network telecommunications pole for the last mile connectivity. This Technical Code shall be read together with the rest of the other series of *Basic Civil Works* depending on specific method of civil work. The latter shall be deemed to be invalid to the extent of any conflict with this Technical Code.

This Technical Code shall continue to be valid and effective from the date of its registration until it is replaced or revoked.

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BASIC CIVIL WORKS - PART 5: LAST MILE FIXED NETWORK TELECOMMUNICATIONS POLE

0. Introduction

Deploying fixed network telecommunication presents several challenges. The high costs associated with building and maintaining the infrastructure are significant, especially since the last mile involves connecting the main network to the last mile connectivity such as individual homes and commercial areas. Refer to Figure 1 for details. Geographical barriers, such as remote locations and difficult terrain, further complicate and increase the cost of installation. Additionally, handling local regulations and obtaining the necessary permits can be time-consuming and may incur fees set by the authorities. Existing infrastructure limitations may also require upgrades or replacements, adding to the complexity.

By allowing multiple operators to share the same pole, the overall cost of infrastructure is reduced, as expenses are split among the providers. This cost-sharing model not only eases the financial burden on each operator but also accelerates the deployment process. Providers can avoid duplicating efforts, leading to a more streamlined and efficient installation.

This Technical Code is intended as a reference for architects, engineers, property owners, developers, service providers and other stakeholders involved in the planning and installation of fixed network telecommunications poles. It provides a comprehensive guide construction of these critical infrastructure elements, prioritising structural integrity, longevity, and innovative approaches to shared pole utilisation among Network Service Providers (NSP)s, thereby promoting efficient and collaborative infrastructure development.

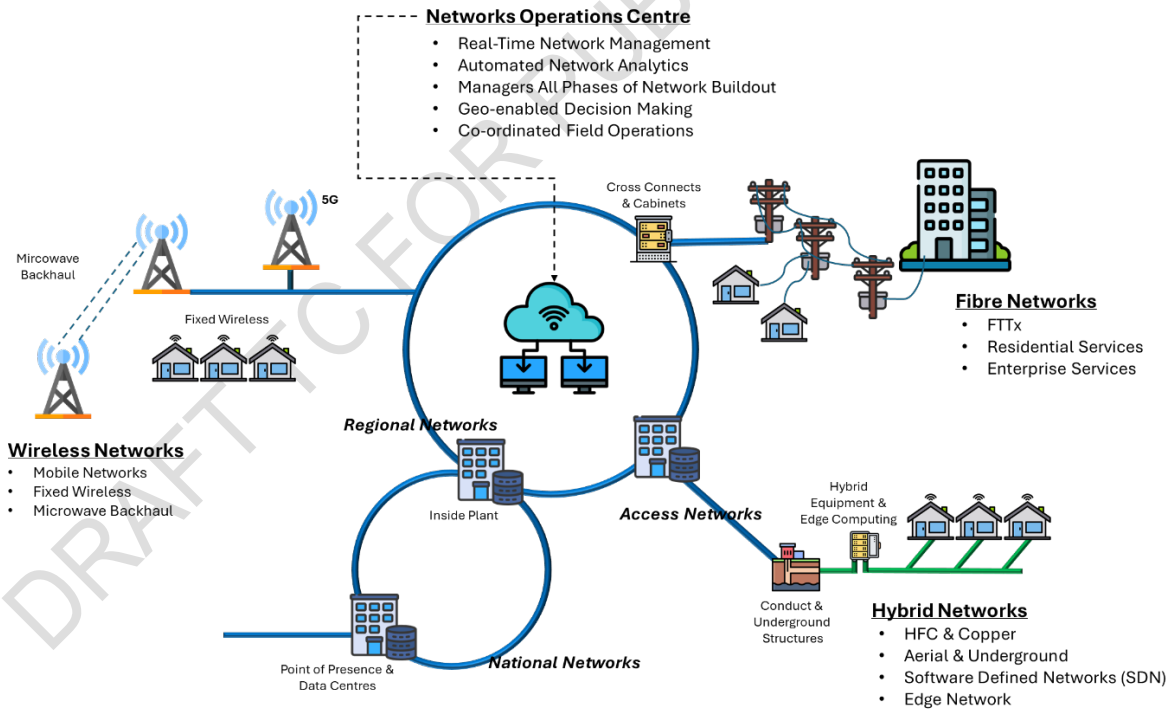

Figure 1. General telecommunication network

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1. Scope

This Technical Code specifies the requirements for infrastructure sharing for fixed network telecommunications poles in both greenfield and brownfield last-mile areas which covers the following items:

a) planning and site selection;

b) pole design and specifications;

c) construction and installation; and

d) safety, maintenance and repair.

2. Normative references

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

Communication and Multimedia Act 1998 (Act 588)

Strata Management Act 2013 (Act 757)

Strata Titles Act 1985 (Act 318)

Commission Determination on Access List, Determination No. 1 of 2005

MCMC MTSFB TC G025-1, *Basic Civil Works - Part 1: General Requirements*

JIS A5373, *Precast Prestressed Concrete Products*

ASCE 7**,** *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

National Electric Safety Code (NESC)

3. Abbreviations

For the purposes of this Technical Code, the following abbreviations apply.

See Annex A.

4. Terms and definitions

For the purposes of this Technical Code, the following definitions apply.

4.1 Access seeker

Access seeker means a network facilities provider, a network service provider, an applications service provider or a content applications service provider who is a licensee as defined in the Act and who makes a written request for access to facilities and/or services.

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4.2 Broadband

High-speed internet access where data, e-mail, videos, music and other applications can be downloaded at speeds significantly faster than those available through dial-up modems.

4.3 Brownfield infrastructure area

A brownfield infrastructure is an area where existing fixed network infrastructure is already available. In the instances where existing infrastructure unable to support the requirements to have multiple service from different provider, the second service provider is required to build a new pole with a sharable design, allowing the third or subsequent service provider to share the new pole in the future.

4.4 Fixed network telecommunications pole

It is also known as a telecommunication aerial pole, is an infrastructure element that serves as a support structure for telecommunication cables and equipment. Its primary function is to facilitate the deployment of telecommunication networks, ensuring reliable and efficient communication services. These poles are typically used in areas where laying underground cables is not feasible or cost-effective, such as in sub urban area, rural or remote regions, brownfield area or where the soil conditions are unstable.

4.5 Distribution Side (D-Side) network

The Distribution Side (D-Side) network refers to the infrastructure and components that distribute fibre optic services from Fibre Distribution Cabinet (FDC) to individual customer premises. This segment is responsible for bringing high-speed internet, voice, and video services to homes and businesses. The D-Side network may include any of the following components

a) Fibre-to-the-Curb (FTTC) or Fibre-to-the-Home (FTTH) connections;

b) FDC that serve as a central point for distributing fibre optic cables to individual customers;

c) Fibre optic cables and splices that connect the FDC to customer premises; and

d) Optical Network Terminals (ONT)s that convert the fibre optic signal to a format compatible with customer devices.

4.6 Exchange Side (E-Side) network including trunk or junction network

The Exchange Side (E-Side) network, also known as the backbone or backhaul network, handles the distribution of fibre optic cables from the service provider's central office or exchange to various FDC in the network. This segment is responsible for connecting multiple distribution hubs and providing high-capacity connectivity between them. The E-Side network may include any of the following components:

a) high-capacity fibre optic cables and trunking systems;

b) fibre optic repeaters or amplifiers that boost signal strength and extend transmission distances;

c) junction points or nodes that connect multiple fibre optic cables and enable signal routing; and

d) central offices or exchanges that serve as hubs for connecting multiple fibre optic cables and providing access to the wider telecommunications network.

Figure 2 below illustrate E-Side and D-Side of a fixed network architecture.

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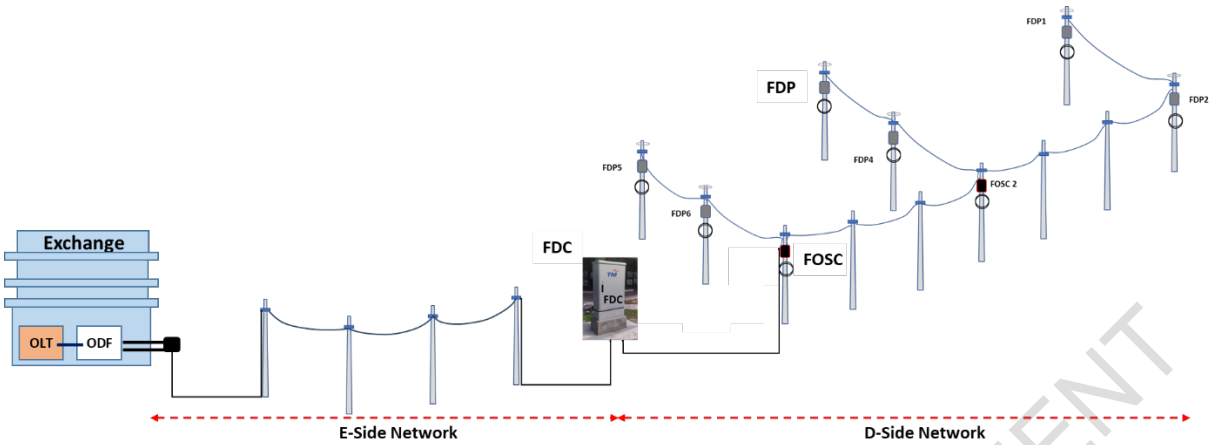

Figure 2. Example of E-Side and D-Side network

4.7 Concrete kicking block

A pole accessory to prevent the pole from slanting on sandy or soft soil environment, and it is designed for outdoor use in area with high humidity and heavy rainfall. The kicking block is designed to tie to pole by using a u-bolt and nuts.

4.8 Property developer

In relation to a development area, means any person or body of persons, by whatever name described, who develops any land for the purpose of residential, commercial or industrial use, or a combination of such uses.

In relation to a subdivided building or land, includes the original proprietor of the lot before the subdivision and includes the executors, administrators and successors-in-title and permitted assigns of such person or body of persons, and in a case where the person or body of persons is under liquidation, includes such person or body appointed by a court of competent jurisdiction to be the provisional liquidator or liquidator.

4.9 Fibre optic cable

A high-speed data transmission medium. Fibre is a future proof technology which has the ability to accommodate any new technologies and applications that require higher bandwidth with much lower maintenance and operational cost than any legacy technologies.

4.10 Fibre-To-The Premises (FTTP)

A generic term of providing fixed network services via fibre optic cable from NFP Central Office (CO) direct to end user premises. Fibre-To-The Premises (FTTP) is an enhancement of legacy technologies such as using a metal cable network via Public Switched Telephone Network (PSTN) or Digital Subscriber Line (DSL) technology.

4.11 Greenfield infrastructure area

The greenfield infrastructure area could be a new or existing development area with no fixed-line infrastructure available. A new infrastructure should be built either by the developer or NFP with NSP licenses to provide fixed-line services to the area.

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4.12 Housing scheme

A group of houses and other buildings built together as a single development. A housing scheme is usually built by a developer and may consist of residential and/or commercial, Single Dwelling Unit (SDU) and Multi-Dwelling Unit (MDU) type of properties.

4.13 Landed strata development

A strata title is a form of ownership, usually meant for MDU, and horizontal subdivisions with shared areas and facilities. A strata scheme is thus defined as a property development that divides buildings or land into parcels and common property under a management system.

A landed strata property is basically a landed house or SDU, but with MDU-style facilities such as a swimming pool and gym. These developments may consist of bungalows, semi-detached or terrace houses, ranging from single storey to 3-storeys in height.

The strata rules only apply to infrastructure except individual parcels inclusive of the external and internal telecommunication infrastructure outside of the individual units.

Landed strata property with strata titles fall under the protection and governance of the Strata Management Act 2013 (Act 757) and the Strata Titles Act 1985 (Act 318).

4.14 Management Corporation (MC)

The Management Corporation (MC) which has come into existence upon the opening of a book of the strata register in respect of subdivided building or land under sub-Section 17(3) of Strata Titles Act 1985 is a corporate body having perpetual succession and a common seal. The MC consists of all the strata unit owners.

4.15 Network Facilities Provider (NFP)

The owners or providers of network facilities licensed under the Communication and Multimedia Act 1998 (Act 588).

4.16 Network Services Provider (NSP)

An entity who provides network services licensed under the Communication and Multimedia Act 1998 (Act 588).

4.17 Private Property Line (PPL)

A legal property development boundary as specified in land title. This boundary shall determine the separation between public or other personal and private areas.

4.18 Property owner

Any person or body for the time being registered as the proprietor of any alienated land.

For strata scheme, the property owner is defined as specified in the Strata Management Act 2013 (Act 757) and Strata Titles Act 1985 (Act 318).

Property owner is responsible to maintain the infrastructure provided within Private Property Line (PPL) is in good condition. It may include the developer, an individual owner, a Joint Management Body (JMB), MC, Subsidiary Management Corporation (Sub-MC) or parcel owner.

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4.19 Subsidiary Management Corporation (Sub-MC)

A Sub-MC is in relation to limited common property created under Section 17A, Strata Titles Act 1985 (Act 318).

4.20 Parcel owner

The purchaser or the developer in respect of those parcels in the strata development area which have not been sold by the developer.

4.21 Single Dwelling Unit (SDU)

A landed property or building with less than 6 storeys which is generally not equipped with Telecommunication Room (TR). Example of SDU are as follows:

a) terrace houses.

b) bungalows; and

c) shop lots.

4.22 Common pole sharing

Common pole sharing infrastructure refers to a system where multiple telecommunications service providers utilise the same physical poles or structures to deploy their network equipment. This collaborative approach facilitates the installation and maintenance of telecommunication services while minimising costs and environmental impacts.

5. Planning for last mile pole

Planning for the last pole is vital for ensuring service reliability, optimising resource use, ensuring user accessibility, responsibility, complying with regulations, addressing safety and minimising environmental impact.

5.1 Planning in greenfield and brownfield

Effective planning for fixed network telecommunication poles is crucial in both brownfield and greenfield areas, as each presents unique challenges and opportunities in telecommunications infrastructure. It involves a comprehensive assessment of existing infrastructure, including the identification of existing fibre optic cables, pole infrastructure, and other relevant assets. This information is then used to design a network architecture that optimises the deployment of new fibre optic cables and determines the most suitable access points for customers, taking into account factors such as population density, terrain complexity, and environmental considerations.

5.1.1 Greenfield area

This Technical Code is to cater for the fixed network infrastructure served by the overhead infrastructure.

The property developer shall be responsible to ensure pole readiness at the PPL. The poles should be installed by companies holding NSP (Network Service Provider) and NFP (Network Facilities Provider) licenses with specifications that allow for sharing. However, property developers may provide these poles based on commercial agreements with NSPs and NFPs. The design supports fibre cables and its own equipment. This includes FDCs, Fibre Distribution Points (FDPs), and D-Side Fibre Optic Closures (FOCs).

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For strata SDU in greenfield, the developer shall be responsible to ensure pole readiness at the PPL.

Subsequent operators, such as Telco B and Telco C, can then join the shared infrastructure. To do so, Telco B and Telco C shall construct their own FDCs, FDPs, and FOCs while adhering to the pole sharing specifications and guidelines established by Telco A and/or property developer. This ensures a harmonious coexistence of multiple service providers on the same infrastructure, fostering a collaborative environment for all parties involved. Figure 3 illustrates the pole sharing arrangement in greenfield area.

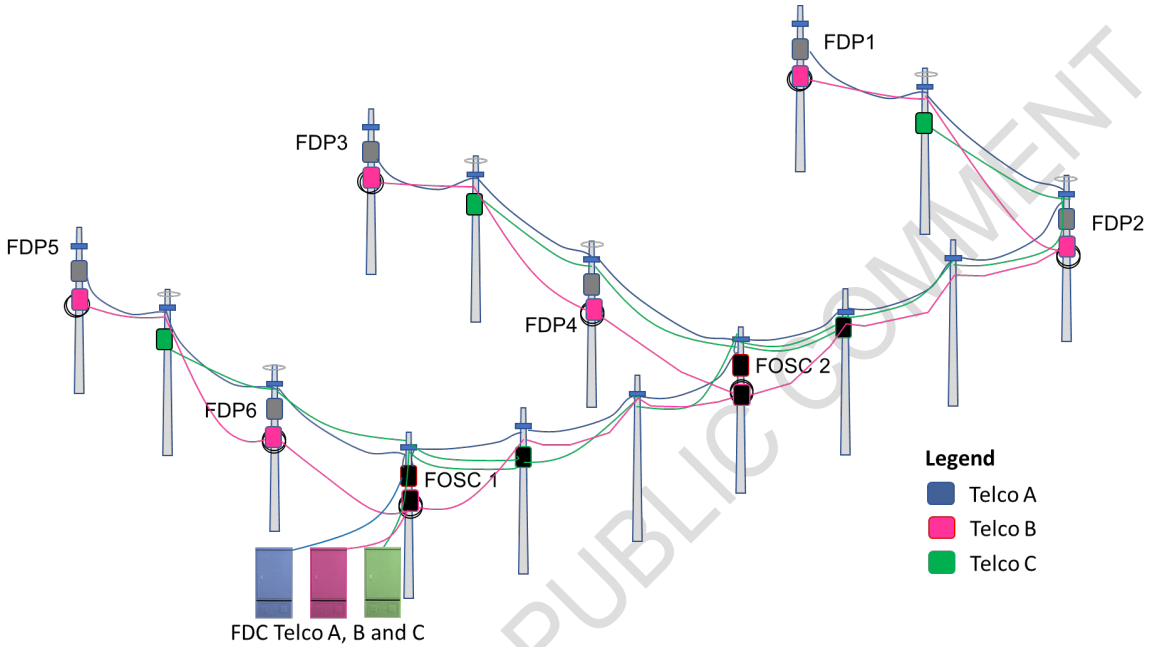

Figure 3. Shareable pole area

5.1.2 Brownfield area

There are 2 scenarios as described in 5.1.2.1 and 5.1.2.2 which ensures that future infrastructure needs are met while minimising the need for duplicate construction and reducing environmental impact.

5.1.2.1 Scenario A: Existing pole not designed for sharing

Area that has available service provider and the existing infrastructure by access provider (Telco A) that is not designed with sharable specifications, the access seeker (Telco B and C) plan to enter the same area and determine the necessity of constructing a new pole structure, the access seeker shall ensure that said new pole is designed with specifications that accommodate sharing. This new pole structure shall support the installation of fibre optic cables, accessories and associated equipment and install own FDCs, FDPs and D-Side FOCs. Figure 4 illustrates the pole sharing arrangement in brownfield area.

5.1.2.2 Scenario B: Existing pole designed for sharing

Area has available service provider and the existing infrastructure that is designed with sharable specifications. The access seeker is required to submit a formal request to structure owner to access for such sharing. The access provider shall provide a reasonable analysis pertaining to the feasibility of the proposed sharing arrangement. Should pole owner grant consent to the sharing agreement, the access seeker shall be obligated to install its own fibre optic cables and associated accessories on the sharable pole and should install own FDCs, FDPs, and D-Side FOCs. To facilitate this, the access seeker shall adhere to the pole sharing specifications, guidelines, and commercial arrangements established by the access provider. Figure 3 illustrates the pole sharing arrangement in brownfield area.

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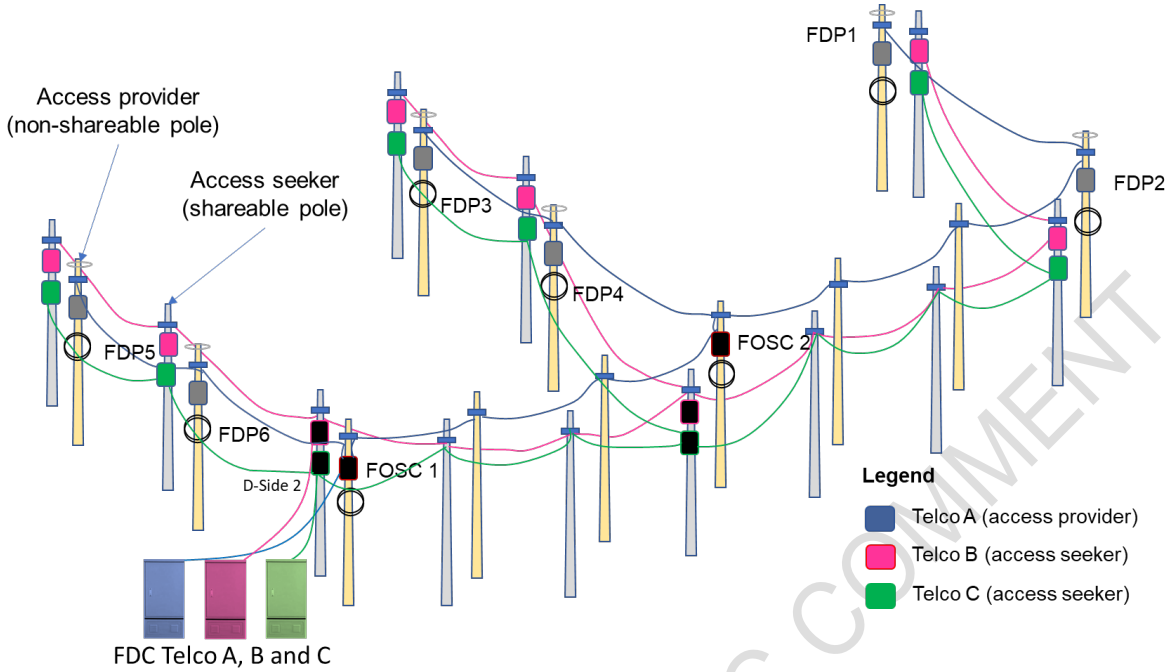

Figure 4. Pole sharing brownfield area

In summary, pole sharing is a viable solution for access provider and access seeker in brownfield areas. By reusing existing shareable infrastructure, both access provider and access seeker can reduce costs, increase efficiency, and minimise environmental impact. However, it requires careful coordination and planning to ensure that all parties can operate effectively in the same area.

5.2 Infrastructure demarcation

The PPL serves as the boundary demarcation point for infrastructure between the developer, property owner, and NFP. The developer is responsible for providing the infrastructure within the PPL. Once provided, ownership and responsibility for this infrastructure will be transferred to the property owner.

The demarcation and responsibilities of the developer, property owner, and NFP can be divided into the following two phases:

a) Phase 1: Development; and

b) Phase 2: Post development.

5.2.1 Phase 1: Development

The developer is required to provide the infrastructure within the PPL for the SDU during the development phase, as illustrated in Figure 5. It is the developer's responsibility to ensure that all necessary infrastructure and facilities needed to support fixed network services are provided.

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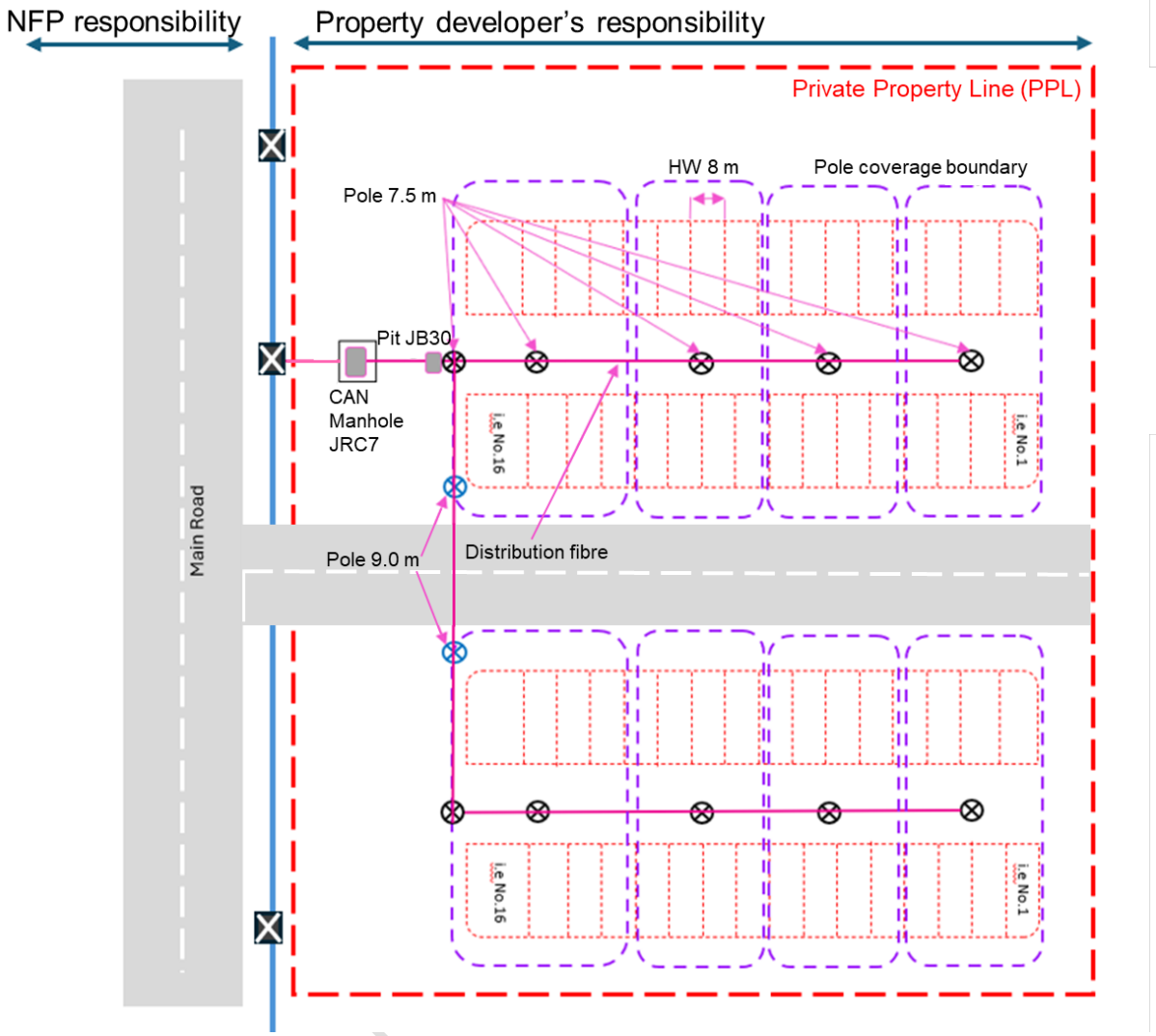

Figure 5. SDU infrastructure demarcation point

Upon completion of the development phase, the ownership of the infrastructure within the PPL shall be transferred to the JMB, MC or any relevant parties with a formal handover agreement. Details of the agreement shall be mutually agreed between the responsible and developer.

5.2.2 Phase 2: Post development

Development area designed with pole infrastructure and connected to NFPs pole shall be constructed as shown in Figure 6. The distance of the first pole that will connect with NFP pole shall be placed as closed as possible with maximum of 50 m from NFP pole. Any requirement for additional poles outside PPL, the developer may discuss with NFP through commercial arrangement for the best option. A proper handover agreement shall be carried out between developer and NFP upon completion of the construction.

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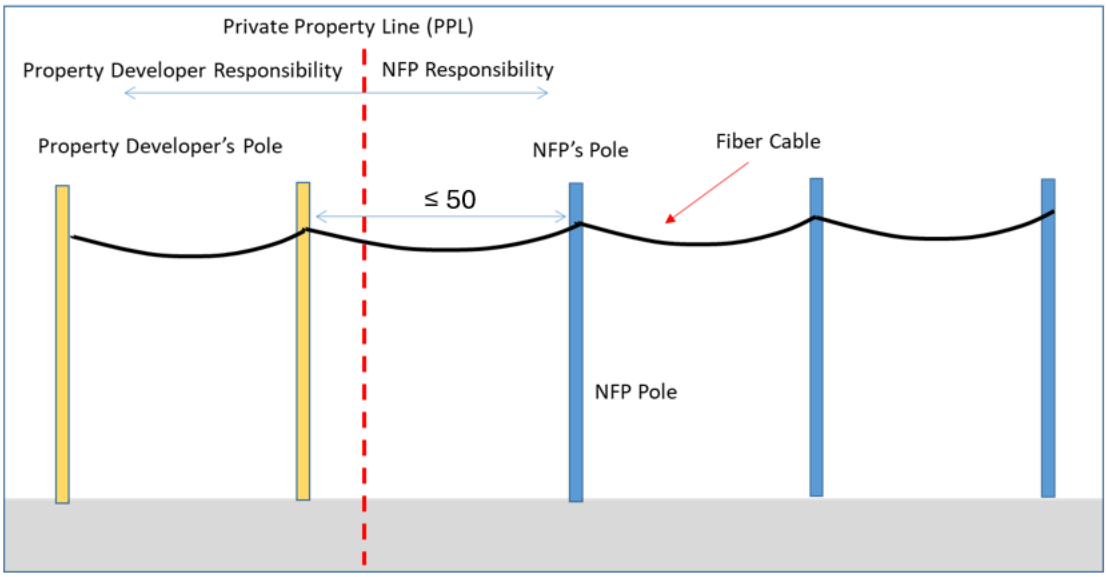

Figure 6. Overhead connection with NFP's pole

Development area designed with pole infrastructure and connected to NFPs underground infrastructure shall be constructed as shown in Figure 7. A common access manhole adjacent to the first developer's pole shall be provided by the developer.

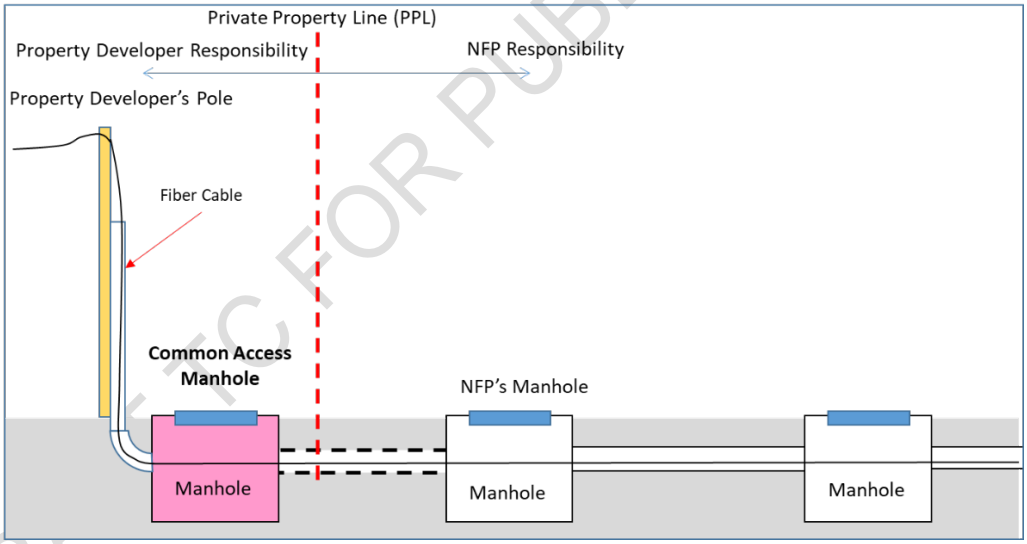

Figure 7. Overhead connection for pole type deployment

5.3 Pole distribution design

Only landed residential SDU is recommended to be served via pole. Industrial or commercial properties is highly recommended to be served with underground infrastructure as the premises access connection.

Development area designed with pole infrastructure for connection via NFP's pole shall be prepared as shown in Figure 8.

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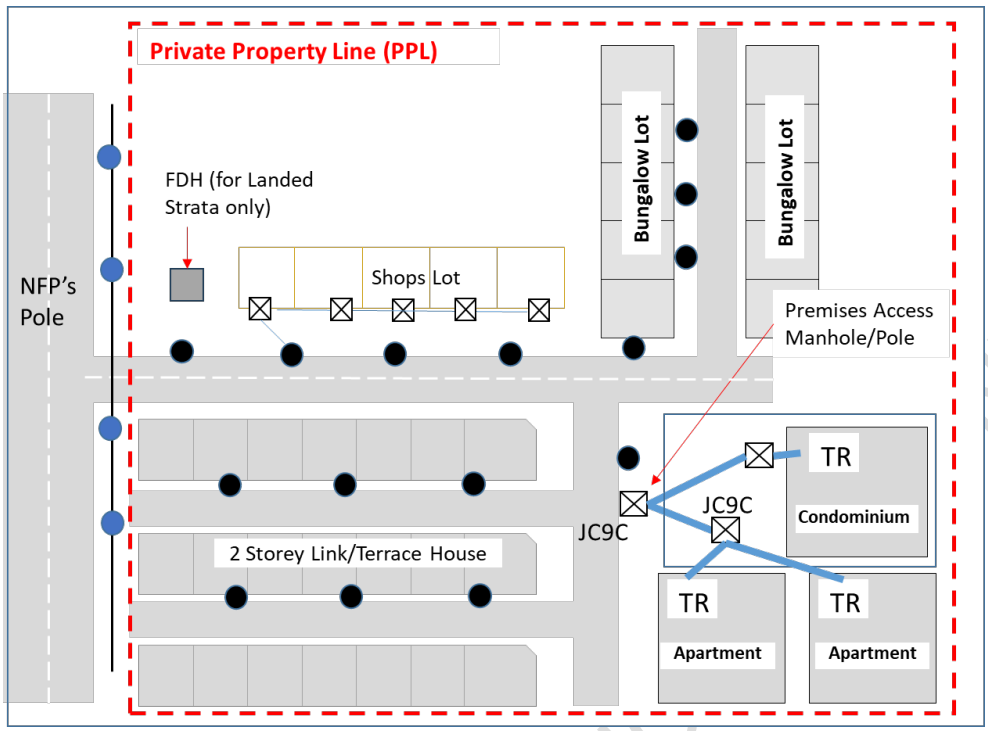

Figure 8. Pole distribution for connection via NFP's pole

Development area designed with pole infrastructure for connection via NFPs underground infrastructure shall be prepared as shown in Figure 9.

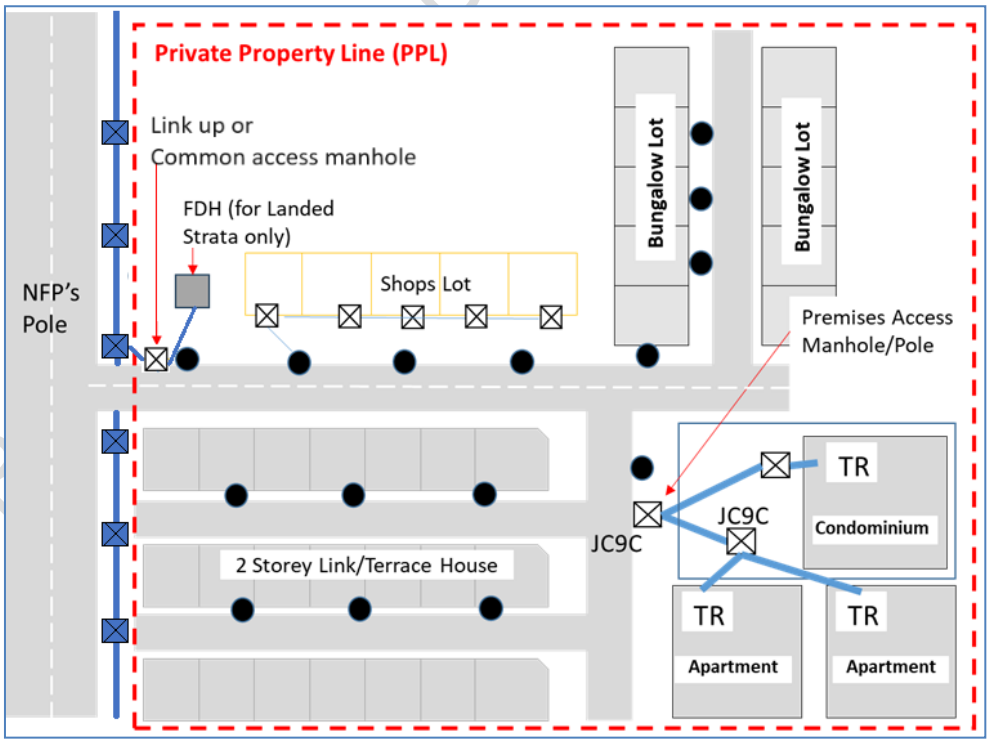

Figure 9. Pole distribution for connection via NFP's underground infrastructure

5.4 Premises access pole

Premises access pole refers to the pole that is used to connect with the customer premises. Each pole shall be positioned within a maximum distance of 50 meters from the serviceable premises shown in Figure 10. The distance shall be measured between pole and premises FTB.

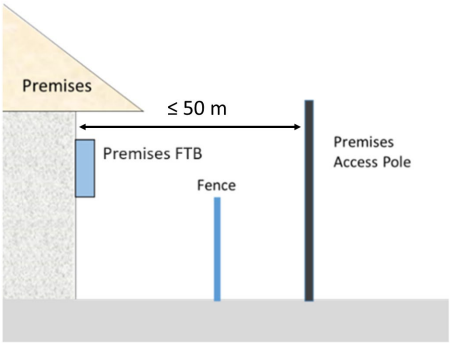

Figure 10. Premises access pole

For scattered developments or rural areas where the distance exceeds 50 m, it is recommended that NFP with NSP license to install an intermediate pole to support the cable. For poles placed on private land, permission from the landowner is required.

6. Infrastructure requirements

6.1 Pole specification

All concrete poles shall meet the specifications in accordance with JIS A5373 or other equivalent and recognised code of practise.

The specifications and installation procedures for these poles should follow the recommendations provided by NSPs and NFPs.

The specifications for the type of poles that can be deployed, with various aspects that dictate the concrete pole functionality, performance are specified in Table 1. The design of the pole shall be endorsed by the Professional Engineer with Practising Certificate (PEPC).

Table 1. Shareable pole specifications

Pole type	Length (m)	Depth (m)	Height (m)	Diameter		Design load (kN), safety factor: 2	Max span (m)	Applications area
				Top (m)	Bottom (m)			
CP7.5-10-1.1kN	7.5	1.3	6.2	0.10	0.175	1.1	30	Premises access pole
CP7.5-14-2.0kN	7.5	1.3	6.2	0.14	0.240	2.0	30	
CP9.0-14-2.0kN	9.0	1.5	7.5	0.14	0.260	2.0	50	a) Road crossing b) High clearance path

The number of cables install on the shareable pole shall not surpass the design load specified in Table 1 (refer to annex B for the guide of determining the number of cables on poles). It is hereby recommended that the first service provider allocate a permissible load space for the benefit of the secondary user.

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6.2 Pole installation

Pole installation should be parallel to along the roads, residential areas, back lanes, and small alleys. The distance between adjacent poles should be refer to Table 1 and illustrated in Figures 13.

For the case of slope area, the maximum difference of height between 2 poles shall be kept less than 300 mm as illustrated in Figure 13. If the distance cannot be met, distance between poles shall be reduced.

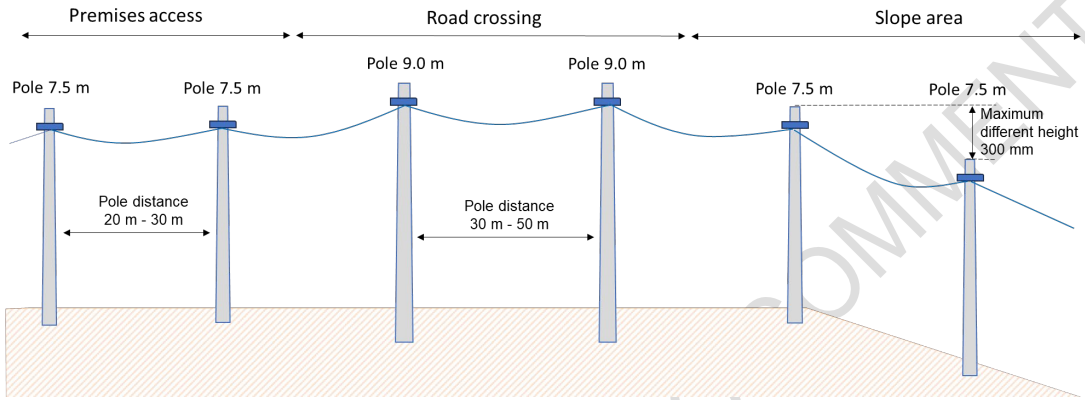

Figure 13. Distance between poles for flat and slope area

The concrete kicking block should be used to support the pole when necessary. The top edge of concrete kicking block shall be installed at 150 mm from the surface level. The example of kicking block dimension is illustrated in Figure 16.

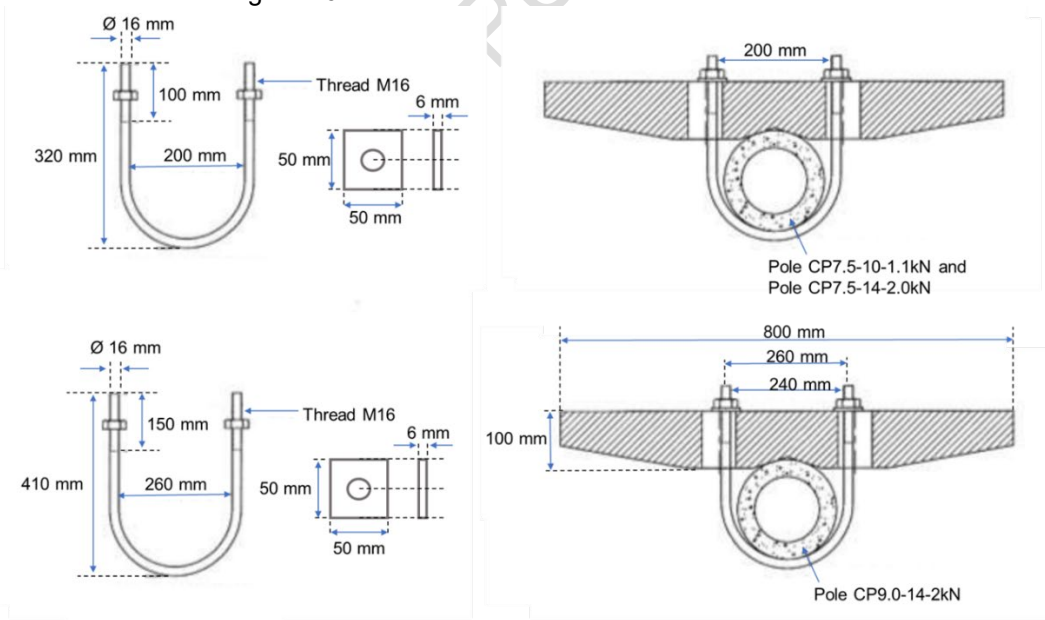

Figure 16. Concrete kicking block dimension

6.3 Stay wire and strut

If the installation of a stay wire or strut is required to account for changes in the alignment, it should be positioned at the beginning, at intersections, and at the end of the cable route to ensure that it does not obstruct the roadway as illustrated in Figures 16 and 17.

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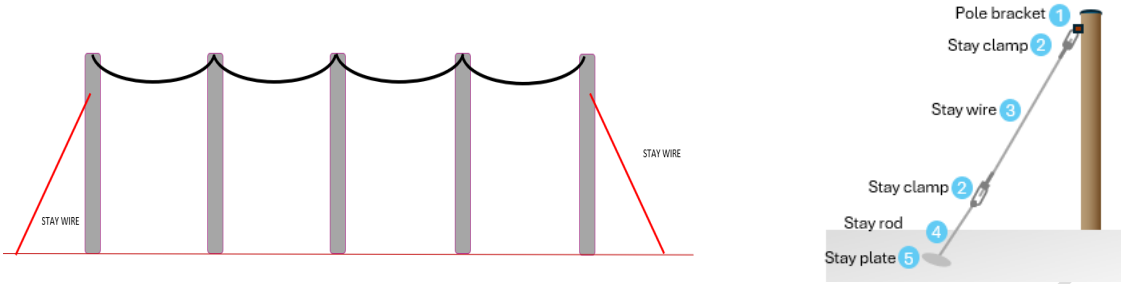

Figure 16. Stay wire installation method

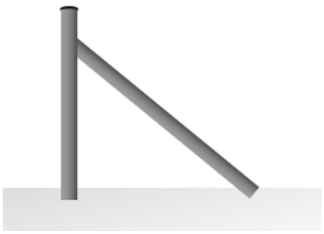

Figure 17. Strut installation method

If the installation of the stay wire or strut requires reassessment, it is essential to ensure that the installation does not disrupt the public or hinder the maintenance work being conducted in the area.

6.4 Pole marking

Pole owners are required to label or mark each pole to indicate below information as per Table 5.

Table 5. Label or marking requirement on pole

Label	Marking requirements		Remarks
	Compulsory	Optional	
Pole owner logo/name	√		To be done by NFP
Asset number/identification	√		
Contact Number		√	-
Pole length	√		To be done by the supplier
Pole design load	√		
Pole standard	√		
Manufacturing date	√		
Embedded length marking	√		
Centre of gravity	√		

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6.5 Accessibility

Only authorised personnel by the NFP and the NSP shall be allowed to access to the pole and equipment. Property owner for strata and non-strata shall establish controlled procedure to allow access to those infrastructure. The access seeker is required to submit a formal request to access provider before accessing the pole.

7. Cabling requirements

Fibre cables installed on poles shall be routed and secured in an organised manner to ensure aesthetics and functionality.

7.1 Cables positioning

To ensure the correct and efficient installation of fibre optic cables, it's essential to pay close attention to the placement of cables, accessories and fittings on poles. Proper spacing not only facilitates maintenance but also minimises the risk of interference or damage to the cables. Figure 18 illustrate the cables position on the poles.

For a detailed understanding of the recommended distances and arrangements, please refer to Figure 19. This illustration provides visual guidance on the appropriate spacing between various accessories and fittings, helping to standardise installation practices. Adhering to these guidelines will promote a safer and more organised installation, ensuring optimal performance of the fibre optic network.

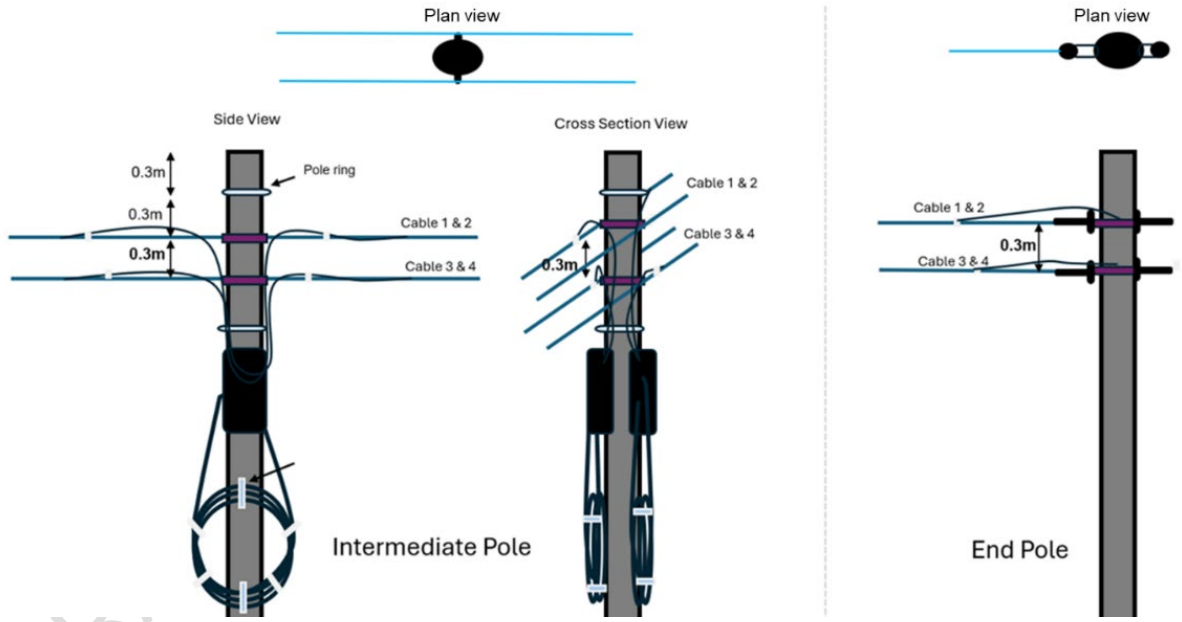

Figure 18. Cables position at pole

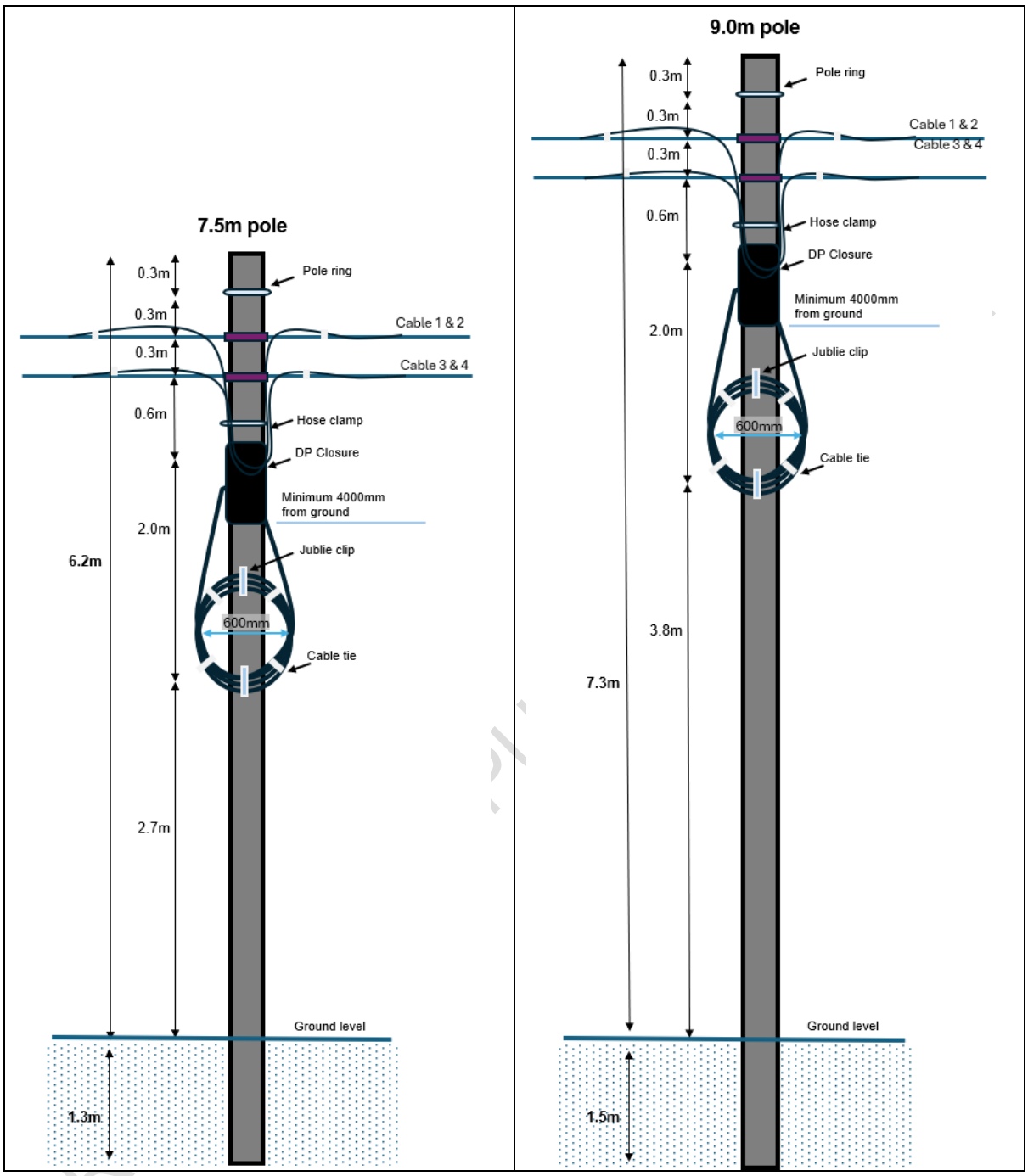

Figure19. Spacing between various accessories and fittings

7.2 Splice closure positioning

As illustrated in Figure 19, dome-type splice closures for aerial fibre optic cables should maintain a minimum clearance of 4 000 mm from the ground. When securing cable coils that have a diameter of 600 mm, utilise cable ties for appropriate fixation.

7.3 Optimal distances between cables

Optimal spacing between cables shall account for various factors such as the cable's size and type, specific operator requirements, and the load-bearing capacity of poles. A general guideline suggests maintaining a minimum distance of 300 mm (0.3 m) for standard single fibre cables.

7.4 Cable organisation and maintenance

For enhanced performance and to minimise potential cable damage or clutter, use the nearest pole ring to systematically manage and drop cables to the nearest premises. This strategy promotes a well-organised setup and facilitates easier maintenance access. Figure 20 illustrates the example on how the drop cable from the nearest pole to the premise.

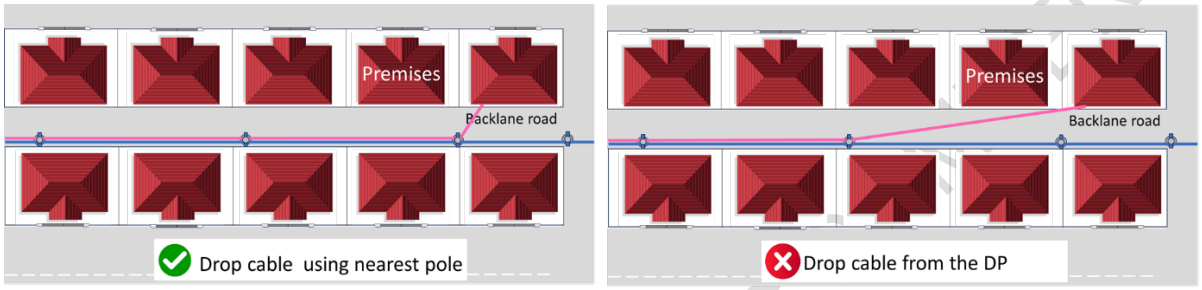

Figure 20. Drop cable from the nearest pole

7.5 Distribution Points (DP)

It is advised to limit the number of Distribution Points (DP) per pole to a maximum of two, with no more than two cable coils per distribution point. Each subsequent distribution point should be positioned on the next available pole to maintain a clean and organised appearance of the installation. Figure 21 illustrates position of DP closures.

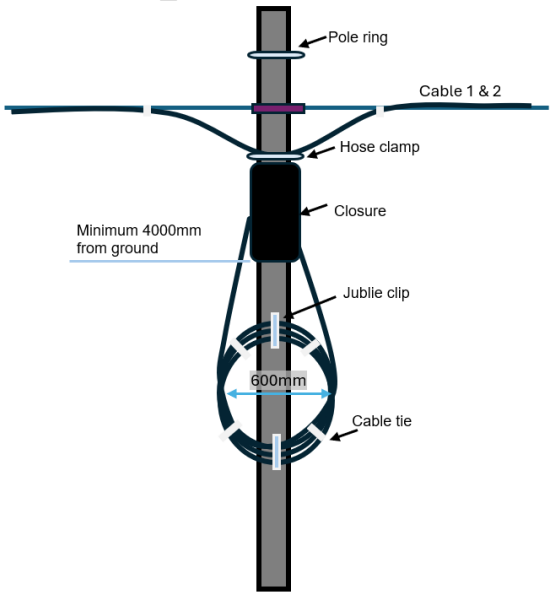

Figure 21. Position of dome-type closures

7.6 Cable sag

For spans measuring between 40 m and 50 m, a targeted cable sag of approximately 1 m is recommended, equating to a sag of about 2% relative to the pole-to-pole distance.

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8. Installation works for Fibre Distribution Cabinets (FDC)

8.1 General requirement

To ensure seamless connectivity and customer satisfaction, NFP or NSP shall ensure that all last mile distribution cabling and FDCs are provisioned with enough number of fibre ports as the house unit, ready for activation and deployment. This means that each house unit shall be allocated a corresponding number of fibre ports in the FDCs, allowing for efficient and reliable data transmission.

The pre-assignment of fibre ports shall be done in a manner that minimises the risk of errors or misconnections, ensuring that customers can access high-speed internet and other services without disruption.

NFP or NSP shall maintain accurate records of the fibre port allocation and availability, to enable swift troubleshooting and resolution of any issues that may arise.

8.1.1 Temporary Occupation License (TOL) application

NFP is required to submit a Temporary Occupation License (TOL) application to the District and Land Office for the installation of fibre distribution cabinets on government land. The following payments are required.

a) permit of work; and

b) TOL fee.

8.1.2 Approval for Fibre Distribution Cabinets (FDC)s construction on local authority road reserve

If the construction of the FDC is located on the local authority (*Pihak Berkuasa Tempatan* (PBT)) road reserve, the NFP shall obtain approval from the local authority (PBT) or local council (*Pihak Berkuasa Meluluskan* (PBM)).

8.2 FDC requirement

When installing FDC, it is essential to adhere to specific guidelines to ensure safety, functionality, and compliance with local regulations. For a proper installation and placement of FDC it shall be:

a) installed neatly and in an organised manner;

b) not hinder traffic flow or pedestrian pathways;

c) made from non-corrosion or treated metallic material to resist corrosion and harsh environment;

d) installed at location by endorsement from PBT or PBM, including the following:

   i) it should not obstruct sightlines at vehicle entry and exit intersections;

   ii) shall not be installed in front of any residential doors or premises; and

   iii) built along pedestrian walkways, ensure a clearance distance from the road edge.

The example of FDC is illustrated in Figure 22.

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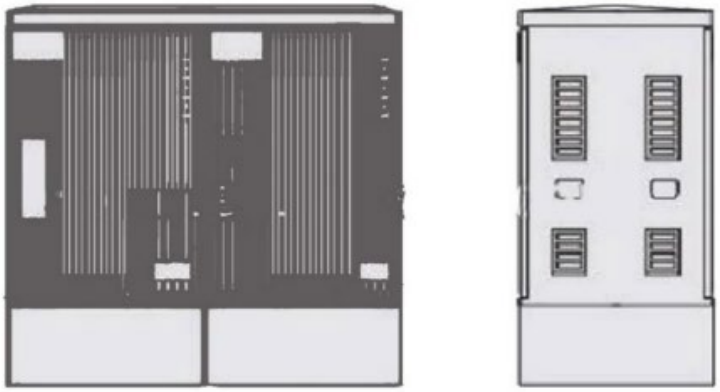

Figure 22: Example of FDC

9. Excavation works

A proper excavation work for installing poles is essential for structural integrity, safety, compliance with regulations, and long-term maintenance, while also considering environmental factors. NFP or NSP shall carry out earth excavation and road resurfacing in a neat and orderly manner if there is any excavation work conducted for pole installation.

The method for installing a concrete pole is by direct embedment. The pole shall be positioned within an augured hole lined with gravel, which shall then be refilled with the original soil or concrete, depending on the current soil conditions. It is imperative to consult with a professional engineer to review the soil condition if required. The poles shall be buried sufficiently deep for stability. The depth depends on the type of pole as tabulated in Table 1.

The requirements for earth excavation from riser cabinets to poles are as follows:

a) damaged roads or road shoulders shall be repaired according to the original specifications (imprint, interlocking, premix, concrete, grass); and

b) if fibre cables need to cross roads via open trench, micro trench and Horizontal Directional Drilling (HDD) method, the road shall be resurfaced using the "mill and pave" method. The resurfacing should be done promptly.

10. Infrastructure and cabling acceptance procedure

10.1 NSP or NFP infrastructure connection request

The developer shall engage with selected NFP for infrastructure connection at least 90 working days before infrastructure installation target date.

10.2 Documentation during infrastructure and cabling acceptance

For the purpose of infrastructure and cabling acceptance procedure, the developer is required to submit the following documents to NFP:

a) acceptance checklist endorsed by consultant or contractor;

b) external infrastructure development plan;

c) as built and cabling schematic line diagram;

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d) registered certifying agency or NFP's type approval certificate of each material used; and

e) upon the acceptance process, NFP shall issue proof of acceptance e.g., Certificate of Acceptance, if all of the requirements are fulfilled according to the specifications.

10.3 Common infrastructure handover

Developer may handover the infrastructure maintenance inside the PPL to selected NFP with the proper handover agreement. Details of the agreement shall be mutually agreed between the responsible and developer.

Selected NFP shall ensure the infrastructure is always in good condition to ensure a smooth service provision to the end-users. Other parties who wish to utilise any of the infrastructure within the PPL are required to notify and obtain permission from the selected NFP.

10.4 Rules and regulations

The developer shall comply with all rules and regulations as follows:

a) The developer shall hire trade contractor with Occupational Safety, Health and Environment (OSHE) and CIDB certifications for all the communications infrastructure and cabling works for the development areas.

b) The developer and NFP shall adhere to the agreed acceptance procedure.

c) The developer to prepare all the documentations required for all the processes for the acceptance procedure.

d) The developer to prepare all the necessary tools and test equipment.

e) All the relevant officers or personnel are required to be present during the acceptance procedure.

f) The developer to ensure all relevant permits are obtained and to be in compliance with all the relevant safety requirements.

g) The acceptance procedure is to be performed once the development progress is 95% completed.

h) All the non-complied items during acceptance procedure shall be rectified by the developer. The developer shall request a new acceptance test procedure to verify the rectified items.

11. Safety and precaution

Safety facilities for construction projects shall adhere to the NFP's guidelines issued by the relevant parties of the NFP and/or any requirements issued by the relevant authorities.

A traffic management plan as specified in MCMC MTSFB TC G025-1 shall be developed and implemented to ensure the safe diversion, slowdown, or stoppage of traffic in the vicinity of the work area.

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Annex A
(informative)

Abbreviations

BM	Bending Moment
CO	Central Office
DP	Distribution Point
DSL	Digital Subscriber Line
D-Side	Distribution Side
E-Side	Exchange Side
FDC	Fibre Distribution Cabinet
FDP	Fibre Distribution Panel
FOC	Fibre Optic Closure
FTTC	Fibre-to-the-Curb
FTTH	Fibre-to-the-Home
FTTP	Fibre To The Premises
HDD	Horizontal Directional Drilling
JMB	Joint Management Building
MC	Management Corporation
MDU	Multi-Dwelling Unit
NFP	Network Facilities Provider
NSP	Network Service Provider
ONT	Optical Network Terminals
PBM	Pihak Berkuasa Melulus (Local Council)
PBT	Pihak Berkuasa Tempatan (Local Authority)
PECP	Professional Engineer with Practising Certificate
PPL	Private Property Line
PSTN	Public Switched Telephone Network
SDU	Single Dwelling Unit
Sub-MC	Subsidiary Management Corporation
TOL	Temporary Occupation License
TR	Telecommunication Room
VoIP	Voice over Internet Protocol

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Annex B
(normative)

Calculation for number of cables on poles

B.1 Introduction

To calculate the number of cables on poles, the following loads, Pole Wind Load (F_{pW}) and Aerial Cable Wind Load (F_{aW}) shall be considered.

These loads expected to be applied to a pole in order to determine the pole's strength requirements to sustain the loads. These loads are simultaneously applied to poles in the horizontal directions.

The poles need to have sufficient strength such that the following relationship is satisfied:

$$F_{pW} + F_{aW} \leq F_{DL}$$

Where,

F_{pw} is Wind load acting on pole (kN)

F_{aw} is Wind load aerial cable acting on pole (kN)

F_{DL} is Pole design load (kN)

B.2 Wind load

Wind load is the effect of wind on buildings, structures and other objects. It is caused by wind pressure, air speed and wind velocity.

Wind pressure is the overall force applied upon a structure by wind. In case of it being a flat surface it includes two main elements, the primary being the energetic weight applied on the windward side of the surface referred to as wind load.

The strength of the wind load depends on the magnitude of the wind speed.

In order to prevent structural collapse, the pole's structural design must securely and efficiently absorb wind forces and convey them to the foundations.

B.2.1 Basic wind speed (V_s)

The basic wind speeds are usually taken at 10m height above ground at all meteorological stations and are used as reference wind speed considered in calculation design load to building structure.

The basic wind speed (V_s) = 33.5 m/s (120.6 km/h) 3 second gust speed or 22.22 m/s mean hourly wind speed for all sites. This corresponds to a return period of 1 in 50 years.

B.2.2 Wind pressure (p_d)

Wind pressure refers to the intensity of force that wind applies to a structure and is measured in Pascals (1 Pascals = 1 N/m^2).

Table B.1 shows the lists of value for wind pressure versus height generated from ASCE 7 which recommended to be used in all wind load calculations of this Technical Code. The value generated based on the following Table B.2 common data.

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Table B.1. Wind pressure versus height

p_d (kN/m^2)	Height (m)
0.364516	0
0.364516	4.572
0.373892	5.158154
0.38246	5.744308
0.390364	6.330462
0.39771	6.916615
0.40458	7.502769
0.411038	8.088923
0.417137	8.675076
0.422918	9.26123

Table B.2. Common data in generating the wind pressure values

Items	Details
Building Classification Category	Category IV
Basic Wind Speed	33.5 m/s
Exposure Category	Exposure C
Structure Type	Chimney, tank and similar structure

B.2.3 Wind load pole (F_{pw})

The pole manufacturer shall provide the wind load information based on the basic wind speed and wind pressure in the above.

If the information is not made available, the following step of calculation can be used as a guidance.

a) Step 1, calculate the Bending Moment (BM)

The bending moment (*BM*) due to wind on pole at ground level:

$$BM = p_d \times P_h^2 \times (C_{pgl} + 2 \times C_{pt})/6\pi) \times \text{overload capacity factor}$$

Where,

p_d is wind pressure

P_h is Pole height

C_{pgl} is pole circumference at ground level

C_{dt} is pole circumference at top

$6/\pi$ is calculation constant

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Overload Capacity Factor taken as 2.5 (NESC Table 253-1 load factor for wind loads)

b) Step 2, calculate the equivalent wind load acting on pole at the load point

$$F_{pW} = BM / (P_h - P_{lp})$$

Where,

P_{lp} is pole load point

B.2.4 Wind load aerial cable (F_{aw})

F_{aW} is the horizontal load acting on a pole (loading position), arising from wind at right angles to the span of the cables. It shall be calculated from the following equation:

$$F_{aW} = p_d \,.d_c \,.k_e \,.L_w \text{ (kN)}$$

Where,

p_d is the design wind pressure in kN/m^2

d_c is nominal external diameter of the cable, in meters

k_e is a span factor, taken as equal to 1.0

L_w is the wind span

$L_w = (L_1 + L_2)/2$

L_1 is pole span of the adjacent pole on the left side

L_2 is the adjacent pole on the right side

B.3 Calculation example

The following are several examples of cables and pole loading calculation.

B.3.1 Example 1 (pole wind load made available by the pole manufacturer)

Given pole data and aerial cable as per Table B.3 and Table B.4 respectively and the pole span 30 m. Calculate the total wind load acting on pole and determine if the numbers of cables exceed the pole design load.

Table B.3 Pole information provided by pole manufacturer

Concrete Pole Type	CP 7.5-10-1.1kN
Pole Design P_{DL} Load (kN)	1.1
Pole Wind Load F_{pW} (kN)	0.26

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Table B.4. Types of fibre optic cable

NFP	Cable Illustration	Fibre Optic Cable Type (IB)	Nominal external diameter of the cable, d_c (m)
A	See Figure B.1	144C	0.0240
B	See Figure B.2	144C	0.0164

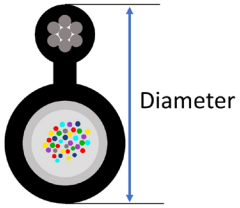

Figure B.1. Example of fibre optic cable type for NFP A

Figure B.2. Example of fibre optic cable type for NFP B

Calculation,

From Table B.3,

$$F_{pW} = 0.26 \text{ kN} \; ; \; F_{DL} = 1.1$$

For NFP A,

$$F_{aW} = p_d \, . d_c \, . k_e \, . L_w \text{ (kN)} = (0.390364 \text{ kN/m}^2) \text{ x } (0.024 \text{ m}) \text{ x } 1 \text{ x } (30 \text{ m})$$
$$= 0.281\text{kN}$$

For NFP B,

$$F_{aW} = p_d \, . d_c \, . k_e \, . L_w \text{ (kN)} = (0.390364 \text{ kN/m}^2) \text{ x } (0.0164 \text{ m}) \text{ x } 1 \text{ x } (30 \text{ m})$$
$$= 0.192 \text{ kN}$$

Total aerial wind load cable,

$$= 0.281 \text{ kN} + 0.192 = 0.473 \text{ kN}.$$

Given,

$$F_{pW} + F_{aW} = 0.26 \text{ kN} + 0.473 \text{ kN} = 0.733 \text{ kN}$$

The value 0.733 kN ≤ 1.1 kN ; hence the pole type CP75-10-1.1 have strength requirements to sustain the loads.

B.3.2 Example 2 (pole wind load not available by the pole manufacturer)

Given pole data and aerial cable as per Table B.3 and Table B.4 respectively and the pole span 30 m. Calculate the total wind load acting on pole and determine if the numbers of cables exceed the pole design load.

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Table B.3 Pole information provided by pole manufacturer

Concrete Pole Type	CP 7.5-10-1.1kN
Pole Design P_{DL} Load (kN)	1.1
Pole height P_h (m)	6.2
Pole Wind Load F_{pW} (kN)	0.26
Pole Depth P_d (m)	1.3
Taper	0.01
Pole Bottom Diameter P_{bd} (m)	0.175
Pole Diameter at Ground Level P_{gl} (m)	0.161
Pole Top Diameter P_t (m)	0.100
Pole Loading Point from Top P_{lp} (m)	0.300

Table B.4. Types of fibre optic cable

NFP	Cable Illustration	Fibre Optic Cable Type (IB)	Nominal external diameter of the cable, d_c (m)
A	See Figure B.1	144C	0.0240
B	See Figure B.2	144C	0.0164

Calculation,

a) Step 1, calculate pole circumference at pole top and pole circumference at pole ground level

$$C_{pgl} = \pi P_{gl} = 0.161\pi \text{ m}$$

$$C_{dt} = \pi P_t = 0.100\pi \text{ m}$$

b) Step 2, calculate Bending Moment (BM)

The bending moment (*BM*) due to wind on pole at ground level:

$$BM = p_d \times P_h^2 \times (C_{pgl} + 2 \times C_{pt})/6\pi) \times \text{overload capacity factor}$$

$$= (0.390364 \text{ kN/m}^2) \times (6.2\text{m})^2 \times [((0.161\pi + (2 \times 0.100\pi))/6\pi] \text{ m} \times 2.5$$

$$= (0.390364) \times (38.44) \times (1.137257)/6 \times (2.5) \text{ kN.m}$$

$$= 1.185 \text{ kN.m}$$

c) Step 3, calculate the equivalent wind load acting on pole at the load point

$$F_{pW} = BM / (P_h - P_{lp})$$

$$= 1.185 / (6.2 – 0.3) \text{ kN}$$

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= 1.185 / 5.8 kN

= 0.20 kN

d) Step 4, calculate wind load aerial cables for NFP A and NFP B

For NFP A,

$$F_{aW} = p_d \,.d_c \,.k_e \,.L_w \text{ (kN)} = (0.390364 \text{ kN/m}^2) \text{ x } (0.024 \text{ m}) \text{ x } 1 \text{ x } (30 \text{ m})$$

= 0.281kN

For NFP B,

$$F_{aW} = p_d \,.d_c \,.k_e \,.L_w \text{ (kN)} = (0.390364 \text{ kN/m}^2) \text{ x } (0.0164 \text{ m}) \text{ x } 1 \text{ x } (30 \text{ m})$$

= 0.192 kN

Total aerial wind load cable

= 0.281 kN +0.192 = 0.473 kN.

e) Step 5, calculate total wind load for both pole and cables

$$F_{pW} + F_{aW} = 0.20 \text{ kN} + 0.473 \text{ kN} = 0.673 \text{ kN}$$

The value 0.673 kN ≤ 1.1 kN ; hence the pole type CP75-10-1.1 have strength requirements to sustain the loads.

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Bibliography

[1] MCMC MTSFB TC G024, Fixed Network Facilities - In-Building and External

[2] MCMC MTSFB TC G025 (all series), Basic Civil Works

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Acknowledgements

Members of the Fixed Network Facilities Working Group

Working Group Leaders

Ts Amir Subhi Wan Omar (Chair)	TM Technology Services Sdn Bhd
Mr Zulkefli Zabri (Vice chair)	Maxis Broadband Sdn Bhd
Ir Dr Anas Abdul Latiff (Secretary)	Universiti Teknikal Malaysia Melaka

Drafting Committee Members

Mr Eami Yusry Mohd Yusof (Draft lead)	Maxis Broadband Sdn Bhd
Mr Muhaimin Mat Salleh (Secretariat)	Malaysian Technical Standards Forum Bhd
Mr Mohamed Azli Ab Jalil	Maxis Broadband Sdn Bhd
Mr Zulkefli Zabri	Maxis Broadband Sdn Bhd
Mr Mohd Mokhtar Daud	Malaysia Digital Economy Corporation Sdn Bhd
Mr Amirahmad khamesipour	PMW Concrete Industries Sdn Bhd
Mr Yusof Yeop Ahmat	PMW Concrete Industries Sdn Bhd
Mr Aminnurrashid Abd Manaf	TIME dotCom Berhad
Mr Salleh Husin	TIME dotCom Berhad
Ts Amir Subhi Wan Omar	TM Technology Services Sdn Bhd
Mr Nazar Mohd Nong	TM Technology Services Sdn Bhd
Ts Sufian Sulaiman	TM Technology Services Sdn Bhd
Ir Dr Anas Abdul Latiff	Universiti Teknikal Malaysia Melaka
Prof Ir Dr Badrul Hisham Ahmad	Universiti Teknikal Malaysia Melaka

Contributors

Mr Muhamad Imran Muhamad Zulkifli	*Allo Technology Sdn Bhd*
Mr Zulkeple Saari	Asaascom Engineering Sdn Bhd
Mr Muhammad Rezza Alui	CelcomDigi Berhad
Mr Peter Barry Macaulay	CelcomDigi Berhad
YM Raja Zahiruddin Raja Muda	CelcomDigi Berhad
Mr Awi bin Shahadan	*Desjaya Concrete Sdn Bhd*
Ir Che Mimi Suriyani Ismail	*Jabatan Kerja Raya Malaysia*
Mr Mohd Ismail Ahmad Sabri	*Majlis Bandaraya Seberang Perai*
Mr Mohd Kasyful Azim Ab Rahman	Maxis Broadband Sdn Bhd
Mr Prakash Anbalagan	Maxis Broadband Sdn Bhd
Mr Mustaqin Alpi	*Pejabat Setiausaha Kerajaan Negeri Pulau Pinang*
Mr Leong Woon Min	Redsun Engineering Sdn Bhd

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Ms Norhanisah Mohd Basri	SIRIM Berhad
Ts Mohd Zulfadzli Abu Seman	SIRIM Berhad
Mr Yousri Taibin	Terengganu Telecommunications Sdn Bhd
Mr Nor Hafiz Mohd Razali	TIME dotCom Berhad
Mr Abdul Ghani Abdul Jalil	TM Technology Services Sdn Bhd
Mr Ahmad Fizri Mohd Azmi	TM Technology Services Sdn Bhd
Mr Ahmad Noor Zaini Bin Mohammad Zaibi	TM Technology Services Sdn Bhd
Mr Ahmad Shahril Abu Bakar	TM Technology Services Sdn Bhd
Ms Erliz Rizuan	TM Technology Services Sdn Bhd
Ms Hana Afita Shahar	TM Technology Services Sdn Bhd
Mr Mohammed Ariffadllullah B Md Shariff	TM Technology Services Sdn Bhd
Mr Mohd Fahmi Hassim	TM Technology Services Sdn Bhd
Ms Fatimah Salwani Ramli	TM Technology Services Sdn Bhd
Mr Mohd Fuad Turiman	TM Technology Services Sdn Bhd
Mr Mohd Nizam Osman	TM Technology Services Sdn Bhd
Mr Mohd Saiful Azim Mohd Safian	TM Technology Services Sdn Bhd
Mr Mohd Saiful Shapiai	TM Technology Services Sdn Bhd
Mr Ahmad Nasri Zakaria	U Mobile Sdn Bhd
Dr Muhammad Yusof Mohd Noor	Universiti Teknologi Malaysia

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