Digital infrastructure technical report

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Acknowledgment of Country

The Department of Planning, Industry and Environment acknowledges the Traditional Owners and Custodians of the land on which we live and work and pays respect to Elders past, present and future.

Contents

Purpose of this document

This document gives the technical detail and information necessary for planning, designing and constructing 'in ground' capacity for competitive telecommunications and smart infrastructure connectivity.

A properly designed and constructed fibre network will provide a flexible, efficient, long‐lasting and cost-effect solution for the City's present and future communication needs. Implementing the technical specifications in this document will ensure a flexible and uniform telecommunications environment that will allow for the growth of high-speed, high-bandwidth communication services that smart place applications need.

This document may be used as a supporting guide for planning instruments referencing Smart Place outcomes as required. This document was first used to support Western Sydney Aerotropolis Development Control Plan (Phase 2) by giving the specifications needed for Chapter 15 Smart Places, Performance Outcome 2 (PO2): *Pit and pipe infrastructure support* for *future requirements to service smart city infrastructure*.

The document is set out in two sections:

- **Part 1: Telecommunication network elements**

  An overview of the components of the telecommunication network to be considered consider when planning and delivering fibre connectivity during the urban development of brownfield, greenfield or renewal areas.

- Part 2: Dimensioning

  General conduit and pit considerations and technical treatment guidelines for specific place and linear corridors, both in a greenfield and brownfield context.

Key terms used throughout this document

Table 1. Terms in this document

Term	Description
4G	The fourth generation of cellular network technology. Technically referred to as Long-Term Evolution (LTE). Continues to provide increases in bandwidth (IMT-2000 or International Mobile Telecommunications-2000).
5G	The fifth generation of cellular network technology. Technically referred to as 5G New Radio (5G NR) (IMT-2020).
brownfield	Refers to an area where there is existing infrastructure and buildings. The opposite of greenfield, where the area is being developed for the first time.
conduit	Parts of a closed wiring system used to enclose cables in an electrical or telecommunications installation, which allows the cables to be drawn in or replaced
edge computing	Data processing that is done locally and closer to the devices that gather it, instead of at centralised or cloud data centres that may be far away
facility	Any non-premise location where a telecommunication service may be required. Typically, a location which has a power supply or measurement device.

service facility conduit	Conduit provided for connection to street furniture and non-building connections
IoT	Internet of Things (devices, such as bin sensors, that connect things to the internet)
lead-in cable	Optic fibre cable that is installed from the optic fibre joint through the street network and lead-in conduit to the building termination points
LIC	Lead-in-conduit – pipe from the street to building
major pits	Major pits provide a location where optic fibre joints can be installed to allow for diverging paths or connection of lead-in cables of facility cables
minor pits	Smaller pits are used for points of interconnection to lead-in conduit and facility conduit or to support the hauling of cable
NBN	National Broadband Network
OF	optic fibre
Pbps	Petabits per second; quadrillions of bits per second
P100	plastic conduit 100 mm diameter
P20	plastic conduit 20 mm diameter
P50	plastic conduit 50 mm diameter
pit	A wiring enclosure used to provide space for placing and joining cables, pulling cables, performing an operation on cables or for the inclusion of other equipment
premises	Defined as either a living unit, business unit or commercial space
smart places	Smart places use sensors and electronic methods in the built environment to capture and convey data and insights. The technology captures information about the asset or local environment. The data is analysed to help people and governments make better, evidence-based decisions about how to improve the productivity, liveability and resilience of cities, towns and communities
street conduit section	Defined as P100 conduits between two major pits. The required number of P100 conduits is part of the dimensioning

Overview

Three tiers of government have a digital vision for the Western Parkland City. It promises a digitally capable region with flexible, future-focused communication infrastructure that supports smart, place-based solutions. This vision is born from the Western Sydney City Deal: a 20-year plan agreed on by the Australian Government, NSW Government and eight local councils to deliver transformative change for the Western Parkland City to become a fully realised 22nd-century city.

To achieve a digital vision of flexible, future-focused communication infrastructure that supports smart, place-based solutions for urban development, we need to consider 'digital plumbing' in the planning of urban areas and deploy it across the city as part of construction where ever possible. Digital plumbing includes capacity conduit, common access ducts, and a network of 'smart poles' and smart street furniture, which is seen as essential foundations for the future city.

Demand for data and the number of connected devices are growing beyond what has ever been envisaged in city planning. Connectivity currently thought of as cutting edge is already being superseded. While many countries are working to provide 10 gigabit optical fibre networks to attract investment, business and new jobs, 100 gigabit networks are already being planned across the globe. These are expected to surpass the 10 gigabit networks in the medium term (two to five years).

The planning, design and delivery of telecommunication infrastructure must consider the connection of premises, support for cellular networks (4G, 5G, 6G), edge computing facilities of the future and the connection of all internal and external facilities. Facilities are forecast to include every device that has some form of power source, including building facilities (that is, lighting, heating, ventilation, air conditioning), usage meters (that is, gas, water, electricity), street lights, traffic lights and vehicles. The exact requirements in many cases remain undefined. Wherever possible, any telecommunication infrastructure that is delivered must consider longer-term requirements.

Because of the long-term planning horizon for the state significant precints and regions, we recommended that networks cater for 1 Pbps (symmetrical) per premise in 2040 and up to 100 Pbps (symmetrical) per premise in 2050.

Currently, the business-as-usual approach to the delivery of telecommunication infrastructure includes:

- installation of greenfield fibre-ready pit and pipe only (for NBN or others)
- post-greenfield carrier installations as required
- non-uniform installation of government/council-owned conduit.

The proposed treatment outlined in this document aims to provide additional pit and pipe (conduit) capacity to enable world-leading connectivity speeds. These would support the requirements of advanced manufacturing, technology sector jobs and advanced research or similar Industry 4.0 jobs which will locate in our urban precincts.

By doing so, the telecommunications environment will be ready to support the multitude of connectivity demands now and into the future, including:

- diverse and redundant multi-carrier connectivity
- transition to terabit and petabit bandwidth
- 5G/6G transmission and small cell/picocell hosting
- massive level Internet of Things sensors
- edge computing facilities
- smart pole network
- electric vehicle (EV) charging stations
- fibre optic sensing.

Part 1: Telecommunication network elements

Facility connectivity

The modern telecommunication environment requires connectivity to many more locations than telecommunication equipment sites, businesses and residential buildings. With the deployment of the Internet of Things (IoT), almost any location ('facility') with equipment will require some form of telecommunication connection.

These include:

- street lights
- traffic lights
- electricity control devices and meters
- water and sewerage equipment
- traffic monitoring
- parking management solutions
- environmental and city management sensors
- electrical vehicle charging points
- edge computing facilities
- V2X (vehicle-to-everything) autonomous vehicles.

Many of the potential requirements for non-premise connectivity are currently unknown; however, ensuring that connections can be made as required is a prudent approach and one that we encourage following.

The current approach to the IoT often involves a combination of direct cable connection and wireless connections to neighbouring devices, creating a 'mesh'. At some point in a mesh network, the concentrated services need to be connected to a wider network, either by fibre or cellular service. Rather than trying to predict how this will be implemented, the recommended approach is to provide pipe from the network to all known street furniture locations when the incremental cost is low because of shared trenching. By providing this pathway, the need to excavate in the future should be minimised, if not eliminated.

The proposed approach within this guideline is to provide a pathway to any identifiable location (facility), such as street or easement equipment location, which has an electricity distribution connection. This will also support the implementation of multiple, smaller millimetre wavelength base stations if required in the future.

Passive infrastructure

Telecommunication passive infrastructure comprises pits and conduits of various sizes in which optic fibre cables can be installed.

For the purpose of this guideline, conduits are divided into four types, which are described in Table 2:

Table 2. Types of conduits

Conduit type	Description
Express conduit	Provides the interconnection points to others network assets. The nature of this network is such that it can easily be expanded or interconnected without affecting the network's robustness.
Distribution conduit	The main conduit network that connects all locations and provides a continuous path from each service location to the boundary of each premise or non-premise
Lead-in conduit	Connects the street network to each building. Extends from the nearest pit or manhole through to the network termination point within the building. For larger buildings, the network termination will be an equipment room.
Facility conduit	A term used in this document to identify conduit installed to provide connectivity to street furniture such as light poles, meters, electrical devices.

All conduits should be installed on the same alignment until a bend into either the building or to connect to a facility is required.

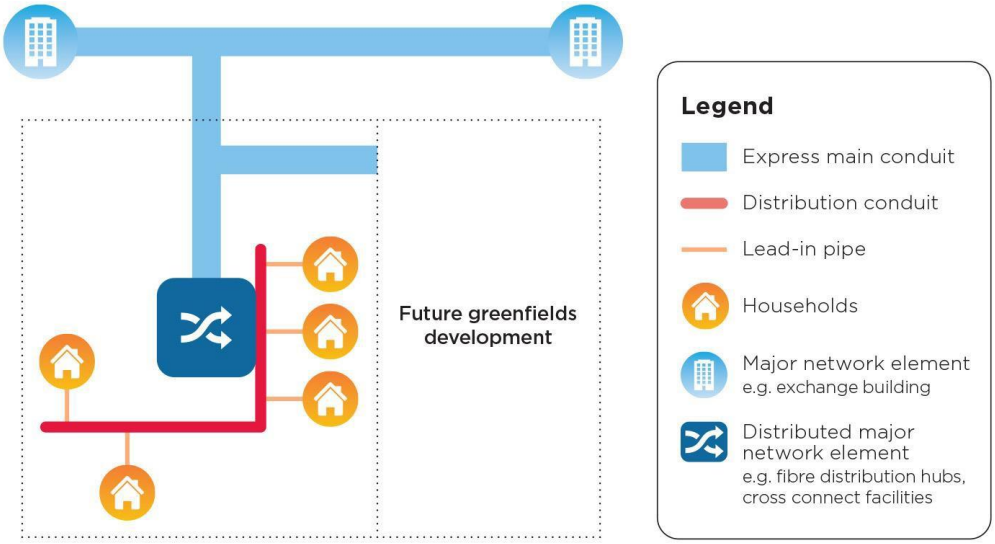


Figure 1. Passive infrastructure

Microproducts and pico-trenching

It is possible to take advantage of existing equipment for trenching to install several ducts and micro-ducts simultaneously. Nowadays, with the miniaturisation of telecommunications infrastructure, it is possible to use low-impact micro-trenching techniques, which take up less time and space.

Part 2: Dimensioning

The dimensioning of the street network and building telecommunication infrastructure requirements within this guideline uses a common unit of measurement: the number of premises.

We have chosen the number of premises as it is readily available from planning processes and is considered the best indicator of overall telecommunication requirements. With modern networks based on optic fibre cable, the differentiation between business and residential premises is no longer a key factor, with a pair of fibres capable of servicing any bandwidth requirement.

The number of premises is to include current and future requirements for the defined area of measurement. Allowance has been made within the dimensioning rules for non-premise requirements and connections.

Premises are defined as any:

- residential unit
- business/office unit
- commercial/industrial unit.

The quantity for dimensioning the various elements is the sum of all premises that will exist beyond a certain point. The point of measurement may be a building, a pit, or a floor in the building.

Examples include the number of premises:

1. within a building for dimensioning the equipment room
2. to be connected beyond a nominated point in the network (for example, pit, conduit section)
3. within a building to define the size of the lead-In conduit.

Table 3 shows the minimum coverage from ground level that conduit installations must have:

Table 3. Minimum coverage requirements

Conduit type	Minimum cover to standard ground level
Facility conduit	300 mm
Lead-in conduit	450 mm
Street route (reserve or easement)	450 mm
Road/street crossings	600 mm (or as per local requirements)

Separation must be maintained from other services, as shown in Table 4:

Table 4. Separation requirements

Service item	Requirements	Minimum radial clearances
Gas pipe	Over 110 mm	300 mm
	110 mm or less	100 mm
Power	High voltage	300 mm
	Low voltage	100 mm (where LV cable not in pipe)
Water mains	High pressure/capacity	300 mm
	Local reticulation	150 mm
Sewer	Main	300 mm
	Connection pipe	150 mm
Hazardous services*	n/a	100 mm

* includes a gas pipe, oil pipe, steam pipe, hot water pipe exceeding 60ºC and a pipe containing compressed air

Conduit requirements

A conduit needs to meet appropriate standards for any telecommunication requirements. These standards include:

- The whole conduit to be white
- The whole conduit to be smooth internally with no burs.
- Conduits to finish flush with the wall of pits
- Conduits to be PVC
- Conduits to be standard industry sizes
- P20 – Diameter 20 mm
- P50 – Diameter 50 mm
- P100 – Diameter 100 mm

To allow for the hauling of optic fibre cables and change of direction, conduits must use pre-formed conduit bends. To prevent damage to cables, minimum radius for bends must be used, as shown in Table 5.

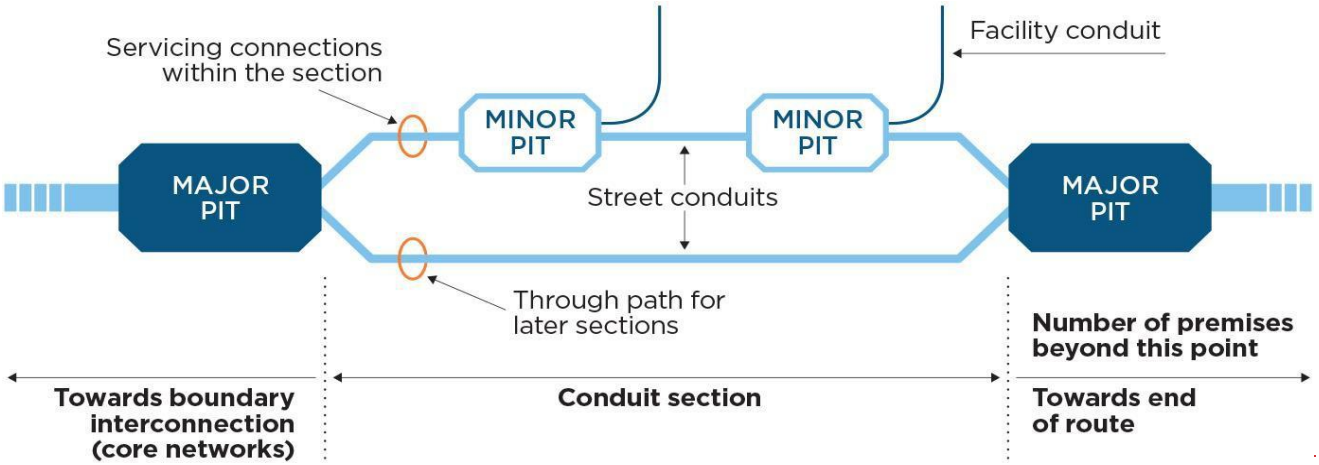
Table 5. Minimum radius for conduit bends

Conduit type	Minimum bend radius
Street network P100	5 m
Lead-in conduit P100	5 m
Lead-in conduit P50	300 mm
Lead-in conduit P20	300 mm
Facility conduit P20	300 mm

The rules to be applied when locating all pits:

- Pits must be a minimum of 3 m away from the corner of the property boundary on road or street intersections.
- Drivers must be able to park a vehicle on the same side of the road 8 m before a major pit.
- Telecommunication infrastructure alignment must be within road reserves or existing easements.
- Pits must be on stable land not subject to any soil movement or expected erosion.
- Pits must not be located in an existing or proposed roadway, driveway or trafficable areas.
- Pits must not be located on private property.
- All conduits and pipes are to enter pits or manholes from the short ends, with no side entry allowed.
- In all cases, pits are to be installed with the longest edge parallel to the property line.

The telecommunication passive network elements should be sized based on the number of premises that will be served beyond the current point in the network.



A limited number of standard conduit and pit sizes are proposed to simplify the network deployment as outlined in Figure 2. Figure 2 also illustrates where multiple P100 street conduits are required to service areas further along the route. Only one conduit is connected through the minor pits.

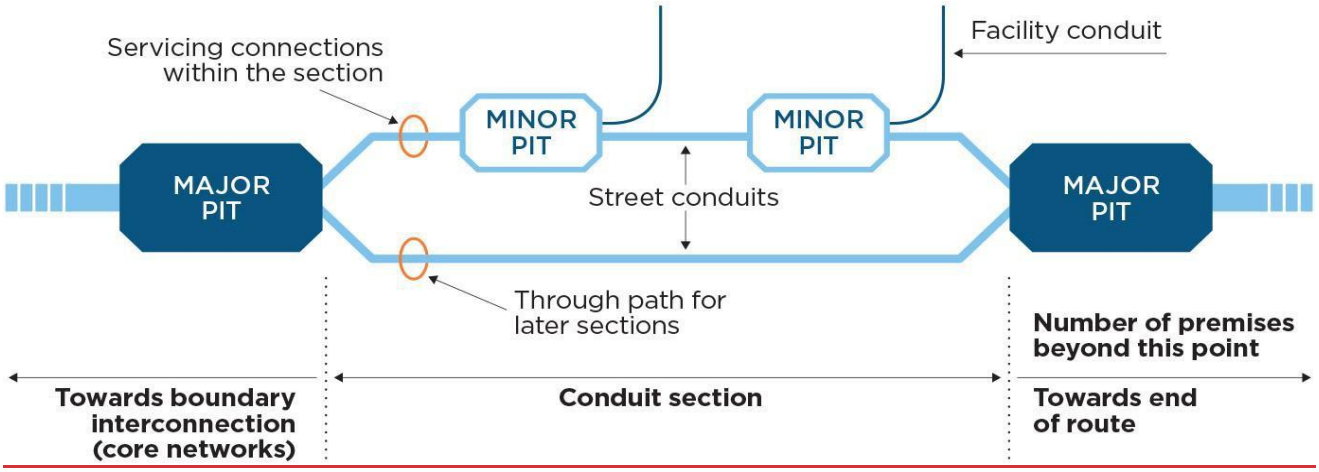


Figure 2. Typical elements of the street network and reference for measurement of premises

There is a need for major pits where street conduit paths extend in two or more directions as outlined below in Figure 3.

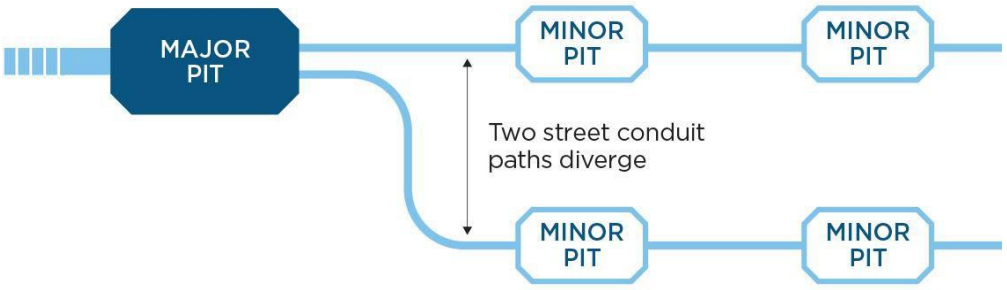


Figure 3. Illustration of major pits where street conduit paths extend in more than one direction

Conduit for greenfield sites

For areas where new roadways and service installations are still to be completed, the telecommunication conduit should be installed in the shared trench with the size or capacity as defined in this document. Pits will typically be installed after the shared trench installation activity, but the locations need to be defined before the work begins to ensure all current and future potential service locations can be connected. With proper planning, the passive telecommunications infrastructure can be deployed intelligently in the first instance, which will maintain the development's overall master plan and aesthetics.

Telecommunication conduit in shared trench areas should be installed as:

- **Express and distribution conduit** – wherever electrical distribution is being installed (the electrical design will define the routes)
- Including where the route will be extending to existing telecommunication infrastructure. These sections will allow for cables to be installed on alternate paths in the future if diversity is required.
- **Lead-in conduit** – if electrical distribution is being provided to a building, telecommunication conduit should be installed. If the site does not have a building, the starter conduit should be installed (approximately one metre in length) and sealed.
- **Facility conduit** – wherever electrical distribution is proposed to other locations such as street lights, traffic lights, water and sewerage, and transformers, a continuous pipe is to be installed from the nearest pit to the new location.

Conduit for brownfield sites

Telecommunication conduit required in brownfield areas should comply with the general standards and capacity definitions and installed as:

- **Express and distribution conduit** – installed on the designated BCC telecommunications infrastructure alignment.
- **Lead-in conduit**
    - If the site does not have a building, the starter conduit should be installed (approximately one metre in length) and sealed
    - If a building exists or is under construction at the site – a lead-in conduit with bend should be installed that complies with general standards.

- **Facility conduit** – follow the telecommunication alignment until adjacent to street furniture and then use an appropriate bend to align with base of element. For brownfield areas, the facility conduit is to be installed as required.

Subduct

Subduct is the preferred method for carrier's cable installations and should always be the first choice for cable installations as a direct point-to-point reservation.

Subducting allows maximum protection for alternative carriers' cables during and after installation, and during recovery of cables. Accordingly, polyethylene (PE) subducts are to be installed to house other telecommunications carriers' cables, with the exception being building lead-ins.

The standard subduct is PE 32 (28 mm ID) subduct to AS/NZS 4130:2009 "Polyethylene (PE) pipes for pressure applications"

Number of subducts allowed per conduit are:

- P100 – 4
- P50 – one
- P20 – Nil

Separation between carrier pits/manholes

There must always be a minimum separation of 3 m between carrier's pits and manholes (see Figure 4). Wherever possible, manholes and pits should be placed to allow both carriers to work in their respective underground plant at the same time. A minimum separation of 1 m must be maintained between the adjacent walls of the manholes or pits.

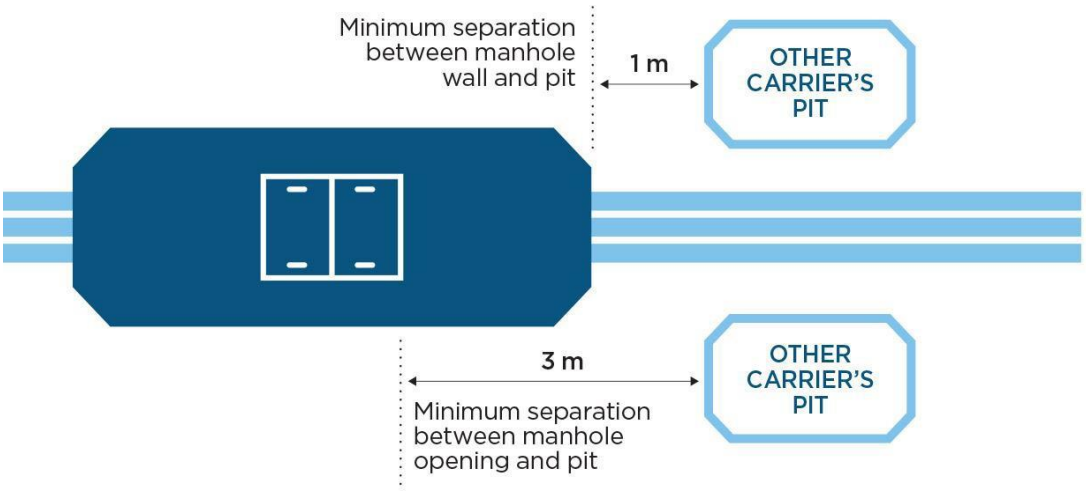


Figure 4. Minimum separation between carrier's pits and manholes

Place/Linear corridor proposed treatment

Table 6. Proposed treatment

<table>
<tr><th>Place/Corridor description</th><th>Telecommunications treatment Brownfield, infill and greenfield</th><th>Notes</th></tr>
<tr>
<td>High-end purpose (agribusiness, advanced manufacturing, quantum and robotics)</td>
<td>
<table>
<tr><th>Description</th><th>Dimension</th></tr>
<tr><td colspan="2">Lead in from Street</td></tr>
<tr><td>Number of Lead in Conduits</td><td>4</td></tr>
<tr><td>Size of Lead in Conduits</td><td>P100</td></tr>
<tr><td>Type of Pit</td><td>Minor Pit Type 1
P6</td></tr>
<tr><td colspan="2">In-Premise</td></tr>
<tr><td>Number of Racks</td><td>6</td></tr>
<tr><td>Room Dimension</td><td>3600mm x 2000mm</td></tr>
<tr><td>Max Number of GPOs</td><td>9</td></tr>
<tr><td>Number of Cables to be accommodated</td><td>6</td></tr>
</table>
Lateral (within building floors) paths should be dimensioned to allow for a minimum of 2 small diameter (5 mm) optic cables per premise beyond the current position.
</td>
<td>
A Lead-In connection / change of direction pit is to be positioned

For all non-single living unit buildings, at one of the building property alignments to allow Lead-In Conduit connection, (Provision is to be made for connection to LICs when a building design is known.)
Where a significant change of direction is required, or
At locations that ensure there is no greater than 200 m of street conduit without a pit.

The size of the Lead-In Conduit is defined by the number of premises within the building to be connected. Lead-In Conduits or Facility Conduit can be connected to either a Joint Pit or a Lead-In Pit.
Facility Conduits are to connect street furniture. Facility conduit should be extended to any street network element that has an electrical connection provided. Unless a significant multi-connection requirement is known, all Facility Conduit is to be P20.
The equipment room must be a controlled environment ensuring cooling and minimising humidity i.e. 23 degrees, or to Australian Standard AS2834.
The equipment room must have a clear and protected path to the building riser or lateral cable management infrastructure.
The equipment room location and construction shall be in accordance with AS/NZS 3084:2003, and:

Equipment rooms should have a minimum standard ceiling height of 2400mm;
Each telecommunication cupboard shall have a minimum total door opening width of 1600 mm

</td>
</tr>
</table>

<table>
<tr><th>Place/Corridor description</th><th>Telecommunications treatment
Brownfield, infill and greenfield</th><th>Notes</th></tr>
<tr><td>Central business district commercial industrial park</td><td>
<table>
<tr><th colspan="2">Number of Premises beyond end of duct section</th><th rowspan="2">Number of P100 in Conduit Section</th></tr>
<tr><th>Low</th><th>High</th></tr>
<tr><td>0</td><td>3000</td><td>1</td></tr>
<tr><td>3000</td><td>6000</td><td>2</td></tr>
<tr><td>6000</td><td>8750</td><td>3</td></tr>
<tr><td>8750+</td><td></td><td>4</td></tr>
</table>
<table>
<tr><th colspan="2">Number of Premises
Low Number
High Number</th><th>Size of Lead-In Conduit</th></tr>
<tr><td>1</td><td>2</td><td>P20</td></tr>
<tr><td>3</td><td>100</td><td>P50</td></tr>
<tr><td colspan="2">Greater > 100</td><td>P100</td></tr>
</table>
</td><td>A lead-in connection/change of direction pit is to be positioned
• For all non-single living unit buildings, at one of the building property alignments to allow lead-in conduit connection
• Where a significant change of direction is required, or
• At locations that ensure there is no greater than 200m of street conduit without a pit
The size of the lead-in conduit is defined by the number of premises within the building to be connected. Lead-in conduits or facility conduit can be connected to either a joint pit or a lead-in pit.
Facility conduits are to connect street furniture. Facility conduit and accompanying minor pit type 2 should be extended to any street network element that has an electrical connection provided. Unless a significant multi-connection requirement is known, all facility conduit is to be P20.
The equipment room must be a controlled environment ensuring cooling and minimising humidity i.e. 23 degrees, or to Australian Standard AS2834.
The equipment room must have a clear and protected path to the building riser or lateral cable management infrastructure.
The equipment room location and construction shall be in accordance with AS/NZS 3084:2003, and:
• Equipment rooms should have a minimum standard ceiling height of 2400mm;
• Each telecommunication cupboard shall have a minimum total door opening width of 1600 mm.</td></tr>
</table>

Table 7. Linear corridor

Linear corridor description	Telco/Smart Civils treatment Brownfield infill	Telco/Smart Civils treatment Greenfield	Notes
Highway Motorway Main streets – commercial district Main streets – business/special purpose precincts	• 4 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 1 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 4 x Pico Trench in Road Pavement (Fibre Optic Sensing)	• 4 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 1 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 4 x Pico Trench in Road Pavement (Fibre Optic Sensing)	A lead-in connection or change of direction pit is to be positioned: • For all non-single living unit buildings, at one of the building property alignments to allow lead-in conduit connection, (Provision is to be made for connection to LICs when a building design is known.) • Where a significant change of direction is required, or • At locations that ensure there is no greater than 200 m of street conduit without a pit. The size of the lead-in conduit is defined by the number of premises within the building to be connected. Lead-in conduits or facility conduit can be connected to either a joint pit or a lead-in pit.

Arterial road	• 3 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 2 every 250m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 2 x Pico Trench in Road Pavement (Fibre Optic Sensing)	• 3 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 2 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole	Facility conduits are to connect street furniture. Facility conduit should be extended to any street network element that has an electrical connection provided. Unless a significant multi-connection requirement is known, all facility conduit is to be P20.

Collector roads	• 2 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 2 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 1 x Pico Trench in Road Pavement (Fibre Optic Sensing)	• 2 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Major Pit Type 2 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 1 x Pico Trench in Road Pavement (Fibre Optic Sensing)	A lead-in connection or change of direction pit is to be positioned: • For all non-single living unit buildings, at one of the building property alignments to allow lead-in conduit connection, (Provision is to be made for connection to LICs when a building design is known.) • Where a significant change of direction is required, or • At locations that ensure there is no greater than 200 m of street conduit without a pit. The size of the lead-in conduit is defined by the number of premises within the building to be connected. Lead-in conduits or facility conduit can be connected to either a joint pit or a lead-in pit.

Local street	• 1 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Minor Pit Type 1 every 250 m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 1 x Pico Trench in Road Pavement (Fibre Optic Sensing)	• 1 x P100 Express Duct (Comms Alignment) • 1 x P100 Distribution Duct (Comms Alignment) • Minor Pit Type 1`every 250m (Express Duct) • Minor Pit Type 1 or 2 every 50 m (Distribution Duct) • 1 x P100 Lead-In Conduit (Telco Tower Site & Building with more than 48 premises) • 1 x P50 Lead-In Conduit (Building with less than 48 premises) • 1 x P20 Facility Conduit & P5 Pit to each Pole/Bus Shelter • 1 x Standard Pole Mount every 25 m & Traffic Light Pole • 1 x Pico Trench in Road Pavement (Fibre Optic Sensing)	Facility conduits are to connect street furniture. Facility conduit should be extended to any street network element that has an electrical connection provided. Unless a significant multi-connection requirement is known, all facility conduit is to be P20.

Smart pole dimensioning

Table 8. Smart pole dimensioning

Hierarchy typ	Capability description	Recommendation for a standardised approach
Smart pole Type 1 **(Full capability)**	• Smart LED or LED • Wi-Fi • CCTV • IoT Sensors (various) • Environment sensor • General power outlet • USB charging • Help button • Microphone • Wayfinding	• As cities around the world increasingly integrate digital technology into the physical environment, enabling flexibility in how devices are deployed will be key to ensuring that systems can be adapted, redistributed, and upgraded as both technology and city needs evolve • Standardising the way that smart poles and conventional street light poles are installed, maintained, and upgraded in in a way that reduces costs and operational complexity is required. Standard pole bases or mounts would be designed to work with any devices that meet its published standards, just like a USB port • A standard pole mount that provides power and network pathway to poles of any type without the need to run new electric wires or close down a street for hours • By providing a standard pole mount with power and connectivity networking, smart poles and poles can be added or interchanged without a large vehicle, additional wiring, trenching, or disrupting mobility • As there are no accepted industry approaches or specifications for this approach, it is recommended that further consultation and potential proof-of-concept initiatives be discussed with industry and suppliers

References

Table 9. References and standards used in this document

Reference	Title
AS/CA S009	Installation requirements for customer cabling (Wiring Rules)
AS/NZS IEC 60825.2	Safety of laser products – Safety of optical fibre communication systems (OFCS)
AS/NZS IS0/IEC 14763.3	Telecommunications installations – Implementation and operation of customer premises cabling – Testing of optical fibre cabling
AS/NZS 2053.1	Conduits and fittings for electrical installations – General requirements
AS/NZS 24702	Telecommunications installations – Generic cabling – Industrial premises
AS/NZS 3080	Information technology – Generic cabling for customer premises
AS/NZS 3084	Telecommunications installations – Telecommunications pathways and spaces for commercial buildings
AS/NZS 3085.1	Telecommunications installations – Administration of communications cabling systems – Basic requirements
AS/NZS ISO/IEC 14763.2	Information Technology – Implementation and operation of customer premises cabling – Planning and installation
SAA HB243	Communications cabling manual – Module 1: Australian regulatory arrangements
SAA HB29	Communications cabling manual – Module 2: Communications cabling handbook
TIA/EIA-568	Commercial Building Telecommunications Cabling Standard
www.nbnco.com.au/content/dam/nbnco/documents/installing-pit-and-conduit-infrastructure.pdf	Deployment of nbn™ pit and conduit network guide
www.commsalliance.com.au/__data/assets/pdf_file/0014/32450/G645_2017.pdf	Communications Alliance G645:2017 Fibre Ready Pit And Pipe Specification For Real Estate Development Projects
www.commsalliance.com.au/__data/assets/pdf_file/0014/32450/G645_2017.pdf	Communications Alliance Industry Guideline G645:2017 Fibre-Ready Pit and Pipe Specification for Real Estate Development Projects Industry Guideline

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www.telstrawholesale.com.au/content/dam/tw/facilities-access/TM00042A01_Inter_Access_Telstra_Underground_Network.pdf	Interconnect Access to the Telstra Underground Network