

**COMMUNICATIONS  
ALLIANCE LTD**



INDUSTRY GUIDELINE

G645:2011

FIBRE READY PIT AND PIPE SPECIFICATION FOR  
REAL ESTATE DEVELOPMENT PROJECTS

## **G645:2011 Fibre Ready Pit and Pipe Specification for Real Estate Development Projects**

First published as G645:2011

**Communications Alliance Ltd (formerly Australian Communications Industry Forum Ltd) was formed in 2006 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services.**

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## INTRODUCTORY STATEMENT

The ***Fibre Ready Pit and Pipe Specification for Real Estate Development Projects*** Guideline (G645:2011) is designed to:

- outline the minimum standard for Telecommunications pit and pipe installation within a Real Estate Development Project to be considered a Fibre Ready Facility;
- describe recommended processes for the design and installation of pit and pipe facilities for use in the deployment of Optical Fibre Lines in a Real Estate Development Project; and
- describe the recommended materials used in the design and installation of pit and pipe facilities.

Phil Smith  
Chair  
***Greenfields Working Committee***

DECEMBER 2011

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# 1 GENERAL

## 1.1 Introduction

- 1.1.1 The development of the Guideline has been facilitated by Communications Alliance through a Working Committee comprised of representatives from the telecommunications industry.
- 1.1.2 The Guideline should be read in the context of other relevant codes, guidelines and industry documents.
- 1.1.3 The Guideline should be read in conjunction with related legislation, including the *Telecommunications Act 1997* (the Act).
- 1.1.4 If there is a conflict between the requirements of the Guideline and any requirements imposed on an entity by statute, the entity will not be in breach of the Guideline by complying with the requirements of the statute.
- 1.1.5 Compliance with this Guideline does not guarantee compliance with any legislation. The Guideline is not a substitute for legal advice.
- 1.1.6 Statements in boxed text are a guide to interpretation only and not binding as Guideline rules.

## 1.2 Scope

- 1.2.1 The Guideline applies to the following sections of the telecommunications industry under section 110 of the Act:
  - (a) Carriers; and
  - (b) persons who install:
    - (i) Optical Fibre Lines; or
    - (ii) facilities used, or for use, in or in connection with Optical Fibre Lines.
- 1.2.2 The Guideline applies to Developers.
- 1.2.3 The Guideline deals with the following activities:
  - (a) carrying on business as a Carrier; or
  - (b) supplying Goods or Service(s) for use in connection with the supply of a Listed Carriage Service.
- 1.2.4 The Guideline describes recommended processes for the design and installation of Pit and Pipe Facilities, including a Fibre Ready Facility, for use in the deployment of Optical Fibre Lines in a Real Estate Development Project.

- 1.2.5 The Guideline does not describe maintenance procedures or arrangements following the completion of the installation of a Fibre Ready Facility.

*NOTE: Refer to Division 4, Part 1 of Schedule 3 to the Act for additional information on the maintenance of a facility by a Carrier.*

- 1.2.6 The Guideline does not apply to in-premises Conduit i.e. beyond the Starter Conduit or lead-in Conduit.

### **1.3 Objectives**

The objectives of the Guideline are to:

- (a) outline the minimum standard for Telecommunications pit and pipe installation within a Real Estate Development Project to be considered a Fibre Ready Facility;
- (b) describe recommended processes for the design and installation of pit and pipe facilities for use in the deployment of Optical Fibre Lines in a Real Estate Development Project; and
- (c) describe the recommended materials used in the design and installation of pit and pipe facilities.

### **1.4 Guideline review**

The Guideline will be reviewed after 5 years, or earlier in the event of significant developments that impact on the Guideline or a chapter within the Guideline.

## 2 ACRONYMS, DEFINITIONS AND INTERPRETATIONS

### 2.1 Acronyms

For the purposes of the Guideline:

#### **PVC**

means Poly Vinyl Chloride.

### 2.2 Definitions

For the purposes of the Guideline:

#### **Access**

has the meaning given by section 372L of the Act.

#### **Act**

means the *Telecommunications Act 1997 (Cth)*.

#### **Alignment**

means the longitudinal centre line of a Conduit run.

#### **Bend**

means a preformed curvature in a Conduit.

#### **Building Lot**

has the meaning given by section 372Q of the Act.

#### **Building Unit**

has the meaning given by section 372S of the Act.

#### **Carriage Service Provider**

has the meaning given by section 87 of the Act.

#### **Carrier**

has the meaning given by section 7 of the Act.

#### **Conduit**

means a tube or pipe that physically accommodates cables and offers mechanical protection for cabling, allowing them to be drawn in and/or replaced.

*NOTE: The terms Pipe and Conduit are used interchangeably in this document. Both are used in industry and for the purposes of this document mean the same thing.*

**Cul-de-sac**

means a roadway end that has no potential for road traffic to travel beyond the roadway end and serves no more than either:

- (a) 24 Building Units; or
- (b) 24 Network Termination Devices.

*NOTE: Possible examples of a Cul-de-sac include where there are Building Units and kerb and gutter planned or in place all the way around the roadway end, designated use such as parkland, or no easement exists beyond the roadway end.*

**Curve**

means a curvature in a Conduit achieved by flexing to a minimum radius of 130 times the nominal diameter of the Conduit without kinking.

**Developer**

means the party (or their agent) commercially responsible for the Real Estate Development Project.

**Express Conduit**

means Conduit feeding into or out of one or multiple Real Estate Development Project(s).

**Fibre Ready Facility**

has the meaning given by section 372W of the Act.

**Fibre Ready Pit and Pipe**

means a Fibre Ready Facility that is constructed of multiple Pits and Conduits.

**Line**

has the meaning given by section 7 of the Act.

**Network Termination Device**

has the meaning given by AS/ACIF S009.

*NOTE: A possible example of a Network Termination Device for an optical network includes the optical network termination unit that is located on a property.*

**Optical Fibre Line**

has the meaning given by section 7 of the Act.

**Pipe**

has the same meaning as Conduit.

*NOTE: The terms Pipe and Conduit are used interchangeably in this document. Both are used in industry and for the purposes of this document mean the same thing.*

**Real Estate Development Project**

has the meaning given by section 372Q of the Act.

**Shared Trench Agreement**

means an agreement between organisations (e.g. utilities) that install services in a trench in a Real Estate Development Project which includes specification of the:

- (c) depth below ground level of the services; and
- (d) separation of the services from one another.

**Starter Conduit**

means Conduit that extends from an end wall of a pit, at least 1 metre and no more than 2 metres unless under a retaining wall or embankment into each property beyond the property boundary point served from the pit.

**NOTES:**

- 1. Starter Conduit is also referred to as a lead-in Conduit, service Conduit or drop Conduit.*
- 2. Where a Starter Conduit extends under a retaining wall or embankment then it should be locatable for subsequent work to connect it to a Building Unit.*

**Street Conduit**

means a section of Conduit that is not intended to connect directly to a Building Unit.

**Telecommunications Alignment**

means an Alignment used only for Telecommunications.

**Telecommunications Network**

has the meaning given by section 7 of the Act.

## **2.3 Interpretations**

In the Guideline, unless the contrary appears:

- (a) headings are for convenience only and do not affect interpretation;
- (b) a reference to a statute, ordinance, code or other law includes regulations and other instruments under it and consolidations, amendments, re-enactments or replacements of any of them;
- (c) words in the singular includes the plural and vice versa;
- (d) words importing persons include a body whether corporate, politic or otherwise;
- (e) where a word or phrase is defined, its other grammatical forms have a corresponding meaning;
- (f) mentioning anything after include, includes or including does not limit what else might be included;
- (g) words and expressions which are not defined have the meanings given to them in the Act; and
- (h) a reference to a person includes a reference to the person's executors, administrators, successors, agents, assignees and novatees.

## 3 GENERAL

### 3.1 Introduction

- 3.1.1 The *Telecommunications Legislation Amendment (Fibre Deployment) Act 2011* amended the Act to:
- (a) enable the Minister to specify new developments in which fixed lines which are installed need to use optical fibre;
  - (b) require passive infrastructure like pit and pipe that is installed to be fibre-ready;
  - (c) impose penalties on developers that are constitutional corporations that sell property without fibre-ready passive infrastructure;
  - (d) enable Carriers to seek Access to passive infrastructure that is owned by a non-Carrier; and
  - (e) enable the Australian Communications and Media Authority to make standards for customer equipment and cabling for use with the NBN and other superfast networks.
- 3.1.2 This Guideline outlines the minimum requirements for Telecommunications pit and pipe installation within Real Estate Development Projects to be considered a Fibre Ready Facility.
- 3.1.3 The rules of this Guideline are organised into 5 main sections:
- (a) **Section 4 Design**, outlines the permitted configurations and sizes of pits and Conduit with the respect to the property allotments and roadways they pass.
  - (b) **Section 5 Conduit Installation**, outlines the rules for the placement of the conduit in the ground; interconnection, bending and entry into pits; and testing of the Conduit.
  - (c) **Section 6 Pit Installation**, outlines the rules of placing pits in-ground and the orientation with respect to Conduits, roadways and allotments.
  - (d) **Section 7 Materials**, outlines the minimum standard of materials to be used.
  - (e) **Section 8 Documentation**, outlines the minimum level of documentation deemed acceptable for transfer of Conduit to a Carrier under a 'build and transfer' arrangement.

### 3.2 Customisation based on Carrier advice

To avoid subsequent disruption to the Real Estate Development Project, the Developer shall engage with a Carrier at the design stage to incorporate Carrier specific requirements.

*NOTE: This assumes that only a Carrier with experience or plans to operate Telecommunications Network(s) that use Optical Fibre Lines would engage with a Developer in relation to a Fibre Ready Facility.*

### 3.3 Shared Trenching

- 3.3.1 If a Real Estate Development Project will have multiple utility services (e.g. two or more of communications, electricity, gas, sewer and water) installed in one service trench then a Developer shall ensure there is in place a documented Shared Trench Agreement for the utility services to enable cost effective installation of pit and pipe infrastructure.
- 3.3.2 A Shared Trench Agreement should comply with recognised industry practices for safety and separation of services.

**NOTES:**

*1. One example of practices for the separation of services is the use of barrier strips between service types, although this is not typically used between nests of conduits of the same service type.*

*2. Refer to AS/ACIF S009 and AS/NZS 3000 for separation distances between electrical and telecommunications cables.*

*2. Refer to AS /NZS 4645.2, AS /NZS 4645.3 and AS/NZS 60079.10.1 for separation distances from gas services.*

### 3.4 Certification

- 3.4.1 A Developer shall check if it needs to supply to:

- (a) State planning authorities; or
- (b) Local Government Areas (e.g. council or shire)

certification that the design for Conduits and Pits within the Real Estate Development Project conforms to this guideline.

- 3.4.2 A Developer shall check if it needs to supply to:

- (a) State planning authorities; or
- (b) Local Government Areas (e.g. council or shire)

certification that Conduits and pits will be or have been installed within the Real Estate Development Project in a way that conforms to this Guideline.

*NOTE: This certification might be provided by a Carrier providing communications services under clause 3.4.3.*

- 3.4.3 Some authorities may require a Carrier to certify it will be providing communications services (of a certain type and standard) to the Real Estate Development Project before final approval is granted.
- 3.4.4 The nature of the telecommunications services provided to the Real Estate Development Project is for the Developer and approving authority to determine, subject to complying with provisions of Part 20A of the Act with regard to where fixed lines must be optical fibre lines.

### **3.5 Registration of Plans**

The owner of completed pit and pipe assets (e.g. the Carrier taking on the Telecommunications Network responsibility) in a Real Estate Development Project should register the plans with the Dial Before You Dig service.

*NOTE: Dial Before You Dig is a national service designed to prevent damage and disruption to pipe and cable networks. To contact the service phone 1100 or visit the website at <http://www.1100.com.au>.*

## 4 DESIGN

This section outlines the minimum permitted configurations and sizes of pits and conduit with respect to factors such as the property allotments and roadways they pass.

### 4.1 Before You Start

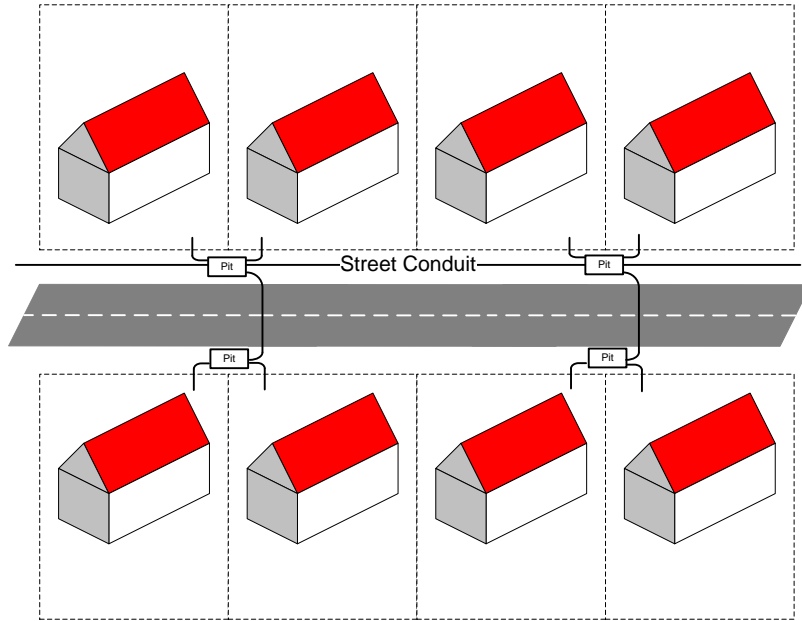
- 4.1.1 A Developer should check for existing infrastructure assets (e.g. electricity, gas and water mains) prior to the design of pit and conduit in a Real Estate Development Project.

*NOTE: One way to check for existing infrastructure assets is to contact the Dial Before You Dig service. Another is to contact the local suppliers of utility services.*

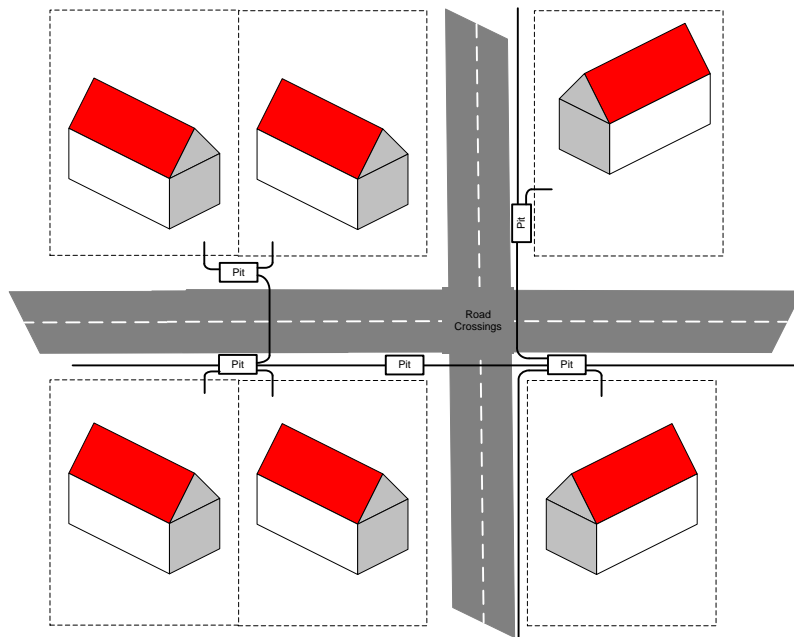
- 4.1.2 Design processes shall consider both the short and long term requirements of the area, including:
- (a) a need for Express Conduit;
  - (b) lot density;
  - (c) how to handle exceptional cases (e.g. a Cul-de-sac, difficult terrain); and
  - (d) site usage e.g. commercial sites.
- 4.1.3 Design processes for pit and conduit in a Real Estate Development Project shall include engagement with non-telecommunications utilities e.g. electricity, gas, water.

### 4.2 Architecture(s)

- 4.2.1 Two permitted pit and pipe architectures that may be used are:
- (a) Single Side of the Street; or
  - (b) Dual Side of the Street.
- 4.2.2 Combinations of clauses 4.2.1 (a) and 4.2.1 (b) are permitted.
- 4.2.3 Under "Single Side of the Street" construction Street Conduit is placed on only 1 side of a street with road crossings used to reach allotments on the other (non Street Conduit) side of the street.
- 4.2.4 Refer to Figures 1 and 2 for examples of "Single Side of the Street" construction.



**FIGURE 1**  
**EXAMPLE OF A SINGLE SIDE OF STREET ARCHITECTURE**



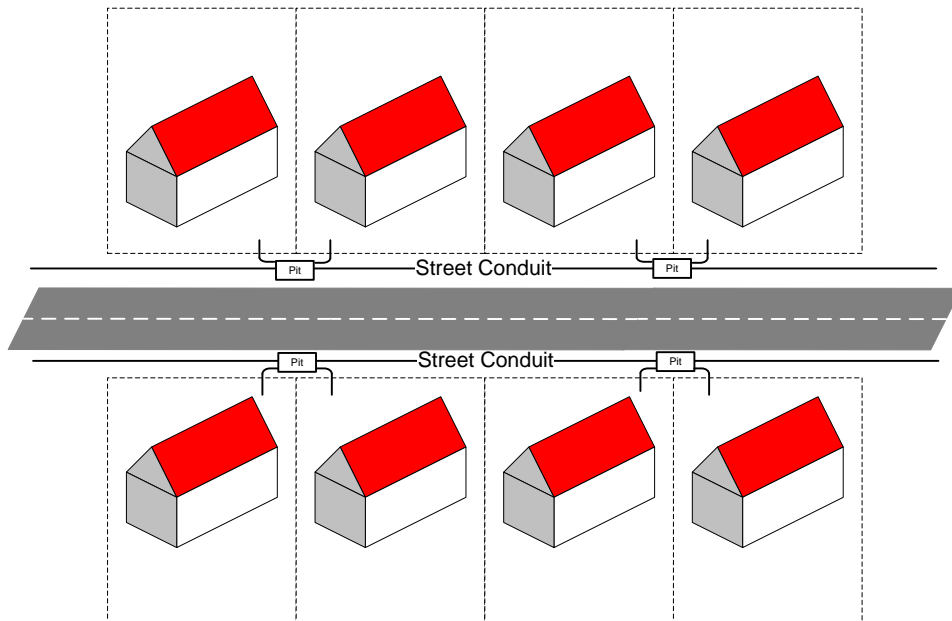
**FIGURE 2**  
**EXAMPLE OF ROAD CROSSING CONDUITS AT INTERSECTIONS**  
**(SINGLE SIDE ARCHITECTURE)**

- 4.2.5 Under "Dual Side of the Street" construction:
- (a) Street Conduit is placed on both sides of the street.
  - (b) Road crossings are generally placed at road intersections.

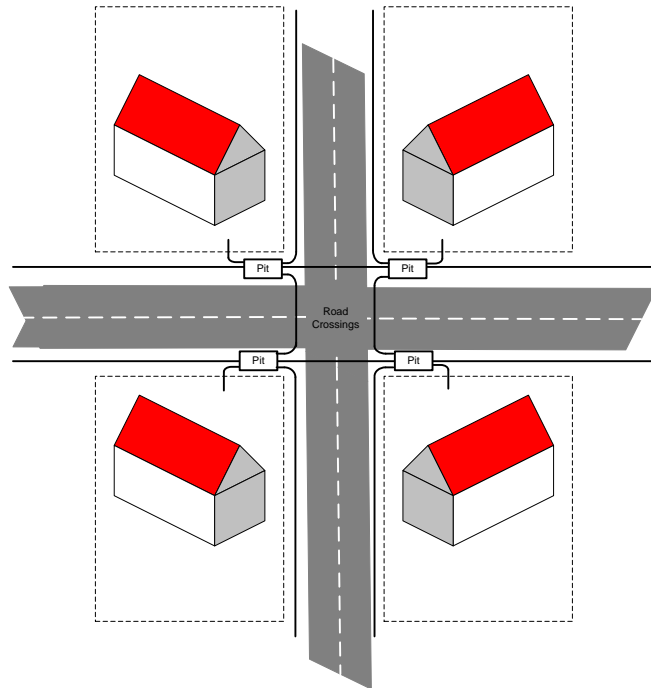
4.2.6 Refer to Figures 3 and 4 for examples of "Dual Side of the Street" construction.

*NOTE: While Figure 4 is an example illustration, it is unusual to have four separate road crossings at the one intersection.*

4.2.7 In addition to road crossings required to service the non "Street Conduit" side of the street, road crossing should be installed at every road intersection to allow connection to every line of "Street Conduit" installed, unless otherwise specified by the Carrier.



**FIGURE 3**  
**EXAMPLE OF A DUAL SIDE OF STREET ARCHITECTURE**



**FIGURE 4**  
**EXAMPLE OF ROAD CROSSING CONDUITS AT INTERSECTIONS**  
**(DUAL SIDE ARCHITECTURE)**

### 4.3 Starter Conduit

- 4.3.1 A Starter Conduit must terminate within the property.

*NOTE: Refer to Appendix B for links to additional industry information with termination methods for Starter Conduit.*

- 4.3.2 A Starter Conduit must be readily locatable within the property.

*NOTE: Where a retaining wall exists, or is proposed, on or adjacent to the property boundary, the Starter Conduit may need to be extended beneath the wall foundations and extend further than the nominal distance into the property to allow a gradual rise to a depth that will allow the end of the Starter Conduit to be located. Alternatively, the Starter Conduit may terminate on the roadside of the retaining wall, with the lead-in conduit extended through the wall from the 'high side'.*

- 4.3.3 The minimum internal diameter of a Starter Conduit must be greater than or equal to:

- (a) 23mm for a single residential Building Unit;
- (b) 50mm for a single commercial Building Unit;
- (c) 50mm for multiple residential Building Units; or
- (d) 100mm for multiple commercial Building Units.

#### 4.4 Express Conduits

- 4.4.1 A Carrier may specify the need for the installation of Express Conduit(s) between any 2 nominated pits.
- 4.4.2 Where Express Conduits are required they should be installed in accordance with the Communications Alliance guideline **Fibre To The Premises Planning – Express Conduit**.

#### 4.5 Minimum Conduit Size

- 4.5.1 The Conduit installed in a Real Estate Development Project must be large enough to accommodate:
- (a) all anticipated telecommunications services in the current design phase; and
  - (b) a future request for Access from a Carrier e.g. to install a subduct in Conduit other than Starter Conduit.
- 4.5.2 Refer to Table 1 for the minimum internal diameters for various Conduit functions within the network architecture(s) where the only use of the Conduit is for:
- (a) installing fibre or cable for; or
  - (b) connecting fibre or cable to a public Telecommunications Network.
- 4.5.3 If the Conduit is to be used for Telecommunications Network(s) in addition to public Telecommunications Network(s) then the Developer and a Carrier shall agree on:
- (a) a Conduit size that will not reduce the ability of a Carrier nominated for ownership of Optical Fibre Lines to install the Optical Fibre Lines in the Conduit below that specified in Table 1;
  - (b) the use of sub-duct(s) to separate a Telecommunications Network from cable(s) for Lines that are not used in a Telecommunications Network.

*NOTE: An example where Conduit is not used exclusively for public Telecommunications Network is in a greenfields estate where the Developer retains ownership of the Conduit and the Conduit contains fibre for a public Telecommunications Network and cable for private intercom service.*

- 4.5.4 While 100mm internal diameter is the default minimum size for Street Conduit in Table 1, a Developer may install two Street Conduits with a minimum 50mm internal diameter each, in place of each 100mm Street Conduit, where:
- (a) there is a Carrier nominated for the ownership of the Optical Fibre Lines; and

- (b) the nominated Carrier has agreed in writing to the installation of the two 50mm Conduits.

**NOTES:**

- 1. The nominated Carrier should be able to demonstrate the chosen combination of internal Conduit diameter and bend radius is capable of permitting Access by another Carrier.*
- 2. If there is another combination of Conduits that can be demonstrated to be equivalent to the minimum 100mm internal diameter Street Conduit then an interested party can contact Communications Alliance and propose it for inclusion in a revision of this document.*

- 4.5.5 If a Carrier specifies a smaller Conduit than in Table 1 for a road crossing to connect directly to a Building Unit on the non "Street Conduit side of the street" it shall only do so when it can demonstrate each Conduit will:
- (a) connect to one Building Unit only on the non "Street Conduit side of the street" i.e. one Conduit per Building Unit;
  - (b) connect directly from a pit on the "Street Conduit side of the street" to a Building Unit i.e. without connection via an intermediate pit;
  - (c) have a length that is not greater than 100m between the pit on the Street Conduit side of the street" and the relevant Building Unit;
  - (d) have a total in Bends between the pit on the Street Conduit side of the street" and the relevant Building Unit of not greater than 180 degrees;
  - (e) have an internal diameter that is greater than or equal to 23mm; and
  - (f) be protected from crushing during road construction e.g. by installation in a suitable envelope conduit.

**TABLE 1**  
**Minimum nominal Conduit internal diameters**

<b>Role in Architecture</b>	<b>Minimum Internal Diameters (mm)</b>
Street Conduit	100mm
Road crossing to reach non "Street Conduit Side of the Street" [Single Side Architecture only]	50mm
Cul-de-sac	100mm OR 50mm with Carrier approval
Road crossings at road intersections	100mm
Starter Conduit – single residential Building Unit	23mm
Starter Conduit – single commercial Building Unit(s)	50mm
Starter Conduit – multiple residential Building Unit(s)	50mm
Starter Conduit – multiple commercial Building Units	100mm

#### 4.6 Minimum Pit Size

- 4.6.1 The minimum dimensions for pits used in the architecture(s) for Fibre Ready Pit and Pipe shall be as specified in Table 2 where:
- (a) 'depth' is measured between the inside of the pit base to under the pit lid; and
  - (b) 'length' and 'width' are measured:
    - (i) along the centreline of the pit;
    - (ii) on the inside of the base;
    - (iii) at right angles to one another; and
    - (iv) with no obstructions above the measured dimension i.e. the nominal internal base dimension is to be reduced for any internal protrusions (e.g. ribs) into the space above the base.

*NOTE: As the internal dimensions are critical in determining useable space, and overall dimensions will vary depending on material and/or design used, pits are specified by the internal dimensions.*

- 4.6.2 A Developer should get confirmation in writing from the Carrier before commencing construction work that the planned pit sizes are appropriate for their intended use.

- 4.6.3 A network designer should ensure a selected pit will be fit for purpose, including consideration of:
- (a) internal space e.g. sufficient for the storage of cable and enclosures;
  - (b) pit surface area e.g. to accommodate the number of conduits required to penetrate an end wall;
  - (c) required depth of cover; and
  - (d) installation environment e.g. clay, sand, soil;
  - (e) installation method e.g. so the pit will not warp under expected use.

**TABLE 2**

**Minimum Pit internal Dimensions**

Pit Size Number	Minimum Internal Dimensions			
	Note 1	Length (mm)	Width (mm)	Depth (mm)
2		490	125	500
5		510	260	540
6		1130	340	600
8		1130	340	820
9		1820	380	840

*NOTE: The pit size number is a common description used by carriers.*

- 4.6.4 If a Carrier requests a pit at a specific location to accommodate plant that is larger than specified above, then this must be accommodated by the Developer, provided that:
- (a) the requested pit size was reasonably justified as fit for purpose; and
  - (b) the exact location and size of the larger pit(s) are specified prior to commencement of construction of the pit and pipe.
- 4.6.5 Developers should consult with a Carrier about other space requirements.

## **4.7 Pit Spacing**

- 4.7.1 The selection of pit size can affect the pit spacing i.e. the number of premises served from a pit (e.g. a smaller pit can connect fewer Starter Conduits).

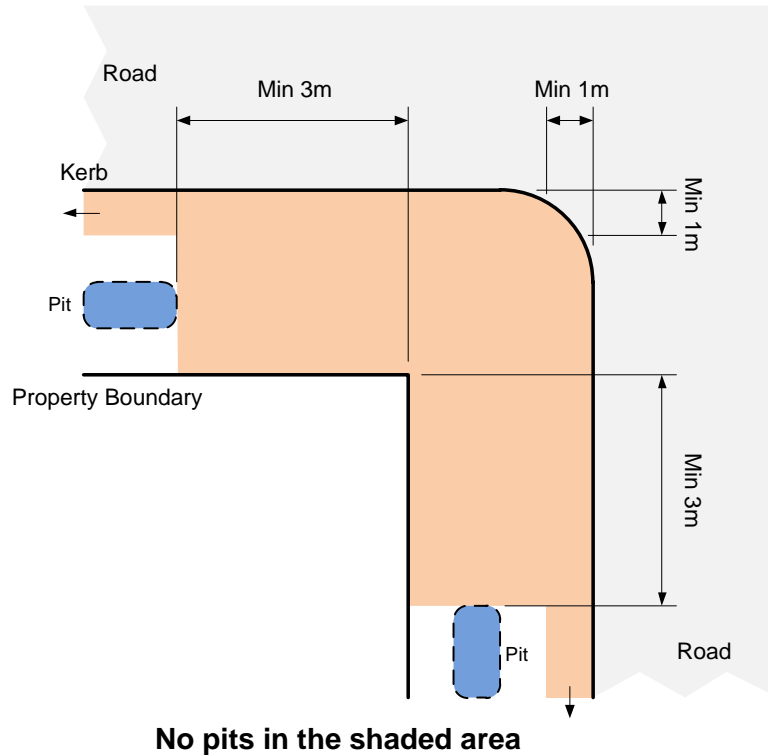
- 4.7.2 A Size 2 pit shall connect to typically two and a maximum of four single Building Units.
- 4.7.3 A Size 5 pit shall connect to typically four and a maximum of six single Building Units via direct connections and road crossings.
- 4.7.4 Different pit configurations to those in Figures 1 to 4 will be required for locations that include higher densities of Building Units e.g. apartment blocks.

*NOTE: Refer to Appendix A for typical combinations of conduits for a given pit size.*

- 4.7.5 Refer to Carrier documentation for whether Road crossings for "Single Side of the Street" construction in low density residential areas are at every pit or every second pit.

## **4.8 Pit Locations**

- 4.8.1 A pit shall be installed at the intersection of Conduit runs that require:
  - (a) a change in the Alignment of the Conduit; or
  - (b) a change in size of the Conduit.
- 4.8.2 A pit shall be installed within 4.5m of where a Street Conduit changes direction by an angle equal to or greater than 90 degrees.
- 4.8.3 A pit shall be installed at the end of a route where significant elapsed time is expected between stages of a Real Estate Development Project.
- 4.8.4 Pits shall be installed along the Alignment of the Street Conduit(s).
- 4.8.5 Where the Alignment:
  - (a) continues into a street crossing; or
  - (b) bends around a street cornerthen pit(s) should be installed not less than 3m, along the Alignment, from the corner of the adjacent property. Refer to Figure 5 for an illustration.
- 4.8.6 Pits shall be installed at least 1m from the kerb where practical. Refer to Figure 5 for an illustration.



**FIGURE 5**  
**PIT DISTANCE FROM KERB**

- 4.8.7 Pits should be installed in an easily accessible location to facilitate installation and operational tasks.
- 4.8.8 Pits should be positioned with their long side parallel to the adjacent property boundary or roadway.
- 4.8.9 Pit installation processes shall ensure the correct pit is installed for the intended use i.e. 'fit for purpose' and 'specific to the task'.
- 4.8.10 A pit shall not be installed in a:
- (a) driveway;
  - (b) roadway area; or
  - (c) hazardous area.
- 4.8.11 A pit should not be installed:
- (a) In an unmade section of a carriageway;
  - (b) In a vehicular access way;
  - (c) Within one metre of a pole;
  - (d) Within two metres of a doorway;
  - (e) On a road edge (i.e. immediately adjacent to the kerb); or

(f) On a median strip or traffic island.

4.8.12 Pits are to be placed as close as practical to the property boundary of two adjacent allotments, in accordance with agreements, or good engineering practice, to ensure access to, and safety of, other utilities infrastructure.

4.8.13 Pits shall not be placed in known or likely driveway locations. In some situations where it is known prior to the pit installation that a driveway is to be placed over the proposed location, the pit shall be slightly offset so as not to be installed in the proposed driveway.

4.8.14 The Starter Conduit for each allotment must connect to a pit.

*NOTE: Common industry practice when using a pit via a road crossing to connect:*

*(a) one or two Building Unit(s) is to use a size 2 pit;*

*(b) more than two Building Units is to use at least a size 5 pit.*

4.8.15 Pits must be spaced so that no conduit section exceeds:

(a) 100m where there are Starter Conduits in use; or

(b) 250m where it is unlikely there will be a future need for intermediate pits e.g. parkland.

4.8.16 In many cases, the most efficient design for placement of pits is to align them with every second allotment side boundary.

*NOTE: The selection of pit size can affect the number of premises served from the pit (e.g. a smaller pit can connect fewer Starter Conduits).*

4.8.17 Pits shall not be placed in a hazardous area, including areas that may be subject to Earth Potential Rise as specified in AS/NZS 3835.1.

*NOTE: While an optical fibre does not conduct electricity a Carrier might install fibre with a metal sheath or metallic tracer element.*

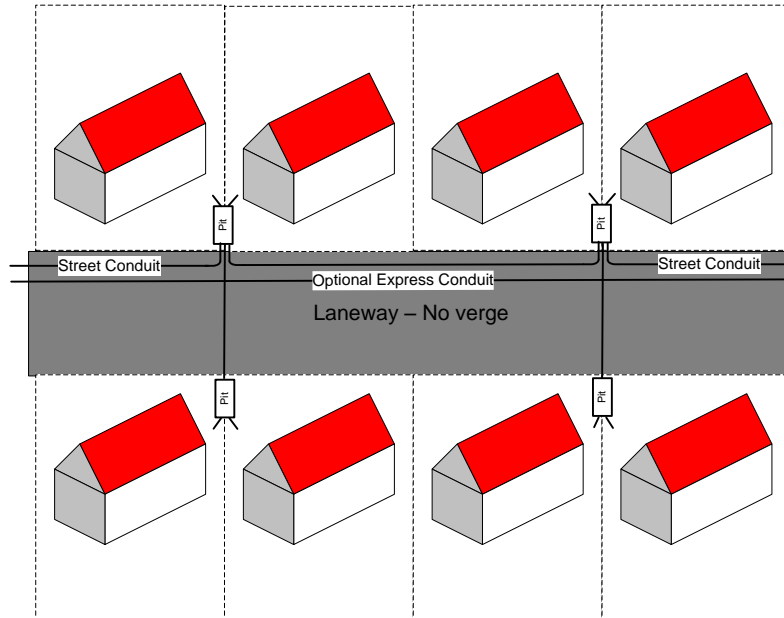
4.8.18 Where easements or property excisions are required for the installation of pits (and other utility connection devices) due to the absence of a verge and the road pavement extending to the property boundary (i.e. a laneway) then:

(a) Street Conduit shall be located under the roadway;

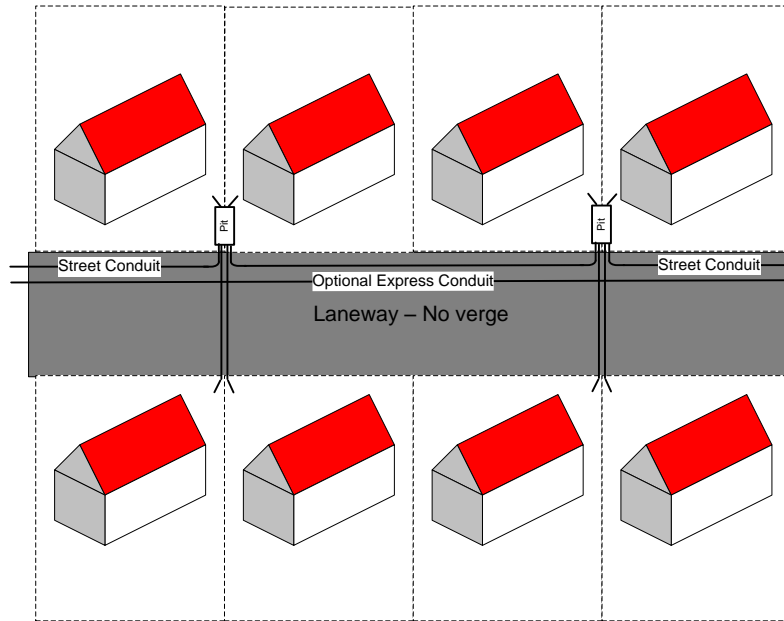
(b) Pits shall be installed with the long side oriented at ninety degrees to the roadway; and

(c) Street Conduit shall enter the pit at the end closest to the road using preformed Bends.

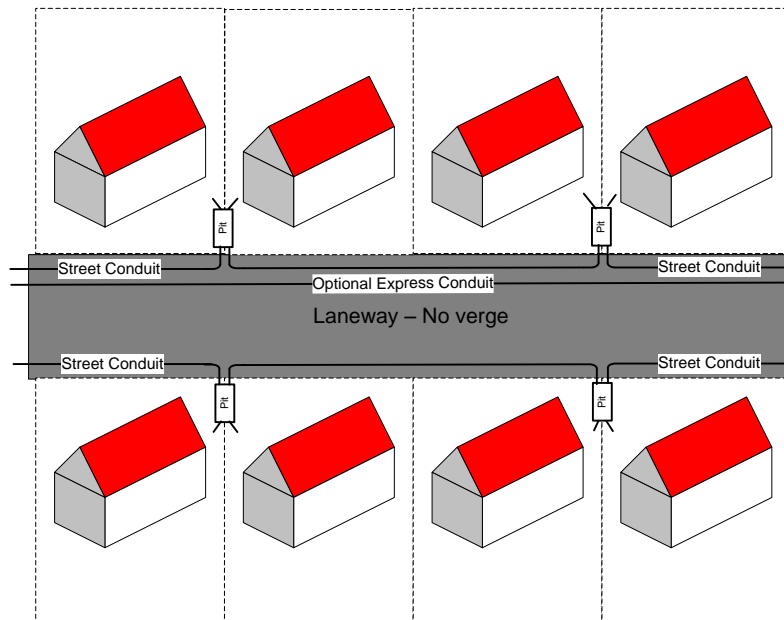
4.8.19 Refer to Figures 6, 7 and 8 for examples of pit installations in the absence of a verge.



**FIGURE 6**  
**PIT INSTALLATION IN THE ABSENCE OF A VERGE**  
**FOR SINGLE SIDE OF STREET ARCHITECTURE – OPTION 1**



**FIGURE 7**  
**PIT INSTALLATION IN THE ABSENCE OF A VERGE**  
**FOR SINGLE SIDE OF STREET ARCHITECTURE – OPTION 2**



**FIGURE 8**  
**PIT INSTALLATION IN THE ABSENCE OF A VERGE**  
**FOR DUAL SIDE OF STREET ARCHITECTURE**

## 5 CONDUIT INSTALLATION

This section outlines the rules for the placement of the conduit in the ground; interconnection, bending and entry into pits; and Testing of the conduit.

### 5.1 Alignments

Conduits must be installed within the designated Telecommunications Alignment, as established by all of the following that exist:

- (a) Any level of Government i.e. Federal, State, Territory or Local;
- (b) Street Opening Conference/ Bodies;
- (c) Any Shared Trenching Agreement to which the Carrier intended to take over ownership of the conduit is a signatory;
- (d) A Shared Trenching Agreement arranged and negotiated by the developer with the appropriate utilities.
- (e) Communications Alliance Telecommunications in Road Reserves - Operational Guidelines for Installations (G591:2006).

### 5.2 Depth of Cover

5.2.1 The depth of cover must meet the requirements in:

- (a) ACIF External Communication Cable Networks Code (ACIF C524);
- (b) State government documents (if any); and
- (c) Local government documents (if any).

5.2.2 Depth of cover from finished ground level for Street Conduit between pits should be either:

- (a) Less than or equal to 1m in the street verge;
- (b) A depth to avoid conflict with other service utilities e.g. to meet the requirements of a relevant road authority for a street crossing, boring under drains; or
- (c) A depth to avoid existing natural structures e.g. watercourses.

### 5.3 Clearance from Other Carriers and Services

Clearance from other Carriers and utility services must meet the requirements in ACIF C524.

*NOTE: A Developer should check the clearance requirements with other utilities, particularly where there is a 'shared trench agreement' for the Real Estate Development Project.*

## 5.4 Trenching and Backfill

5.4.1 Conduits are to be installed into trenches, preferably shared, with appropriate bedding and backfill that complies with the minimum standards set out in:

- (a) section 9 of ACIF C524 External Communication Cable Networks where the Developer or its agent must facilitate meeting the obligations on "The Carrier"; and
- (b) AS/NZS 2032 Installation of PVC Pipe Systems.

*NOTE: ACIF C524 is written to describe Carrier actions and responsibilities. The owner of an asset is responsible for the asset until such time as the asset ownership is transferred to a Carrier.*

5.4.2 Where multiple communications conduits are placed in a trench the largest diameter communications conduits should be positioned at the bottom of the conduit grouping (also known as "nest").

## 5.5 Conduit Joints

5.5.1 Conduit Joints for PVC pipes are to be made using "coupler" or "socket and spigot" bound with solvent cement.

5.5.2 Conduit joints shall be water tight and installed in accordance with the manufacturer's instructions.

## 5.6 Conduit Bends

5.6.1 All Bends must be prefabricated when the curvature of a Conduit is less than specified in AS/NZS 3084.

5.6.2 All Bends must be of the same material as the conduit to which they connect.

5.6.3 No more than two ninety degree (or equivalent) Bends shall be installed in the Conduit between pits where the Alignment between the pits has a uniform requirement for depth of cover.

### NOTES:

*1. A road crossing typically requires additional depth of cover and therefore the Conduit would need additional Bends (e.g. of 22.5 degrees) to facilitate this.*

*2. While clause 5.6.3 sets a limit on the number of Bends in use between pits, in practice Curves are sometimes used in road crossings to change depth.*

5.6.4 All Curve radii must be not less than the minimum specified in Table 3.

5.6.5 If using a ninety degree Bend then it should be located within 4.5m of the end of a conduit run.

**TABLE 3**  
**Minimum Curve and Bend Radii**

Minimum internal Conduit diameter	Minimum Curve / Bend radius (see Notes)		
	Long run (mm) no preformed Bends	Long run (mm) using preformed Bends	Short run (mm) using preformed Bends
100mm	13,000	5,000	800
50mm	6,500	800	300
23mm	2,600	Not applicable	300

**NOTES:**

1. The long run Bend radius with manufactured or preformed Bends (also referred to as cold form Bends) is typically in multiples of 22.5 degrees for 100mm Conduit.

2. The long run Curve radius with no manufactured or preformed may be used on all Conduit runs, including trunk runs e.g. where there is greater than 100m between pits.

3. A larger Curve radius is required on long runs because there is typically more cable mass to haul through a Conduit.

4. The short run Bend radius may be used on road crossings and Starter Conduit.

5. The short run Bend radius is not to be used on Express Conduit routes.

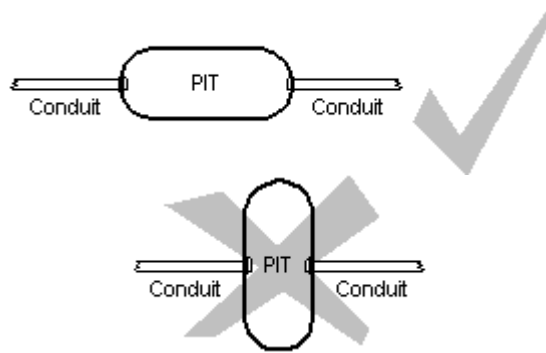
6. The short run Bend radius should only be used in close proximity to a pit or opening of a Pipe (e.g. turning up a building wall).

7. Elbows (i.e. a sharp ninety degree change of direction) must not be used.

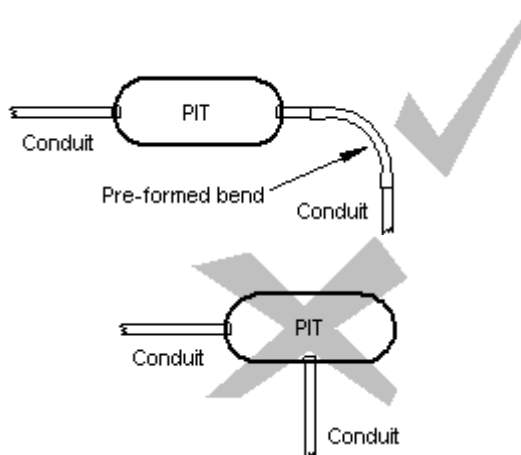
## **5.7 Pit Entry**

5.7.1 Conduits shall only enter a pit at the narrow ends i.e. those faces of the pit with the least surface area. Refer to Figures 9 and 10 for an illustration.

5.7.2 Where a pit does not have a narrow end (e.g. square or round pits is used), all Conduit entries must be in the same Alignment i.e. no change of direction is to occur. Conduits should only enter on opposite sides and any required change of direction be achieved by the use of Bends.

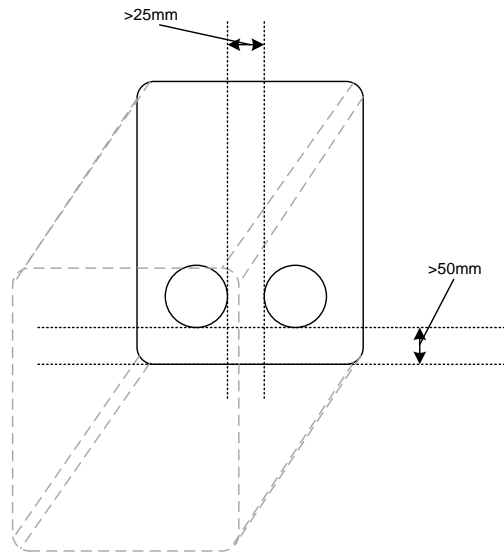


**FIGURE 9**  
**CONDUIT ENTRY AT PIT ENDS – PART 1**



**FIGURE 10**  
**CONDUIT ENTRY AT PIT ENDS – PART 2**

- 5.7.3 Holes in plastic pits for Conduits shall be cut with the correct size hole saw to ensure a tight fit for bushes.
- 5.7.4 The bottom edge of Conduits shall enter a pit no less than 50mm from the bottom of the pit where bottom is measured from the inside of the pit. Refer to Figure 11 for an illustration.
- 5.7.5 A minimum of 25mm separation must be kept between Conduits. Refer to Figure 7 for an illustration.



**FIGURE 11**  
**SKETCH OF PIT SHOWING MINIMUM**  
**CONDUIT ENTRY SPACINGS**

- 5.7.6 Additional separation between Conduits to that in clause 5.7.5 may be required to accommodate the flange on pipe bushes.
- 5.7.7 Conduit entries in opposite ends of pits should align as closely as possible to allow continuous and unrestricted pull through of cable.
- 5.7.8 When entering pits, Conduits must be cut flush with the end of the pit.
- 5.7.9 Where a single Conduit enters a pit end the Conduit should be installed in the centre of the pit wall.
- 5.7.10 Each Conduit entering a pit shall be fitted with a bush.
- 5.7.11 Each bush fitted on a Conduit entering a pit shall be:
  - (a) installed flush with the inside wall of the pit; and
  - (b) adhered to the Conduit.
- 5.7.12 The interface between a pit and a bush should:
  - (a) minimise water ingress and the entry of soil, silt, insects and vermin into the pit; and
  - (b) provide a smooth entry for cable hauling.

## **5.8 Conduit Sealing**

- 5.8.1 Where the installation of a Starter Conduit will not have a fibre hauled through it as part of the installation process then the Starter Conduit should be sealed at both ends.

**NOTES:**

1. *This is to minimise ingress and build up of water or debris prior to fibre installation.*
2. *A decision on whether or not to 'turn up' the Starter Conduit is for negotiation between a Carrier and a Developer.*
3. *It is good practice to seal Starter Conduit for downhill runs after the installation of an Optical Fibre Line (e.g. to minimise silt build up and water entry to the premises).*

- 5.8.2 Where there is underground reticulation of gas within a Real Estate Development Project and the installation of Street Conduit will not have a fibre hauled through it as part of the installation process then the Street Conduit should be sealed at both ends.

*NOTE: This is to reduce the risk of gas transfer from a gas leak prior to fibre installation. After fibre installation it is the responsibility of the Carrier or owner of the pit and pipe infrastructure to decide on sealing of Conduits in the presence of gas services. Some Carriers may prefer to seal all Conduits regardless of other services.*

## **5.9 Road Crossings**

- 5.9.1 Conduit in a road crossing shall be locatable e.g. through the use of (permanent) marking on kerb on both sides of a road, or coordinates that record survey points.
- 5.9.2 The use of non pre-fabricated Curves may assist in a change of depth of cover for road crossing.

## **5.10 Testing**

- 5.10.1 Prior to any handover of ownership of Conduit every Conduit must be proved by passing a mandrel of a diameter no less than 80% of the Conduit internal diameter through its entire length.
- 5.10.2 Where the mandrel does not pass easily, corrective action must be undertaken, and the mandrel test redone. Results should be recorded on, or with 'as built plans' to meet the requirements of third party certification.
- 5.10.3 On completion of the mandrel test, a draw cord suitable for use as a hauling aid (e.g. made from polypropylene or equivalent rot-proof material) must be installed in the conduit.

## 6 PIT INSTALLATION

This section outlines the rules of placing pits in-ground and the orientation with respect to conduits, roadways and allotments.

### 6.1 Bedding and Backfill

- 6.1.1 Bedding for the pit shall be a layer of sand or fine crushed rock of an appropriate type approximately 100mm thick.
- 6.1.2 The level of the foundation shall bring the top of the pit level with and conforming to the:
  - (a) surrounding pavement or surface; or
  - (b) proposed final ground level.
- 6.1.3 Backfill material shall be sand, stabilised sand, fine crushed rock or equivalent.
- 6.1.4 Backfill material shall not contain contaminants, debris, vegetation or waste.
- 6.1.5 Pits must not be distorted by the backfill process.

<p><i>NOTE: Plastic pits can deform with compaction of soil by mechanical rammers or vehicle wheels.</i></p>
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- 6.1.6 All backfilling should be compacted by hand held rammers in layers not exceeding 150mm in thickness to minimise the risk of subsidence.
- 6.1.7 In grassed areas:
  - (a) backfill material shall stop within 50mm of the finished surface level; and
  - (b) a suitable top dressing shall be used to complete the reinstatement to the finished surface level.
- 6.1.8 Compaction should be taken to the full height of the backfill material.
- 6.1.9 Where the slope of the pit does not exceed 1 in 8 the pit shall be installed so that the top of the pit:
  - (a) is flush with the ground level or pavement; and
  - (b) conforms to the general slop of the ground level or pavement on all sides.

6.1.10 Refer to AS/NZS 2032 for information on bedding and backfill.

**NOTES:**

*1. Use compact soil in compliance with this specification, otherwise pits may buckle as soil subsides. If pits buckle, pit lids no longer fit.*

*2. Where a concrete collar surrounds the upper rim of the pit, it is important that the finished level around the collar and upper rim does not create a trip hazard.*

6.1.11 Refer to AS/NZS 2566.1 for information on pit installation in an embankment.

6.1.12 Pits should:

- (a) Conform to the surrounding slope and ground level when reinstating;
- (b) Be the correct size and type for the intended use; and
- (c) Be installed within 4.5 metres of where a Conduit changes direction by ninety degrees or more.

## **6.2 Orientation**

6.2.1 Pits shall be placed in line with the conduit they connect with.

6.2.2 Pits shall be oriented such that the long side of the pit is parallel to the:

- (a) allotment boundary; or
- (b) road.

## 7 MATERIALS

This section outlines the minimum standard of materials to be used.

### 7.1 Conduit

- 7.1.1 Conduit material must meet the minimum requirements of:
- (a) C524 External Communication Cable Networks;
  - (b) AS/CA S008 Requirements for Customer Cabling; and
  - (c) AS/NZS 1477 PVC Pipes and fittings for pressure applications.
- 7.1.2 Conduit wall thickness for 100mm internal diameter conduits shall conform to AS/NZS 1477 Table 4.2(A) under PN9 nominal sizes DN of 100mm.
- 7.1.3 Conduit wall thickness for 23mm and 50mm internal diameter conduits shall conform to AS/NZS 1477 Table 4.2(A) under PN12 nominal sizes DN of 20mm and 50mm.
- 7.1.4 The conduit should be white in accordance with AS requirements, including AS 1345.

### 7.2 Pits and Pit Lids

- 7.2.1 A pit shall be:
- (a) fitted with a lid that meets the requirements in Table 3.1 of AS 3996; and
  - (b) able to withstand a serviceability design load classification equivalent to that in Table 3.1 of AS 3996, either by:
    - (i) its designed strength; or
    - (ii) installation with additional protection to prevent warping under the appropriate serviceability design load classification, for example by fitting it with a factory preformed pit collar or pit frame, or surrounding it with reinforced concrete.

**NOTES:**

*1. This clause does not replace the requirement in clause 4.8.11 about not installing pits in locations such as driveways, roadways and vehicular access ways.*

*2. Footpaths are not intended for vehicular traffic.*

*3. A plastic collar on a pit would be insufficient to prevent warping under a vehicle load.*

- 7.2.2 Pits must have a gasket fitted between pit body and pit lid to minimise silt entering the pit.

- 7.2.3 Pit lids shall meet the requirements for slip resistance in AS/NZS 4586 and Table 3 of HB197 where the classification is for "External colonnades, walkways and pedestrian crossings".

*NOTE: The nominated test method shall be either:*

*(a) the "Wet Pendulum Test Method" for Pendulum W in accordance with Appendix A of AS 4586; or*

*(b) the "Oil – Wet Ramp Test Method" for Ramp R10 in accordance with Appendix D of AS 4586.*

### **7.3 Physical Labelling of Material**

- 7.3.1 Conduits should be labelled as required by AS/CA S008.
- 7.3.2 Pits should be labelled as required by AS/CA S008.
- 7.3.3 Pit covers should be labelled as required by AS 3996-2006, Section 1.6 Permanent Marking.
- 7.3.4 Pit lids labelled with a Carrier name should not be installed without express written approval from the Carrier, including agreement that the Carrier will accept ownership of the Pit and Pipe following any required inspection or certification.

## 8 DOCUMENTATION

This section outlines the minimum level of documentation deemed acceptable for transfer of the pit and pipe to a Carrier. Carriers may require the information to be prepared in specific drawing formats (i.e. CAD) and/or use of particular symbols for each network element.

### 8.1 As-Built Documentation

- 8.1.1 In order to allow effective transfer of ownership of the pit and pipe from the Developer to the Carrier, the as-built documentation must be prepared by the Developer for hand over to the Carrier at the time of transfer.
- 8.1.2 The as-built documentation must include:
- (a) The location of all allotment and street boundaries;
  - (b) The location of all pits and conduits, relative to known fixed assets e.g. allotment boundaries;
  - (c) The dimensions of all pits and conduits;
  - (d) The depth of cover for conduits, measured as actual soil or back fill depth and does not include coverings (for example paving);
  - (e) details from any Shared Trench Agreement, including trench cross sections with all services within 2 metres of the installed pits and/or Conduit; and
  - (f) results of any mandrel testing for each conduit section.

**NOTES:**

1. A CAD file would typically contain a legend with pit types and dimensions.
2. Depth of cover is usually part of a shared trench agreement.
3. Refer to Carrier guidelines and/or requirements for the file formats of as-built documentation.

## 9 REFERENCES

Publication	Title
<b>Australian Standards</b>	
AS/CA S008:2010	Requirements for Customer Cabling Products <a href="http://commsalliance.com.au/Documents/all/Standards/s008">http://commsalliance.com.au/Documents/all/Standards/s008</a>
AS/ACIF S009:2006	Installation requirements for customer cabling (Wiring rules) <a href="http://commsalliance.com.au/Documents/all/Standards/s009">http://commsalliance.com.au/Documents/all/Standards/s009</a>
AS/NZS 1477:2006	PVC Pipes and fittings for pressure applications <a href="http://infostore.saiglobal.com/Store2/Details.aspx?ProductID=358763">http://infostore.saiglobal.com/Store2/Details.aspx?ProductID=358763</a>
AS/NZS 2032:2006	Installation of PVC Pipe Systems <a href="http://infostore.saiglobal.com/store/Details.aspx?ProductID=362775">http://infostore.saiglobal.com/store/Details.aspx?ProductID=362775</a>
AS/NZS 2566.1:1998	Buried flexible pipelines - Structural design <a href="http://infostore.saiglobal.com/store/Details.aspx?productID=365861">http://infostore.saiglobal.com/store/Details.aspx?productID=365861</a>
AS/NZS 3000:2007	Electrical installations (known as the Australian/New Zealand Wiring Rules) <a href="http://infostore.saiglobal.com/store/Details.aspx?ProductID=366926">http://infostore.saiglobal.com/store/Details.aspx?ProductID=366926</a>
AS 1345:1995	Identification of the contents of pipes, conduits and ducts <a href="http://infostore.saiglobal.com/store/details.aspx?ProductID=224345">http://infostore.saiglobal.com/store/details.aspx?ProductID=224345</a>
AS/NZS 3084:2003	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings <a href="http://infostore.saiglobal.com/store/Details.aspx?productID=367215">http://infostore.saiglobal.com/store/Details.aspx?productID=367215</a>
AS/NZS 3835.1:2006	Earth potential rise - Protection of telecommunications network users, personnel and plant - Code of practice <a href="http://infostore.saiglobal.com/store/Details.aspx?ProductID=375170&amp;timerOff=1&amp;also=1">http://infostore.saiglobal.com/store/Details.aspx?ProductID=375170&amp;timerOff=1&amp;also=1</a>
AS 3996-2006	Access covers and grates <a href="http://infostore.saiglobal.com/store/Details.aspx?productid=307453">http://infostore.saiglobal.com/store/Details.aspx?productid=307453</a>

AS/NZS 4586:2004	Slip resistance classification of new pedestrian surface materials  <a href="http://infostore.saiglobal.com/store/Details.aspx?ProductID=385268">http://infostore.saiglobal.com/store/Details.aspx?ProductID=385268</a>
AS /NZS 4645.2:2008	Gas distribution networks - Steel pipe systems  <a href="http://infostore.saiglobal.com/store/Details.aspx?productID=1089794">http://infostore.saiglobal.com/store/Details.aspx?productID=1089794</a>
AS /NZS 4645.3:2008	Gas distribution networks - Plastics pipe systems  <a href="http://infostore.saiglobal.com/store/details.aspx?ProductID=1089795">http://infostore.saiglobal.com/store/details.aspx?ProductID=1089795</a>
AS/NZS 60079.10.1:2009	Explosive atmospheres - Classification of areas - Explosive gas atmospheres  <a href="http://infostore.saiglobal.com/store/details.aspx?ProductID=1137925">http://infostore.saiglobal.com/store/details.aspx?ProductID=1137925</a>
HB197:1999	An introductory guide to the slip resistance of pedestrian surface materials.  <a href="http://infostore.saiglobal.com/store/Details.aspx?productid=568795">http://infostore.saiglobal.com/store/Details.aspx?productid=568795</a>

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**Industry Codes**

ACIF C524:2004	External Communication Cable Networks  <a href="http://commsalliance.com.au/Documents/all/codes/c524">http://commsalliance.com.au/Documents/all/codes/c524</a>
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**Industry Guidelines**

Comms Alliance G591:2006	Telecommunications in Road Reserves - Operational Guidelines for Installations  <a href="http://commsalliance.com.au/Documents/all/guidelines/g591">http://commsalliance.com.au/Documents/all/guidelines/g591</a>
Release 1, May 2010	Fibre To The Premises Planning – Express Conduit  <a href="http://commsalliance.com.au/Documents/national-broadband-network">http://commsalliance.com.au/Documents/national-broadband-network</a>

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**Legislation**

<i>Telecommunications Act 1997</i>  <a href="http://www.comlaw.gov.au/Series/C2004A05145">http://www.comlaw.gov.au/Series/C2004A05145</a>
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## APPENDIX

### A CONDUIT COMBINATIONS AT PIT END

Refer to Table 4 for the maximum physically possible combinations of Conduit at one end of a pit, including a pit with a collar (i.e. riser).

*NOTE: It might be physically possible to connect two 100mm conduits to one end of a size 5 pit however this should be confirmed with the pit manufacturer before the design and installation of Pit and Pipe Facilities.*

**TABLE 4**  
**Conduit combinations at pit end**

Pit Size	Physically possible conduit combinations at one end of a pit; including pit with collar (i.e. riser)		
	100mm	50mm	23mm
2	0	1	4
5	1	2	0
	1	1	2
	1	0	4
	0	3	0
	0	2	2
	0	1	4
	0	0	4
	0	0	8
6	2	0	0
	1	2	0
	1	0	4
	0	4	0
	0	2	2
	0	1	4
	0	0	4
8	4	0	0
	3	2	0
	3	0	4
	2	4	0
	2	2	4
	1	4	4
9	4	0	0
	3	2	0
	3	0	4
	2	4	0
	2	2	4
	1	4	4

## APPENDIX

### B STARTER CONDUIT TERMINATION METHODS

Refer to Table 5 for links to examples of Starter Conduit termination methods.

**TABLE 5**  
**Examples of Starter Conduit termination methods**

Company	Document title	URL
NBN Co	In-Home-Wiring guidelines for Single Dwelling Units (SDU) and Multi Dwelling Units (MDU)	<a href="http://nbnco.com.au/getting-connected/new-developments/new-developments-technical-guidelines.html">http://nbnco.com.au/getting-connected/new-developments/new-developments-technical-guidelines.html</a>
OptiComm	Cable Entry Guide	<a href="http://www.opticomm.net.au/index.php/helpful-information/for-the-builder/conduit-and-cabinet">http://www.opticomm.net.au/index.php/helpful-information/for-the-builder/conduit-and-cabinet</a>
Telstra Smart Community	Cable entry facilities for Telstra Velocity networks	<a href="http://www.telstra.com.au/smart-community/builders/">http://www.telstra.com.au/smart-community/builders/</a>
TransACT	Home preparation guideline	<a href="http://transact.com.au/broadband/fibreToThePremise.aspx">http://transact.com.au/broadband/fibreToThePremise.aspx</a>

## **PARTICIPANTS**

The Working Committee that developed the Guideline consisted of the following organisations and their representatives:

<b>Organisation</b>	<b>Membership</b>	<b>Representative</b>
NBN Co	Voting	Chris Roberts
NBN Co	Non-Voting	Haydn Dale
OptiComm	Voting	Phil Smith
Telstra	Voting	Zach Kernich
Telstra	Non-Voting	Craig Hedges
TransACT	Voting	Peter Lee
DBCDE	Non-Voting / Observer	Paul Mooney

This Working Committee was chaired by Phil Smith. James Duck of Communications Alliance provided project management support.

Communications Alliance was formed in 2006 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services.

In pursuing its goals, Communications Alliance offers a forum for the industry to make coherent and constructive contributions to policy development and debate.

Communications Alliance seeks to facilitate open, effective and ethical competition between service providers while ensuring efficient, safe operation of networks, the provision of innovative services and the enhancement of consumer outcomes.

It is committed to the achievement of the policy objective of the *Telecommunications Act 1997* - the greatest practicable use of industry self-regulation without imposing undue financial and administrative burdens on industry.



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