



## AUS-SPEC

# Infrastructure Specifications

## 1391 Service conduits

**1391 SERVICE CONDUITS**

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the Cessnock City Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) Cessnock City Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown **in brown text like this**.
- Where content is deleted or excluded from the main body of the document, it is to be shown ~~struck through like this~~. Such clauses are to have no effect.

Where there is a conflict between main body text and Cessnock City Council specific clauses, Council's specific clauses shall prevail.

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide electrical and telecommunication conduits and pits as, documented.

#### Design and construct contracts

Requirement: Complete the requirements documented in **PRE-CONSTRUCTION PLANNING** and conform to **MATERIALS, EXECUTION** and the **ANNEXURES**.

#### Construct only contracts

Requirement: Conform to the requirements documented in **MATERIALS, EXECUTION** and the non-design requirements of the **ANNEXURES**.

### 1.2 CROSS REFERENCES

#### General

**Application:** This worksection is applicable to the supply of materials and the underground installation of electrical, telecommunications, conduits and pits by or on behalf of entities other than Utility Authorities, as defined in *1152 Road openings and restoration (Utility Authorities)* worksection.

**Exclusions:** This worksection does not apply to under boring, trenching, excavation or backfill activities which are conducted under:

- *1152 Road openings and restoration (Utility Authorities)*.
- *1392 Trenchless conduit installation*.

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *0136 General requirements (Construction)*.
- *0152 Schedule of rates (Construction)*.
- *0161 Quality management (Construction)*.
- *0319 Auxiliary concrete works*.
- *1101 Traffic management*.
- *1152 Road openings and restoration (Utilities)*.

### 1.3 STANDARDS

#### General

Electricity conduits and pit installation: To AS/NZS 3000 (2018), AS/CA S009 (2020), the requirements of the local electricity network distributor, **the Electricity Supply Act, Essential Energy's standards**, relevant state legislation and Australian Communications Media Authority (ACMA).

Telecommunication conduits and pit installation: To Communications Alliance G591 (2006).

For laying of NBN conduit and pit network in new developments see *New Developments: Deployment of the NBN Co Conduit and Pit Network - Guidelines for Developers* available at [www.nbnco.com.au/content/dam/nbnco/documents/installing-pit-and-conduit-infrastructure.pdf](http://www.nbnco.com.au/content/dam/nbnco/documents/installing-pit-and-conduit-infrastructure.pdf).

PVC-U pipe systems installation: To AS/NZS 2032 (2006).

## 1.4 INTERPRETATION

### Definitions

General: For the purposes of this worksection the following definitions apply:

- Space factor: Ratio of the sum of the cross sectional areas of the installed cables to the internal cross sectional area of the conduit.
- **Utility authority:** A public authority with statutory responsibility for the development, operation and maintenance of a public utility (including but not limited to electricity, telecommunications or gas), and that meets the definition of the Principal (see above) in relation to the proposed works.

## 1.5 TOLERANCES

### General

Conduit installation: Conform to the following:

- Variation from plan position in any direction:  $\pm 50$  mm.
- Level of top of conduit at any location between pits: +50 mm.

Pit installation: Conform to the following:

- Variation from plan position in any direction:  $\pm 100$  mm.

## 1.6 SUBMISSIONS

### Authority approvals

Design: Submit evidence of ~~service distributor~~ **Utility Authority's** approval of the design.

### Calculations

Survey: Submit survey of set out of service conduit works and quantity calculations.

### Certification

Pit installation: Submit certification of the suitability of proposed pit lifting methods.

Components: Submit certificates of conformance for all materials and components.

### Design documentation

Design and Construct contracts: Submit design documents to **PRE-CONSTRUCTION PLANNING**.

### Execution details

Pit installation: Submit proposed lifting methods including lifting points and devices.

### Products and materials

General: Submit technical data for the following:

- Ducted wiring enclosure systems.
- Proprietary pits.

### Records

Work-as-executed drawings: Include service conduit system information sheets and works.

### Shop drawings

Submit shop drawings to a scale that best describes the detail, showing the following:

- Layout of underground conduits, pits and drainage trenches.
- Invert levels for underground conduits.
- Depth of burial for cables and conduits.
- In situ pits.
- Provision for expansion and ground movement.

### Tests

Other tests: Submit results, as follows:

- Particle distribution.
- Plasticity Index.
- Ovality.

## 1.7 INSPECTIONS

### Notice

General: Give notice so that inspection may be made of the following:

- Set-out: Location, lengths, levels of the cable network and pits.
- Testing: Testing of installed conduits.
- Marking: Kerbs are marked with route of conduits.
- Final inspection: Conduit installed correctly, cleanliness of pits, pit labelling.

## 2 PRE-CONSTRUCTION PLANNING

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### 2.1 CONDUIT DESIGN CRITERIA

#### General

Requirement: Base the detailed design on the concept design drawings.

Detailed site survey: Prior to undertaking the detailed design, carry out a detailed site survey and include the following:

- Identify significant features such as rock outcrops, rocky surfaces, existing conduits and pits.
- Existing services.
- Access roads, easements or right of ways.
- Location of under roads, under waterway or bridge crossings.

Route location: Locate within the road reserve and outside the area occupied by the road pavement without resulting in any land acquisition. If the conduit passes through reinforced soil walls, avoid soil reinforcement elements.

Environmental considerations: Conform to the **ANNEXURES – SELECTIONS, Environmental requirements**.

### 2.2 DESIGN DOCUMENTATION

#### General

Design drawings: Prepare documentation based on the concept drawings, and include the following details:

- Conduit alignment and chainages along the route and highlight areas where route intersects other utilities or obstructions.
- Positions of under roads, under waterways or bridge crossings.
- Along the length of the conduit route notate the number and each type of conduit, their arrangement and depth below finished surface.
- Position of conduit route and any equipment housing.
- Pits and lids detail including dimensions, wall thickness, reinforcement details and loading class.
- Identify pits that require risers and access ladders.
- Bends are required.
- Conduit changes at crossing of bridges or culverts.
- Method of support and connections of conduits to bridge construction, retaining walls or rock face.
- Finished surface levels along the length of the conduit route.

Design report: Include the following:

- Choice of cable route and reasons for any variation to the concept design or this worksection.
- Reason for pit location.
- If galvanised steel tube are proposed, reasons for their selection.
- Site specific environmental requirements.
- Identify any obstructions to the cable route and proposed means to avoid them.
- Methods of construction including for under road, under waterway and bridge crossings.

#### Designer qualifications

Requirement: Use only persons appropriately experienced and qualified to undertake the service conduit design work.

**Authority requirements**

Requirement: Liaise with and conform to the requirements of the ~~service distributor~~ **Utility Authority**.

**2.3 SCHEDULING****Program of works**

General: Program the works as follows:

- Materials: Arrange the program for compliance and usage of component and materials.
- Authorities: Arrange approvals and conform to the local environmental requirements.

**3 MATERIALS**

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**3.1 CONDUITS****General**

Draw cord: Provide synthetic draw cord in conduits not in use.

Conduit colour: Conform to the following:

- Telecommunications: White.
- Electrical: Orange.

PVC-U priming fluid and solvent cement: To AS 3879 (2011).

Marker tape: To AS/NZS 2648.1 (1995).

Fixings saddles: Double sided fixed.

**Conduits types and fittings**

Heavy duty rigid PVC-U conduits and fittings: To AS/NZS 61386.21 (2015).

Flexible conduits and fittings of metal or composite material: To AS/NZS 61386.23 (2015).

Heavy duty galvanized steel tube: To AS 1074 (1989).

- Type: Screwed steel.

Saddles: Conform to the following:

- Internal: Zinc plated.
- External: Hot-dipped galvanized.

Corrosion protection of steel conduits: Paint ends and joint threads with zinc rich organic primer to AS/NZS 3750.9 (2009).

Laid underground: Steel water pipe with protection outside and inside to AS 1074 (1989).

**Electrical cables enclosed in ferromagnetic enclosures (steel conduit)**

Requirement: Install to AS/NZS 3000 (2018) clause 3.9.10.

**3.2 PITS****General**

Pits: Install cable draw-in pits, as documented. Sizes given are internal dimensions.

Plastic materials: Must be UV stabilised.

**Proprietary pits**

Pits: Provide proprietary concrete or polymer concrete moulded pits in conformance to the **ANNEXURES – SELECTIONS, Proprietary pit schedule**.

**In situ construction**

Pits: Construct walls and bases from rendered brickwork or 75 mm thick reinforced concrete. Add a waterproofing agent in the render or concrete. Alternatively, construct in conformance with the requirements of the Network provider requirements.

Concrete: To the *0319 Auxiliary concrete works* worksection.

**Pit covers**

Access covers and frames: Conform to AS 3996 (2019) and to the **ANNEXURES – SELECTIONS, Access covers and frames schedule**.

Ductile iron covers size: Width parallel to the lifting ends and undercut. Length parallel to the direction of cover removal.

Infill material: Bond tile or paver to the concrete bed with an epoxy mortar.

Marking: Mark all covers permanently on the inside of the pit and on the cover by casting, engraving or moulding in bold letters 30 mm high for pit use e.g. Electrical, Telecommunications.

## 4 EXECUTION

### 4.1 SET-OUT

#### General

Location: Set out the location, lengths and levels of the cable network and pits, as documented.

### 4.2 CONDUIT INSTALLATION

#### General

Requirement: Lay conduits in straight lines parallel or normal to the carriageway and avoid unnecessary bends.

Identification: Identify all conduits in conformance with AS 1345 (1995) and AS/NZS 3000 (2018).

Conduits not in use: Provide a draw cord for the full length of the conduit and 1 m past either end coiled.

Layout of each conduit within the trench: In conformance with the underground services shared trench agreement between the respective service authorities and AS/NZS 3000 (2018) clause 3.11.

Conduits under roads and other objects: > 1 m beyond the obstruction , and outside the zone of influence supporting any road pavement, structure or other service.

Capping of conduits: Provide a non perishable removable cover before backfilling.

#### Entry into pits and footings

Requirement: Conform to the following:

- Provide large sweep bends for entry into junction pits and light pole footings.
- Do not provide more than 180° total change of direction in any run of conduit between pits.
- Install conduits with not more than 2 right angled bends for each cable draw-in run.

Termination of conduit in post concrete footings: Terminate more than 25 mm inside the recess in the concrete footing.

#### Installation on concrete or rock face

General: Detail and certification by professional engineer.

#### Cover

General: Between 600 mm and 800 mm below finished level. If more than 600 mm cannot be achieved, encase in concrete in conformance with AS/NZS 3000 (2018) clause 3.11.4.4.

~~Reduced cover: To the requirements of the Network provider.~~

Minimum bedding thickness: 50 mm compacted sand.

Material: Fill in conformance with **EXECUTION, TESTING**.

Surround: Provide clean sharp sand not less than 150 mm around cables and conduits installed underground.

#### Marking

Marking tape: Lay at approximately 50% of the depth of the conduit and at conduit bends.

Marks in kerb: Route a mark in the face of kerb on both sides of the road indicating the location of the conduit crossing and conform to the following:

- Electrical: The letter 'E'.
- Telecommunications: The letter 'T'.
- Height of lettering: ≥ 75 mm.

Temporary markers: If kerb and gutter construction has not commenced, install temporary timber post markers at the conduit crossings so that markings in the face of kerb can be made at the correct locations at the time of kerb and gutter construction.

#### Joints

Non-metallic: Make sure joints are clean of dirt and grease and burrs before cementing together. Provide a solvent cement weld as recommended by the manufacturer.

Metallic: Provide threaded couplings with a minimum 25 mm length of thread on the end of a conduit or conduit bend.

Flexible conduit: Provide proprietary fittings.

### **Drawing cables**

Requirement: Install all conduits and fittings before commencing drawing in of cables.

## **4.3 PIT INSTALLATION**

### **General**

Requirement: Install pits to conform to the following:

- Set flush with the finished level of the surrounding area.
- Shape surrounding area to prevent ponding within 1 m of the pit.
- Number each pit.

Pit collars: Provide for circular pits before compaction of the backfill material.

Bedding: 5 mm nominal size screened aggregate of minimum 150 mm thick.

Sealing of pit rim: Coat the rim of the pit with a manufacturer approved sealing compound to achieve an airtight seal when the lid is positioned over the pit to prevent ingress of water and dust.

### **Termination for conduits to pits**

Requirement: Conform to the following:

- Provide a drilled hole into the pit less than 10 mm larger than the outside diameter of the conduit.
- Turn end of conduits upwards and protrude 50 mm into the pit.
- Seal around the conduit with an approved flexible sealant.
- End of the conduits: Smooth and free from burrs.

### **Location**

Electrical pits: As documented and conform to the following, as required:

- Within 4 m of service points for earthing.
- At all junctions and sharp changes in direction of conduits.
- Adjacent to poles to provide tee-off cable joints.
- Required, if distance between draw in pits exceeds 50 m.

Communication pits: Generally locate between major intersections and at transverse connections and conform to the following:

- Install with long dimension of covers indicating direction of main conduit run.
- Do not locate at vehicle crossovers.
- Do not locate in areas that may be affected by service congestion and future maintenance activities.
- Do not locate within 300 mm of low voltage electricity distribution pedestal, pads, domes or service pits.
- Do not locate in driveways.

Pits installed on batter slopes: Do not install pits on slopes steeper than 3H:1V.

### **Drainage**

Requirement: Install drainage in each pit as follows:

- Drain type: PVC-U.
- Diameter: 50 mm.
- Grade: Slope the drain to a stormwater drainage pit or discharge through an embankment batter.

### **Installation on concrete or rock face**

General: Detail and certification by professional engineer.

## **4.4 COMPLETION**

### **General**

Backfill: Do not commence backfill until conduit system has been inspected.

Work-as-executed drawings: Record the locations of all conduits and pits.

Restoration works: To *1152 Road openings and restoration (Utilities)*.

## 4.5 TESTING

### Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

### Completion tests

Ovality: Test completed conduits for ovality at least 14 days after compaction of completed backfill.

Ovality tolerances to manufacturer's requirements.

- Method: Use a test mandrel through each conduit.
- Damaged conduits: Immediately replace any damaged sections.

### Site tests

- Bedding fill: Limits to AS/NZS 3725 (2007) Table 6.
- Plasticity Index: Maximum 6.

## 5 ANNEXURE A

### 5.1 ANNEXURE - SELECTIONS

The use of these schedules in addition to project Drawings on Council or private development works is optional, at the Superintendent's discretion.

#### Environmental requirements

As per DA consent conditions.

#### Conduit schedule

Property	Size (mm)	Spacing factor	Breaking load (kN)
Conduit type: General underground			
Conduit type: Under road			
Conduit type: Flexible conduit			
Exposed conduit			
Draw cords			

#### Notes to schedule:

Conduit type: If a specific size is required, enter it here. Conduit size may be different for telecommunications and under roads. Alternatively, allow the contractor to size according to the space factor. Delete as required.

Generally the following may be specified:

Conduit type: General underground: 50 mm.

Conduit type: Under road: 80 mm.

Conduit type: Flexible conduit: 25 mm.

Spacing factor: Maximum 0.5.

Draw cords: The size of the draw cord may vary, if a specific size is preferred, specify it here. e.g. 5 mm, 4 mm, 2.5 mm.

Breaking load: Only applicable to Draw cords.

#### Proprietary pit schedule

Pit number	Type	Size (l x b x d) (mm)	Intervals (m)	Cover marking	Cover type	Security

**Proprietary pit schedule** above using the proprietary pit guide available from the manufacturer as appropriate.

Type: e.g. Type 53 concrete polymer.

Size: 505 x 220 x 435 mm – Put the size of the pit required, this may require extension pieces to be purchased by the contractor to conform to the sizing.

Intervals: Install at regular intervals, maximum 250 m.



Cover marking: e.g. 'Electrical', 'Telecommunication' or 'blank.'

Cover type: e.g. Galvanized steel cover.

Security: e.g. Military locking.

#### Access covers and frames schedule

Requirements	A1	A2	A3	A4
Cover number				
Load class				
Size (mm)				
Aesthetics (recessed covers)				
Aesthetics (decorative edging)				
Security				
Seals				
Cover orientation				
Handling				
Weight (kg)				
Lifting handles				

Notes to schedule:

If using proprietary pits, the covers come as a set. Use the **Proprietary pit schedule**.

Where A1, A2, A3 and A4 are the location of access covers.

Cover number: Align cover numbers in the schedule to the drawings.

Load class: A to G inclusive to AS 3996 (2019) clause 3.1.

Size: Unobstructed opening inside the frame W (width) x L (Length).

Aesthetics (recessed covers): For infill material to match or complement surrounding pavement.

Tile depth: Generally Maximum 25 mm.

Paver depth: Generally Maximum 40 mm.

Aesthetics: (decorative edging): Stainless steel or brass.

Generally, ductile iron covers: Height increase 12 or 40 mm, width/length increase 6 mm.

Generally, galvanized steel covers: Height increase 2.5 mm, width/length increase 2.5 mm.

Security: Locking requirements and preferred type of locking mechanism e.g. Locking bolt.

Seals: Requirements for specialised seals pressure tight (requirement over 1 kPa), single or double seals.

Cover orientation: Direction of traffic flow to prevent cover lifting.

Handling: Note whether the lifting is manual unassisted (Maximum 55 kg) or assisted with lifting keys.

Weight: Maximum 40 kg for any section of the cover.

Lifting handles: Install a lifting handle for each size of cover section.

## 5.2 ANNEXURE - SUMMARY OF HOLD AND WITNESS POINTS

For private developments, certain Hold and Witness Points where specifically noted below require representatives of both the Superintendent and the Principal Certifier (e.g. Council) to authorise release.

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS Design documentation  Design and Construct contracts	H – Superintendent and Principal Certifier	Design documentation.	2 weeks before commencement.	Commencement
SUBMISSIONS, Authority	H	Evidence of service distributor's design	5 days before commencement.	Commencement

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
approval Design		approval.		
SUBMISSIONS, Certification Components	H	Certificates of conformance for all materials and components.	7 days before installation.	Installation
INSPECTIONS, Notice Set-out	H	Location, lengths, levels of the cable network and pits.	1 day before excavation.	Commencement of excavation.
INSPECTIONS, Notice Testing	W	Testing of installed conduits	1 day before testing.	Conduit testing.
INSPECTIONS, Notice Marking	W	Face of kerbs showing route of conduits.	3 days before final inspection.	Final inspection.
INSPECTIONS, Notice Final inspection	H – Superintendent W – Principal Certifier	Correct number of conduits installed Draw wire in each conduit Pits free of debris and ingress of water Pit lids fit securely Label on pit lid	3 days before completion.	Completion.

Note: H = Hold Point, W = Witness Point

### 5.3 ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Bedding fill	Particle distribution			
	Sieving method	1 contract	1 per type	AS 1141.11.1 (2020)
	Material finer than 75 µm in aggregates (by washing)	1 contract	1 per type	AS 1141.12 (2015)
	Plasticity Index	1 contract	1 per type	TfNSW T109 (2021)

### 5.4 ANNEXURES - PAY ITEMS

Pay items	Unit of measurement	Schedule rate inclusions
<b>1391.1 Supply and lay PVC-U conduit</b>	Lin.m	All costs associated with supply and installation of conduits and bends in place.
<b>1391.2 Pits</b>	Each	All costs associated with supply and installation of junction pits in place.
<b>Traffic management</b>	Lump sum	To the 1101 Traffic management worksection.

### 5.5 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS/CA S009	2020	Installation requirements for customer cabling (Wiring Rules)
AS 1074	1989	Steel tubes and tubulars for ordinary service
AS 1141		Methods for sampling and testing aggregates
AS 1141.11.1	2020	Particle size distribution - Sieving method

AS 1141.12	2015	Materials finer than 75 µm in aggregates (by washing)
AS 1345	1995	Identification of the contents of pipes, conduits and ducts
AS/NZS 2032	2006	Installation of PVC pipe systems
AS/NZS 2648		Underground marking tape
AS/NZS 2648.1	1995	Non-detectable tape
AS/NZS 3000	2018	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3725	2007	Design for installation of buried concrete pipes
AS/NZS 3750		Paints for steel structures
AS/NZS 3750.9	2009	Organic zinc-rich primer
AS 3879	2011	Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS and ASA pipes and fittings
AS 3996	2019	Access covers and grates
AS/NZS 61386		Conduits systems for cable management
AS/NZS 61386.21	2015	Particular requirements - Rigid conduit systems
AS/NZS 61386.23	2015	Particular requirements - Flexible conduit systems
CA G591	2006	Telecommunications in road reserves – Operational guidelines for installations - Industry Guideline
TfNSW T109	2021	Plastic limit and plasticity index of road construction materials
EN 15804	2012	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
ISO 14025	2006	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 21930	2017	Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services
AS/CA S009	2020	Installation requirements for customer cabling (Wiring Rules)
AS 1074	1989	Steel tubes and tubulars for ordinary service
AS 1141		Methods for sampling and testing aggregates
AS 1141.11.1	2020	Particle size distribution - Sieving method
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AS 3996	2019	Access covers and grates
AS/NZS 61386		Conduits systems for cable management
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CA G591	2006	Telecommunications in road reserves – Operational guidelines for installations - Industry Guideline
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EN 15804	2012	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
ISO 14025	2006	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 21930	2017	Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services

## 6 ANNEXURE M – CESSNOCK CITY COUNCIL SPECIFIC CLAUSES

M1.	Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's <i>Development Engineering Handbook</i> . Acceptance is to be obtained in writing from: an authorised representative of Council's Director of Infrastructure and Engineering Services.	<b>Variation procedure</b>
M2.	This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.	<b>DA Conditions</b>
M3.	Refer to the Cessnock City Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.	<b>Completion</b>

## 7 AMENDMENT HISTORY

0	15/01/2024	First Published
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