Installation and recommendations for Bulk Series Pits/Manholes including Concrete Slab and FRP Cover

Rev 1.4

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1 Executive Summary

The purpose of this document is to list and identify the requirement and functionality of deploying the Bulk Manhole / Pit, over existing and New Ducts be used within the Outside Plant Network (OSP).

2 Objective/Scope

The objective is to provide approved guidance and understanding the requirement and functionality for the deployment of Bulk Manhole/Pits, in support of an operational lifecycle.

This document is to be used as an approved standard for all operational departments.

3 Specification Requirement

A comprehensive business objective is to implement a best practice methodology for the implementation of Bulk Pits, in order to introduce a repeatable cohesive service delivery model.

Researching and documenting a standard approach throughout the OSP will ensure cost efficiency and quality are up held for all analyzed and approved strategic business case. There by mitigating risk from operational inefficiencies, due to increased costs and excessive lead times.

4 Operational Requirement

Operational requirement focuses on provisioning attributes (components) that contribute to the implementation of an optical network. A factor considered in the formatting of the material found within this document

Standardizing component installation practices will provide operational teams with greater service continuity.

5 Product Specification

The following is a holistic view of a requirement for (*OSP*), *underground chamber* for the provisioning (hosting) of *cable ducts,* optical *fibre cables* and *enclosures* within a secure dry environment.

Listed are those criteria's, required in answer to either commercial and or an operational requirement, recorded under the following categories;

- *Functionality*
- *Weights and Measurements*
- *Technical*
- *Product Life Span*
- *Quality Assurance*

5.1 Product Requirements Matrix

The table below is to be populated by those who find themselves involved in specifying the standard specifications.

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Product Requirements
Product: *Underground Chamber (Telecommunications Handhole Assembly)*
Category: *Outside Plant*

Functionality	▪ ***Provide a sealed, secure environment reducing risk of vandalism;*** Able to; = Be secured, lockable = Provide a secure environment in hosting of passive optical attributes	 **=** ✓ **=** ✓
	▪ *Capable of facilitating buried fibre application*	= ✓
	▪ *Manholeed lid assembly;* *Able to: = Be secured, lockable under mechanical key system*	= ✓
	▪ *Furniture supplied;* *Able to: = Support Joint Closures* *= Cable Management* *= Steps, minimum dimension 100mm*	 = ✓ = ✓ = ✓
	▪ *Index type;* *Able to host: = Singlemode Fibre Cable* *= Multimode Fibre Cable*	 = ✓ = ✓
	▪ *Fibre enclosures;* *Able to host: = Dependent on Closure / Pit Size*	 = ✓
	▪ *Sub-duct configurations;* *Able to host: = Multiple Configurations of various sizes*	 = ✓

Materials	List those martial and performance criteria	
	▪ *High Density Polyethylene (HDPE)*	= ✓
	▪ *Shield Cover Tier 22*	= ✓
	▪ *Polyvinyl chloride*	= ✓
	▪ *Galvanized Steel*	= ✓
	▪ *Ductile Iron*	= ✓
	▪ *Concrete Slab and FRP round cover*	= ✓

Weights and Measurements	List each dimension that has importance in procuring the components	
	▪ *Range between external length (mm) = 600 and 2000*	= ✓
	▪ *Range between external Width (mm) = 450 and 900*	= ✓
	▪ *Range between external Depth (mm) = 350 and 1200*	= ✓
	▪ *Load Potential (Kilo Newton's); able to support vehicular transportation loads of;* *= Class A up to 15 kN* *= Class B up to 125 kN* *= Class C up to 250 kN* *=Meeting Philippines H25 Load bearing capacity*	 = ✓ = ✓ = ✓ = ✓

Product Life Span	What is the required shelf life of the product	
	▪ *20 Years*	= ✓

Environmental	What are the products Environmental protection values	
	▪ *Ultra Violet rated protection, Associated with G154 and G53.*	= ✓
	▪ *Free water drainage capability*	= ✓
	▪ *Temperature values; Compliant with aging process at temperature's ranging between -40° and 60°*	= ✓

Quality Assurance	State Quality Assurance values	
	▪ *Type Approval Test (Certification evidence)*	= ✓
	▪ *Light performance tests prior to shipment (Random selection of components)*	= ✓
	▪ *Unique Manufacturer Identification Code*	= ✓
	▪ *Certification, = (Vendor Specific, component compliance material)*	= ✓
	▪ *Component Markings (Vendor Specific, component material)*	= ✓
	▪ *Documentation; = (Vendor Specific, component material)*	= ✓
	▪ *Packing and Delivery; = (Supplier Name, Product Destination, Batch Number)*	= ✓
	▪ *Component Warranty*	= ✓
	▪ *Training on request; to be carried out by supplier representation*	= ✓

1 Product Introduction

The underground service grade level product (BULK), has been introduced to handle high load applications such as those designated “Light Duty” “Heavy Duty” and “Extra Heavy Duty”, when coupled with the right covers and support system.

With growing demand for network infrastructure components, this is a perfect fit for today’s worldwide Telecommunication companies.

All components facilities a superior strength for below grade applications, supported from material’s that keeps costs low whilst still keeping structural integrity as a priority.

This document identifies both functionality and capability of the pit (underground chamber) integrity when used in optical cable network design and when deployed within the Outside Plant Network in various network locations.

This product may be used in several underground utility applications as well. Designed to be placed in greenbelt, pedestrian/light traffic, medium duty/non-deliberate traffic, and heavy duty/ deliberate traffic by simply selecting the appropriate components for the desired application.

2 Acronyms and Abbreviations

Table 1 provides the descriptions to an associated abbreviation. These abbreviations will be found throughout the content of this documents and serves a point of reference.

Acronyms/Abbreviation	Description
ASTM	American Society for Testing and Materials
AS	*Australian Standard*
EN	*European Standards*
LVDT	*Linear Variable Differential Transformer*
OSHA	*Occupational Safety and Health Administration*
CBD	*Central Business District*
POP	*Point Of Presentation*
ODN	*Optical Distribution Network*
GPON	*Gigabit Passive Optical Network*
FFC	*Fibre Feeder Cable*
SGLB / BULK	*Series Grade Level Box*

3 Functionality

The series grade level box (Bulk) encompasses a modular design, which facilities the provisioning of a secure outside plant, ground level manhole.

Functionality is achieved through the selection of components, configurable to facilitate a ground level plant environment;

- Body (*BULK*); *A high density polyethylene (HDPE) manhole body assembly, (with a melt temperature of 135C) shaped by high pressure injection or low pressure structural foam moulding. Typically deployed in support of buried below grade applications*
- Lid (*SHEILD*); *A composite comprising of a filled thermoplastic polymer matrix, inorganic filler and reinforced with glass fibre.*

Lids and rings made from these materials, are formed using a moulding or casting process. It has no inherent scrap value.

- Galvanized Steel; *Low alloy sheet steel coated with a zinc galvanizing coating (AS 4680), providing long term corrosion protection. Frames are typically made by cutting, forming, and welding sheet steel and are coated as the last process.*
- Ductile Iron; *An iron composition, (sometimes known as spheroidal graphite iron), whose properties are enhanced through the introduction of magnesium, aiding in the formation of carbon graphite onto the nodules. Enhancing ductility of the component, lids and frame production is typically constructed using this casting process.*
- Concrete Slab / FRP Round Hinged Cover*; local manufactured slab capable of meeting Philippine Highway installation practices and 3rd party purchased FRP Frame and Cover.*

These components represent the building blocks of the BULK manholes, and provide various levels of load rating and security for the protection of passive outside plant optical components.

Note: *By combining both BULK and ductile Iron components / Concrete Slab, the term "SUPER BULK" was introduced*.

3.1 General Requirements

All identified components meet a functional requirement as identified from the criteria stated throughout the content of this document.

The following is a brief insight to that criteria;

- *Metal hardware is corrosion resistant.*
- *The manufactured components of the manhole (BULK) are free of defects which would adversely affect product performance.*
- *Lid assemblies may not have glass fibres exuding out of the surface area surrounding the cover.*
- *Lid assemblies may not show chipping or flaking damage after transportation and installation.*
- *Manhole assemblies include non-metallic cable racking.*
- *Manhole assemblies have an optional floor installed. Floors are designed to allow water to drain from the bottom.*
- *An application or customer logo can be clearly marked and displayed on all lid top surfaces.*
- *Lid assemblies incorporate lifting holes that have a removable cover cap, which is anti-trip.*
- *BULK 3 and larger manhole enclosures are configured to customer requirements, such as cross bars, placed for safety purposes, to prevent the covers from falling into the pits during the placement of the covers.*

We will now look to capability, in answer to the products deployment under various conditions.

3.2 Capability

With functionality comes capability, here we will focus on the SGLB/BULK assembly capability, as each component is integrated as an operational asset.

As part of a functional passive infrastructure design, each series grade BULK component has been designed to function in both heavy and extra heavy duty underground utility applications.

Note: *The correct capability is achieved through correct component selection, for the purpose of this document the following configuration types will apply.*

3.3 Weights and Measures

The product is available in the associated weights and dimensions, supporting the needs of the network architecture.

		External Dimensions - mm			Internal Dimensions - mm		
Outside Plant Application	Product Model	*Length*	*Width*	*Depth*	*Length*	*Width*	*Depth*
Access Pit	*Bulk 2*	*692*	*457*	*387*	*597*	*350*	*387*
Terminal/Splice Pit	*Bulk 3*	*845*	*553*	*610*	*780*	*450*	*610*
Terminal/Splice Pit	*Bulk 4*	*1016*	*730*	*905*	*900*	*615*	*905*
Terminal/Splice Pit	*Bulk 6*	*2080*	*745*	*1160*	*1920*	*595*	*1160*
Terminal/Splice Pit	*Bulk 7*	*1330*	*883*	*910*	*1213*	*768*	*910*
Manhole Body Extension	*(Bulk 3)*	*845*	*553*	*260*	*780*	*450*	*260*
Manhole Body Extension	*(Bulk 4)*	*1016*	*730*	*260*	*900*	*615*	*260*
Composite Raising Ring	*(Bulk 3)*	*840*	*510*	*65*	*780*	*450*	*65*
Composite Raising Ring	*(Bulk 4)*	*1016*	*730*	*150*	*900*	*615*	*150*
Ductile Iron Lid & Steel Ring	*(Bulk 3)*	*895*	*622*	*127*	*692*	*419*	*127*
Ductile Iron Lid & Steel Ring,2	*(Bulk 4)*	*1098*	*756*	*129*	*879*	*552*	*129*

Note: There are further Bulks, larger, but for the purpose of this document, we have covered only the above and excluded the Concrete slab above due to local variations

1. Bulk 3 – SHEILD lid/body assembly: *Medium and Heavy Duty applications = 23.5kgs*
2. Bulk 3 – SHEILD lid/composite ring and body assembly: *Heavy Duty applications = 32kgs*
3. Bulk 4 – SHEILD lid/body assembly: *Medium and Heavy Duty applications = 24kgs*
4. Bulk 4 – SHEILD lid/composite ring and body assembly: *Heavy Duty applications = 57kgs*

3.4 Technical Performance

The following are aligned to those four categories, associated to recording performance criteria for components tested in a controlled environment before leaving the factory.

Properties	Test Parameters		Reference to International Specifications	Requirements
Visual Inspection				
Appearance	Manhole Body Manhole Lid	Visual Inspection	None	No defects which would affect performance

Table 2: Technical Performance

Note: *To meet higher load requirements (Class C and D) for roadway applications, it is expected that the lid will be contained within a reinforced frame that is formed from a concrete collar* during installation or a Concrete Slab and FRP cover.

The HDPE body is BULK. The frame and cover assembly can withstand the specified loads without permanent damage or distortion.

For all applications, including Class A, B, C, and D, it is expected as a minimum requirement that the pit and lid is tested in the Channell Lab in Temecula USA, to meet all required standards.

4 Implementation Instructions

The Implementation instruction sheet provides general information useful to those that are involved in the installation of the BULK (*manhole*) component and lid assemblies for below grade applications.

All material is available for the purpose of general guidance and there for we cannot anticipate all conditions that may be encountered under field conditions, but our team of Engineers are available for advice and direction, please contact your local Channell Representative for any clarification.

Please follow local guidance through your local quality assurance representation, if faced with conditions that may impact best practice when implementing this product.

4.1 BULK/SHEILD Assembly Implementation

At this point and for the purpose of this instruction only, it is important to note the following points whilst carrying out the actions recorded in the works instruction table;

- *It is not imperative that trench excavation (for micro duct applications) has been completed. Trench excavation and duct implementation can be introduced at the convenience of the build schedule.*

- *It is however and again for the purpose of this instruction, imperative that all internal furniture applications are secured as required, prior the outer perimeter of the manhole being back filled*.

Note: *The BULK manhole body is reinforced by the use of custom fabricated embedded racking in the sidewall of the manholes.*

In the course of manhole placement, it will be necessary to drill holes for ducts or cut away portions of the HDPE manhole to fit in a previous installation.

Under no circumstances are the vertical racks to be cut in the process. Failure to observe this requirement may lead to premature failure of the installation.

4.1.1 Works Instruction

Site Preparation and Installation
1. Ensure local authorities are notified and that regulatory compliance is adhered to prior to and during the Installations procedure.

2. Plan to excavate approximately 12-16 inches (305 - 405mm) in length and width, larger than the dimension of the slab or cover being installed.

Note: This allows room for labor and also to ensure compaction is done correctly plus making good of the concrete FGL.

3. Excavate 6-8 inches (152- 202mm) deeper than the overall depth of both combined Manhole and lid assembly dimensions. (refer section 5.3)

Tamp (compact) the floor area of the excavation using either a hand tool; or a mechanical plate compactor.

Note: At this point should a concrete collar be required for your application, then a polymer ring must be included within your depth dimension prior to excavation, unless the concrete slab is to be installed.

4. Place 5 to 6 inches *(127- 152mm)* of ¾" (*20mm*) crushed rock, over the excavations entire floor surface area,

Note: The rock should be free of soil and all other forms of foreign organic matter. This is important step when providing a sound foundation for the manhole and mitigate risk of subsidence over time.

This also facilitates in producing a free draining solution;

a). An alternative, you could consider when looking to increase the foundations strength, is the application of a dry mix solution, of 1 part cement to 10 parts crushed rock.

Note: *Do not use "pea gravel" or other alternative round stone products for this step.*

The following is for reference and can be use in sourcing the correct aggregate base material.

Aggregate base: *Typically composed of crushed rock capable of passing through a ¾ in (19.05 mm) rock screen.The component particles will vary in size from 3/4 inch down to dust. The material can be made of virgin (newly mined) rock, or of recycled asphalt and concrete*

5. Position the manhole within the excavation*;*

a) Centre the manhole body, parallel to the side walk or curb where applicable, this will increase the aesthetics and fit in with the local environment.

b) Adjust the manhole, in order to achieve the correct grade (height), by either removing and or introducing additional crushed rock material.

Note: *For the purpose of this instruction, the manhole is being located where a side walk (pavement) will be constructed. There for a composite ring has been introduced as a requirement*.

The composite ring is only Implemented when the manhole requires greater support, this can be provided by introducing a 150mm concrete form, around the perimeter section of the composite ring, already secured to the manholes body

6. Locate and secure the lid assembly to the pit body (manhole),to mitigate any risk of any material from entering the manholes body

Securing the lid assembly is advised during this phase, however remember to ensure this action is carried out prior to leaving site.

Note: Ensure covers for Bolts and lifting hook are re-fitted to prevent pedestrians from tripping

7. Excess soil removed when excavating the pit can be used in the backfill process.

The back fill process should be completed in stages. Where by soil is returned at graded levels, no greater than 12 inches (300mm). With each grade being compacted through either hand tool; or a mechanical compaction method.

This will prevent soil (material) settlement around the perimeter of the encased manhole.

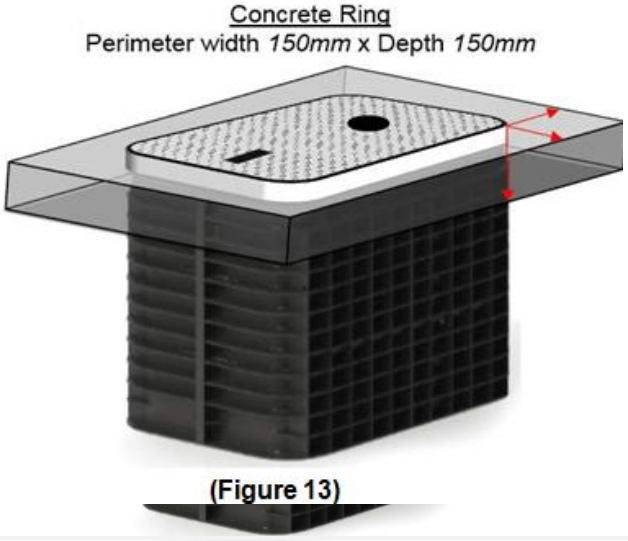
Note: Soil used in the back fill process, must not be of a grade greater than a dimension of 3 inches (76mm). If so it should be removed from the excavation

8. The final back fill shall be tampered fall level with surounding virgin ground from the perimeter of the lid assembly's rim.

   Note: All excess material should be reinstated as stated through the local authorities statement of works and the local operational companies reinstatement procedures

9. **Note:** Should both BULK and SHEILD assembly's be used in conjunction with the composite raising rings as seen in Fig 12 Then a 150mm perimeter of concrete should be introduced around the ring, at a depth of 150mm, as seen in Fig 13.

(See Figure 12)



(Figure 13)

4.2 Super BULK/Ductile Iron Assembly Implementation

Following on from previous sections *our focus is still with the implementation of both BULK and lid assembly's.*

In this section we will introduce the ductile Iron lid assembly, for class C and or D grade applications, as referred to in previous sections

As already stated: All available material is provided as general guidance and there for cannot anticipate all conditions that may be encountered under field conditions, please contact your Channell representative for advice if required.

Note: *The BULK manhole body is reinforced by the use of custom fabricated embedded racking in the sidewall of the manholes*

4.2.1 Works Instruction

The introduction of the ductile iron lid and steel ring combination are intended for locations where, vehicular traffic is present.

Locations such as alley ways and parking areas would be of an illustration for such applications. It is important to note that the steel frame must be imbedded in a concrete surround or collar as part of the installation.

Site Preparation and Installation

1. Ensure local authorities are notified and that regulatory compliance is adhered to prior to and during the Installations procedure.

2. Plan to excavate approximately 8-10 inches (203 - 254mm) in length and width, larger than the dimension of the manhole being installed Excavate 6 inches (152mm) deeper than the overall depth of both combined Manhole and lid assembly dimensions.

3. Excavate 6-8 inches (152- 202mm) deeper than the overall depth of both combined Manhole and lid assembly dimensions. (refer section 5.3)

   Tamp (compact) the floor area of the excavation using either a hand tool; or a mechanical plate compactor.

   Note: At this point should a concrete collar be required for your application, then a polymer ring must be included within your depth dimension prior to excavation, unless the concrete slab is to be installed.

4. Place 5 to 6 inches *(127- 152mm)* of ¾" (*20mm*) crushed rock, over the excavations entire floor surface area,

   Note: The rock should be free of soil and all other forms of foreign organic matter. This is important step when providing a sound foundation for the manhole and mitigate risk of subsidence over time.

   This also facilitates in producing a free drainage solution;
   An alternative, you could consider when looking to increase the foundations strength, is the application of a dry mix solution, of 1 part cement to 10 parts crushed rock.

   Note: *Do not use "pea gravel" or other alternative round stone products for this step.*

   The following is for reference and can be use in sourcing the correct aggregate base material.

   Aggregate base: *Typically composed of crushed rock capable of passing through a ¾ in (19.05 mm) rock screen.*
   The component particles will vary in size from 3/4 inch down to dust. The material can be made of virgin (newly mined) rock, or of recycled asphalt and concrete

Note: Left Picture is a new build, and the right picture, replacing a smashed concrete Box during rehabilitation.

5. If duct openings are required, take this opportunity to create your openings in the HDPE sidewall construction using a Properly sized "*Hole Saw*"

Should larger clearances be required during a retrofit of a previous installation? Then this can be achieved be the use of a reciprocating saw

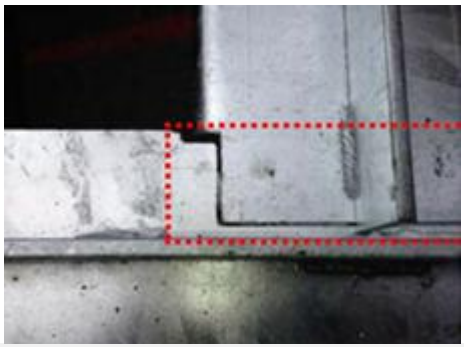
Note: *Do not cut the Carbon or Metal embedded racks in the sidewall of manhole body assembly.*

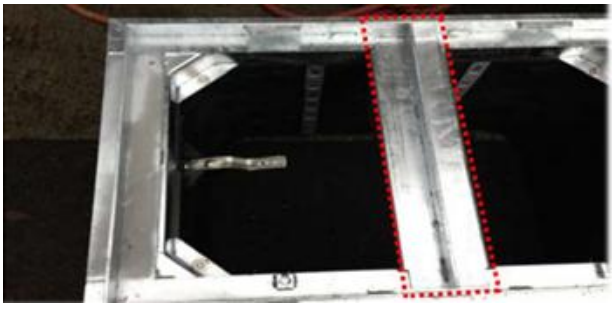
6. Position the manhole body and steel ring assembly within the excavation. Adjust the manhole assembly to the correct grade (level) by adding and or removing crushed rock material.

7. Remove any lose soil and or rock fragments from the cover seat of the steel ring.

Locate the support beam correctly into the steel ring and place the ductile iron covers in their allocated housings.

Ensure the support beam and covers are properly seated. Cover the bolt holes with an adhesive backed tape, such as "duct tape" to prevent filling or contamination during backfill of the pit.



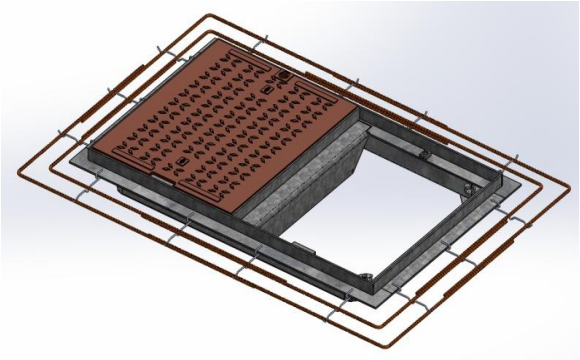


8. The excavated pit should be backfilled with fine crushed gravel, or “crush and run”. Hand tamp the gravel in layers of 4-6 inches (101-152mm) to insure flow of backfill into the cells of the manhole wall

a) The back fill process should be complete in stages. Where by material is returned at graded levels, no greater than 4-6 inches (101-152mm). With each grade being compacted through hand tool; to insure flow of backfill into the cells of the manhole wall.

b) *Add backfill to a level 6-8 inches (150-200 mm) just below the top of the ductile iron cover. Tamp the final layer the backfill to a uniform level to grade*

Note: *Care should be taken to prevent excessive damage of the cellular ribs during the tamping step*



(Figure 21)

9. Reinforcing Rods, can be added to the ductile iron cover set to improve loading stress and prevent cracking of concrete pour around cover.

a) Drill holes in steel cover set ring to attach galvanized wire supporting rods.

b) Cut and bend standard rebar rods, and place around cover set, approx 75mm apart as in figure 21

c) Tie down reinforcing rods to galvanized wire with wire tie downs.

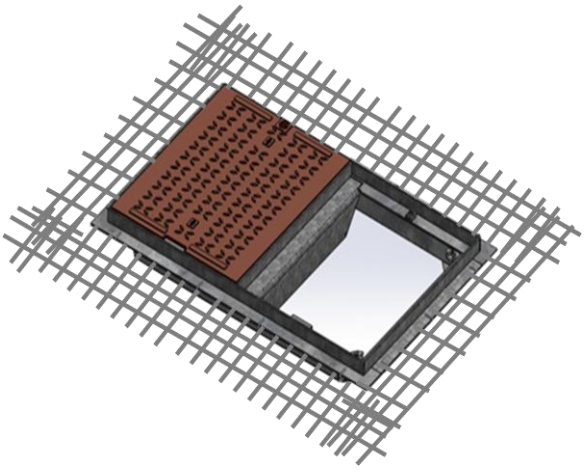
10. Reinforcing MESH, **(OPTION)**

a) Drill holes in steel cover set ring to attach galvanized mesh
.

b) F50 (5mm) galvanized reinforcing mesh can be used as a alternative to reinforcing rods. The mesh should extend out from the steel frame approx 150mm

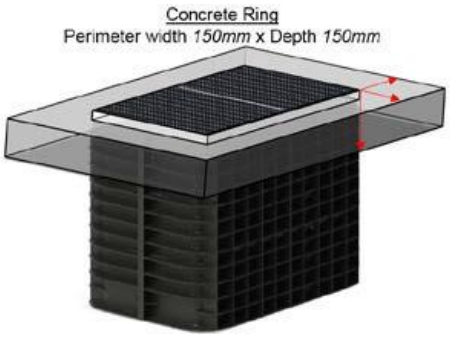
c) The mesh can be overlapped at the four corners to provide additional strength and securing points

d) Tie down reinforcing mesh were they overlap at the four corners.



11. The addition of the concrete application to the ring assembly is a requirement.

a) *Ensuring that concrete flows into the sidewall cells and is uniform under the steel flange of the galvanized ring.*



Note: *This concrete pour should look to be a minimum of; 150mm Perimeter width x 150mm depth, as seen in this diagram*

(Figure 22)

12. The final stages will be;

b) *Clean uncured concrete from the iron lid assembly and gaps between the ring and covers.*

c) *Remove tape from the bolt counter bore location and place bolts into threaded locations*

d) *Add any cement finishing steps to the top layers as required*

Note: *Assure that the concrete is properly cured before vehicular loads are applied to the covers*

4.3 BULK Extension Assembly

With weights and measurements already recorded within previous sections. Here we will introduce the manhole extension assembly which can increase both BULK 3 and 4 chamber depths by a further 260mm.

This can facilitate the fibre network planning team, in achieving greater depths that may be required in support of trench systems that maybe greater than the standard BULK depths.

4.3.1 Works Instruction

In association with those previous works instructions, here we will introduce the procedure in applying the BULK chamber extension

Preparation and Installation

1. Ensure local authorities are notified and that regulatory compliance is adhered to prior to and during the Installations procedure. Position the main manhole body assembly on top of the Manhole extension, see figure 22.

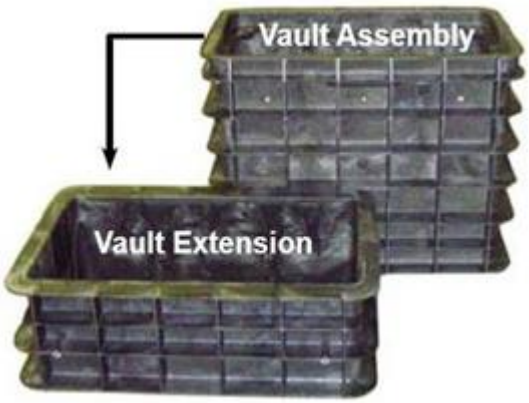
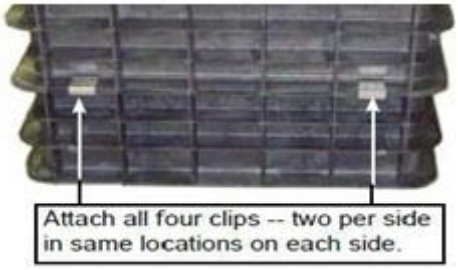


Figure 22

Figure 23

2. Align both forms, attaching vice like grips, shown in figure 23.



(Figure 24)

3. Position the supplied clip between the two vice like grips. Using a mallet knock the clips home to mate the two forms, as seen in figure 24.

(Figure 25)

4. Make sure that phase 3 is repeated with the remaining clips, for those positions identified in figure 25

5 Manhole Component Applications

With the introduction of CHANNEL's BULK manhole assembly, the following has been included to provide the audience with insight, in how each planned manhole (*environment*) should be managed when introducing the following listed passive optical components;

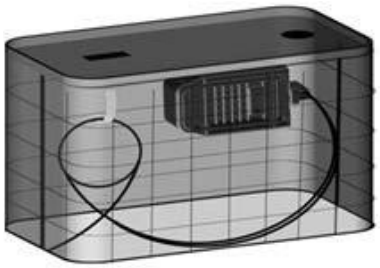
- *Micro-duct*
- *Standard PVC Conduit*
- *HDPE Conduit*
- *Passive optical cable (All capabilities)*
- *Passive fibre enclosures (Network joint closures)*

5.1 Manhole Application Management

Illustrated are both manhole and passive optical component configurations, associated with network infrastructure design and planning capability as an example.

All information is designed to provide guidance for personnel, whom find themselves engaged in duties associated with the planning and construction of passive optical infrastructure components

Manhole Application



1. Diagram shows how both network Joint enclosure and optical cabling should be introduced, hosted within the BULK Manhole assembly.

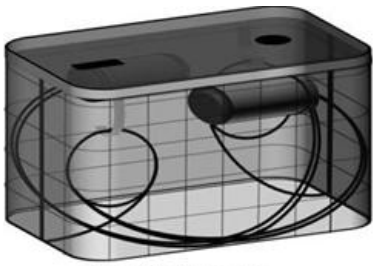
   This configuration can also be supported through the introduction of the manholes body extension, recorded under previous sections

Note: *This capability is achievable through the use of the closure cradle or "L" Bracket. This component must be ordered separately*.

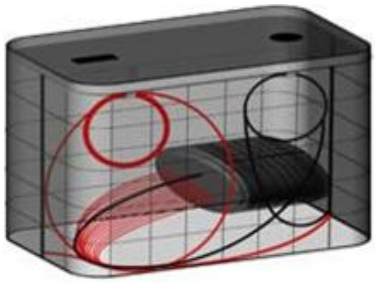
2. Aligned in the support of networking capability, to facilitate were fibre count has already converged through the use an existing channell closures and the introduction of an optical distribution node (ODN) is now required

Note: *Again this application would be used were fibre count has converged and fibre capacity exists, in order to feed a new GPON*

Two closure cradles or "L" Bracket will be required for this application type



Two x G5 Closures/
Bulk 3 Configuration

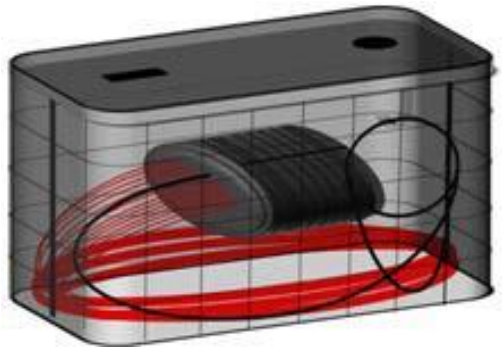


3. Here in scenario three you see the fibre distribution network (FDN) application. This configuration supports the introduction of an FDN closure, in support of customer PON service orders.

Note: *The cabling illustareted in "Red" are customer drop cables and the "Black" is the fibre feeder cable (FFC) that is networked with its respective ODN closure.*

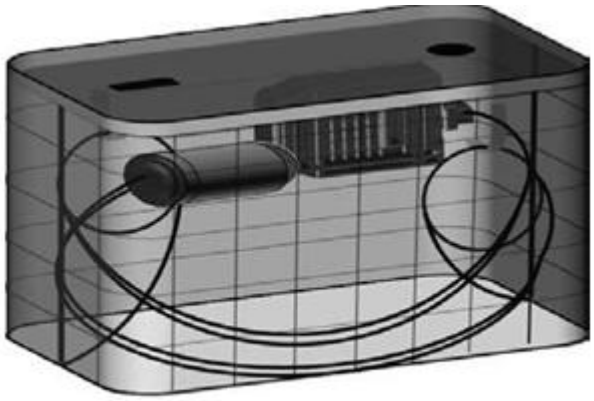
4. Here in scenario four you see the fibre distribution network (FDN) application. This configuration supports the introduction of a FDN closure, in support of customer PON service orders.

Note: *The cabling illustareted in "Red" are microduct customer drop applications and the "**Black**" is the fibre feeder*



5. As mentioned earlier in the following scenario is aligned to support what may be deemed as a requirement for high networking capability. In facilitating were fibre count is high

Note: *In this application you will notice that the body comprises of a BULK4 as it is felt that this would facilitate a higher fibre count for future networking capacity. The cradle will be required for this application type.*



Two x 144 Fibre Varied Closure/
Bulk 4 Configuration

5.2 Manhole / Sub-Duct / FDN Application

From material recorded within previous sections, the following has been formulated to assist in the orchestration of the underground chamber and Channell's fibre distribution closures.

This information should be from the conclusions from a field based survey, carried out in order to clarify a best practice methodology for the implementation of both FDN closures and customer sub-duct orchestration for customer drop applications to decide Bulk sizing required.

Recommended Duct Install, this allows better coiling of cables and customer drops, as seen in Fig 26

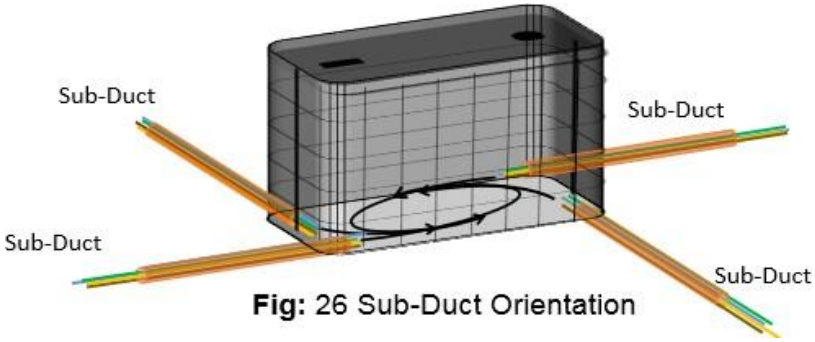
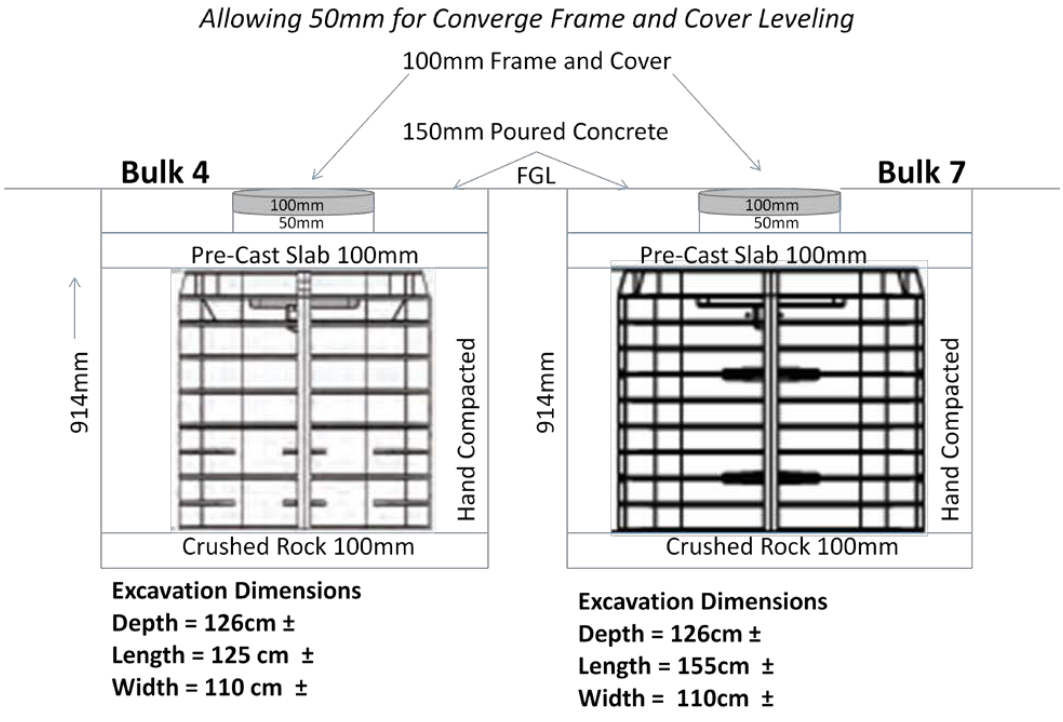


Fig: 26 Sub-Duct Orientation

5.3 Manhole with Concrete Slab and FRP Cover

The following demonstrates the installation procedure for Bulk 4 and 7, installed in carriageway application, using local manufactured Slab and FRP cover sourced from 3rd Party. Dimensions are approximate to allow for site conditions and considerations.



6 Quality Assurance

The statements provided throughout this document are supported and have been formatted for the audience's information.

It is important that the material found in this document is followed, as a catalyst for a best practice methodology in the planning, ordering and the implementation of a fibre network design.

6.1 Advantages

- **Designed for Telecoms Networks –** We supply a product that is specifically designed with telecommunications network infrastructure in mind. This means adequate space for storage, and all relevant accessories needed to safely and securely deploy your network
- **Above And Beyond Country Specifications required for approved applications.**
- **Shipped As Complete Units – No On Site Construction Necessary -** BULK chambers are shipped as pre-assembled units only. This ensures a quality product every single time, checked by our strict quality procedures on the production line. This also removes the need for field staff to construct the chamber, reducing margin for error and reducing on site engineering and time.
- **Lightweight –** The two specified units are both less than *25kg*, meaning one man can lift and manoeuvre the chamber into the excavation, removing the need for costly lifting equipment.
- **Cable Entries –** Simple cable entries can be made with a cordless drill and hole saw, no need for expensive cutting equipment. Entries can be orientated wherever is best at the time of installation.
- **Superior Storage Space -** Space either in the bottom of the chamber or on the side wall to enable cable storage removing quality issues and reducing the risk of downtime to your customers.
- **Duct Management –** optional mounting hardware for storage of microduct, reducing the risk of damage and breakages.
- **Swing Arms** - store fibre joints and closures on these keeping your investment in your network safe and secure, and up off the ground.

- **Choice of three locking types;**

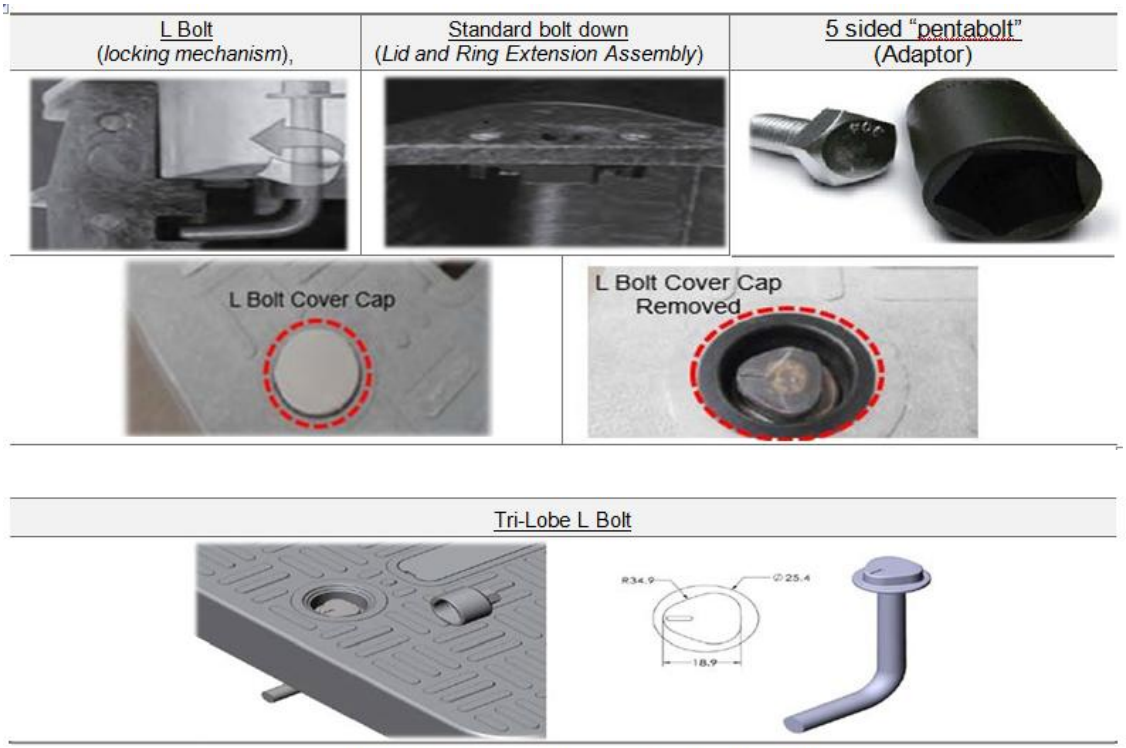


Fig 27: Lid Assembly; secure application method

6.2 SHEILD Features

The identified features are standard and facilitate in the functionality of the SHEILD component operational capability.

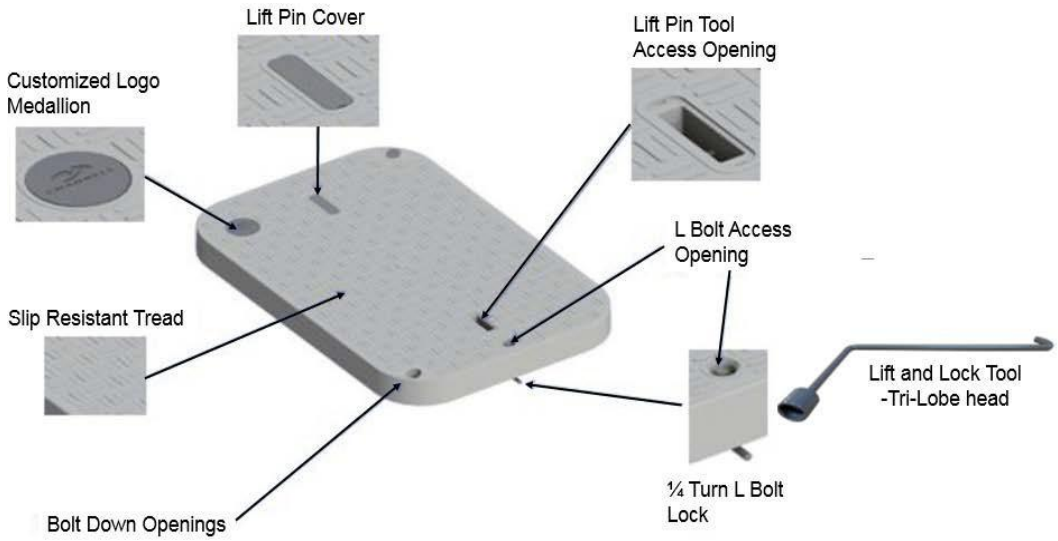


Fig 28: SHEILD Assembly Features

6.3 Component Accessories

Here we will introduce those components that are available to both planning and Implementation teams, when orchestrating and delivering a comprehensive passive optical infrastructure design.

1. L Mounting Bracket; used in conjunction with the PON closure. In order to keep the closure in an elavated position with the Bulk manhole body

Note: This component can be ordered separately

2. Manhole (Pit) Extension; This component is used to acheive greater depths, than that provided by the standard BULK3 and 4 chambers.

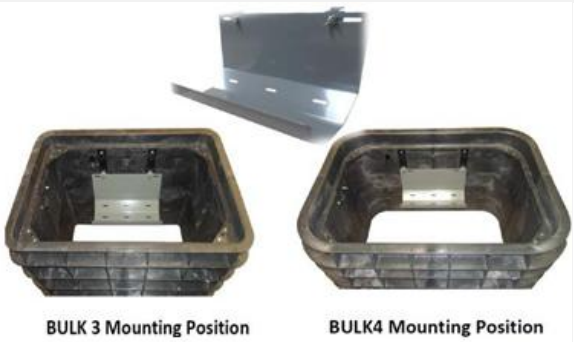
Note: *The pit extension can add a futher 260mm to both BULK3 and 4 standard depth of 610mm, and 905mm. Thus making a total depth of 870mm for the BULK3 and 1165mm for the BULK4.*

Product includes extension and 4 clamps

3. J Hook, This component is used in cable management, to store a fibre cable service loop within the manhole body.

Note: *This aid is supplied in packs of 12.*

4. Lift and Lock Tool – Tri-Lobe Bolt Heads



5. Fibre closure mounting bracket; Unit is mounted using the openings in the step racks.

Size adjustments allow for use of this component in both Bulk 3 and 4 manholes, possible by loosening the wingnuts and setting the rack tabs to the correct dimension

6. Comosite Raising Rings, BULK 3 and 4; Incorporated into the build when the introduction of a 150mm width x 150mm depth concrete skirt is required.

Note: This would be for applications were High vehicular traffic volumes are expected.

7. The 3M™ Disk Marker provides an easy and accurate method of precisely locating flush-mounted facilities, which become covered by backfill.

Note: *Disk Markers are not intend for direct burial. Marker mounts to the back of the logo disc of non-metallic lids or covers over flush-mounted facilities. Kit includes marker and mounting screw.*

8. Bulk3: Ductile iron lid and ring assembly; Used in grade C and D applications.

Frame wieght; 65 LB

9. Bulk4: Two piece ductile iron lid and ring assembly; Used in grade C and D applications.

Frame wieght; 85 LB

Cross member; 25 LB…Total weight 110 LB's

6.4 SHEILD Assembly Field Test Load Application

Seen here in figure 29 is visual representation of the Bulk 2 underground chamber, with polymer concrete lid

Now Shield, having a 12 tonne load introduced to it from both front and rear axles of a heavy duty vehicle.

Back fill material was purely soil recovered from the excavation site, and reintroduced around the manhole body, as outlined in sections

Channell not only tests the centre of the lid, but also the sidewall loading. This is an equally important test, which many other manufactures omit, as sidewall loading can lead to collapse of the chamber.

Due to the design of the BULK, we have no problem placing equal loads onto the side walls.

Due to the “pockets” in the side walls, when back fill and compaction takes place, the load placed on the finished article is dissipated into the surrounding ground, making the box even stronger. This compaction within the cells can be seen in figure 30 (Next Page), which is of a unit that had been forcefully removed from the ground as part of the above test.

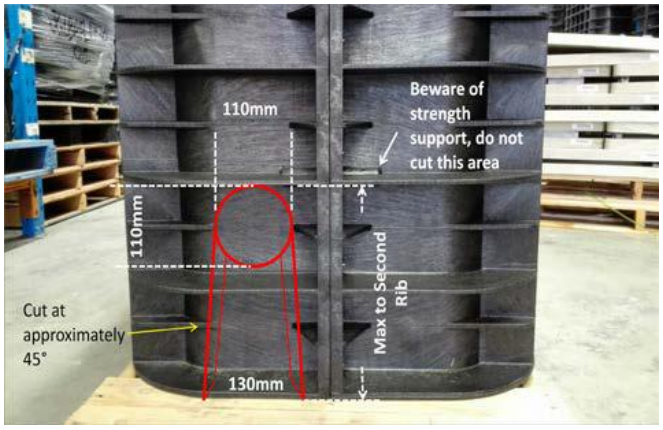
Fig 30: Manhole Cell Compaction

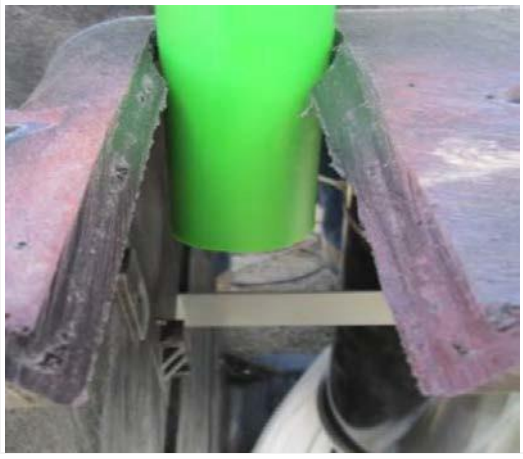
7 Existing Network

7.1 Placing Bulk over existing Pipes / Conduit (bottom entry)

The Next section takes in to consideration the placing of the Bulk, over existing conduit.

Application





Off Center is preferred for the cutting of Mouse Holes, care should be taken to Measure and drill the hole, and ensure the cut with reciprocating saw is carried out at approximately 45° this allows the off cut to be re-installed without it falling through in to the Pit, once glued

If the existing conduit is higher than the second rib (Steel Insert), the manhole can be un-bolted once the hole has been drilled in the correct location, and then fitted around the conduit, and bolted back together, if the conduit is lower than the second Rib, the mouse hole can be done as above, with the same method as the off center, ensure to remove any bolts which are within the cutting area, as not to damage the cutting blades.

1. When installing over existing networks, a further 500mm of the approved excavation size should be excavated around the area of the manhole, this is to give room to the on- site engineers, to install the floor of the manhole after completion of operation, this will assist in providing more room for ease of re-clipping the floor for the engineers.

2. Hole should be drilled from inside the manhole once position has been marked, always be aware of any steel bolts in cutting or drilling area, these should be removed so as not to damage the cutting blade

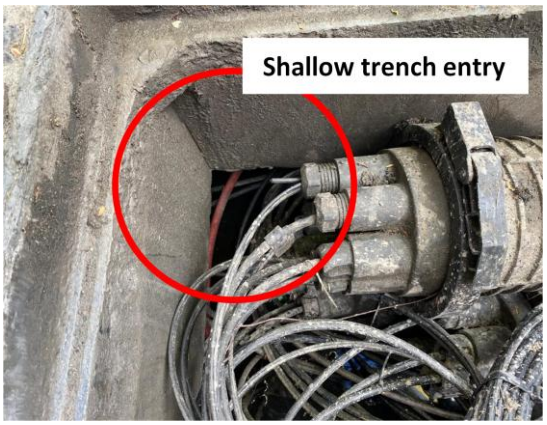
3. The mouse hole slot should be done from the outside to assist in cutting the ribs, and ensuring a good angle is achieved to ensure once glued back, it will hold and not fall in the manhole, during and after compaction (please follow glue manufactures instructions concerning setting time).

4. Re-Compact soil as normal, ensuring compaction is also done under existing pipe, this can be done as normal procedure, at a slight angle until required density is achieved by hand compaction (mechanical compaction not recommend to reduce risk of damaging existing pipe.

5. Care should be taken once back filled above existing network, not to damage the existing pipe by over compacting the soil, Hand Compaction over any existing network should be done by hand, other areas around the manhole can be done carefully using normal mechanical compaction methods.

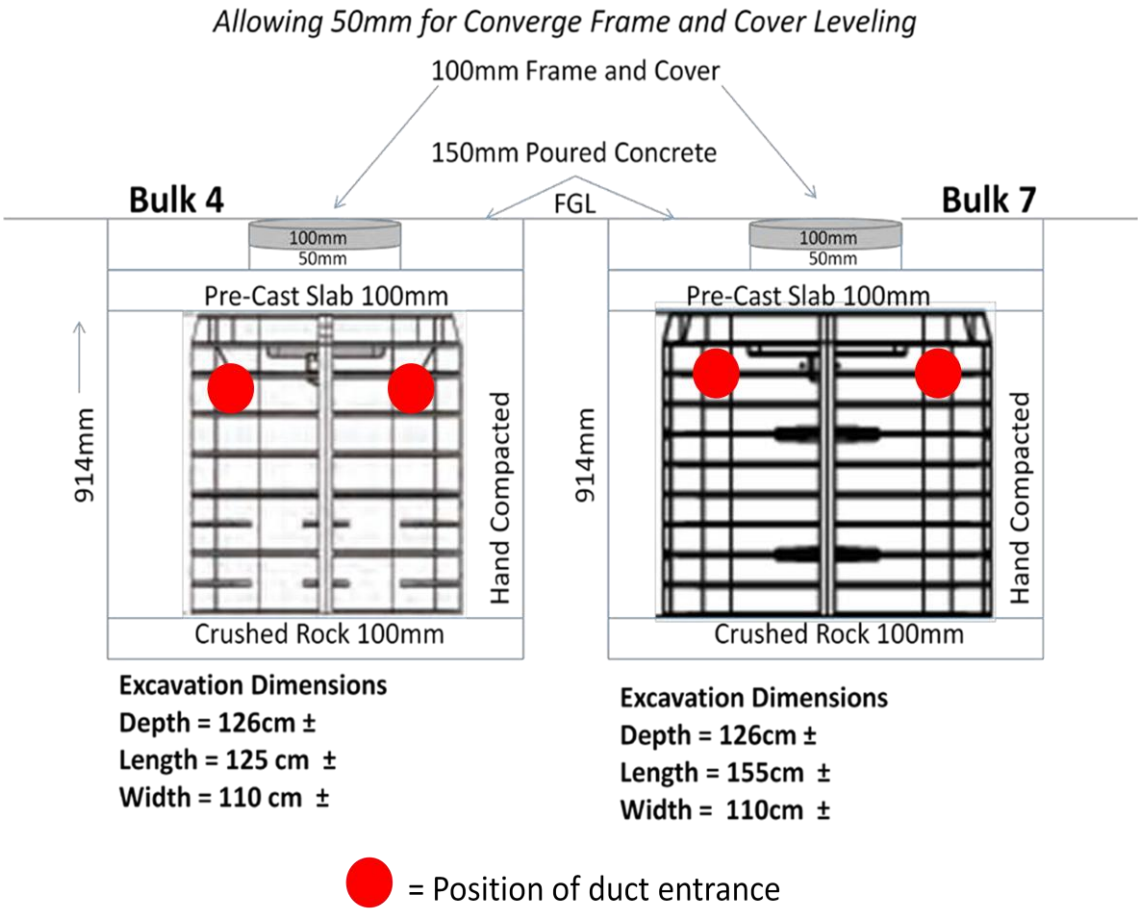
7.2 Shallow trenching Pipes / Conduit application into Bulk (top entry)

The method of deployment should only be used when a concrete slab cover is used.



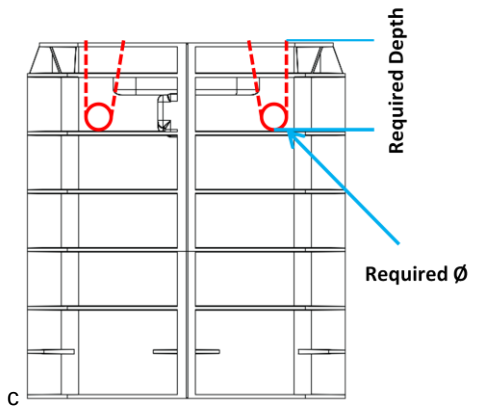
Existing shallow trench manhole that has been scheduled for replacement with CHANNELL BULK MANHOLE SOLUTION.

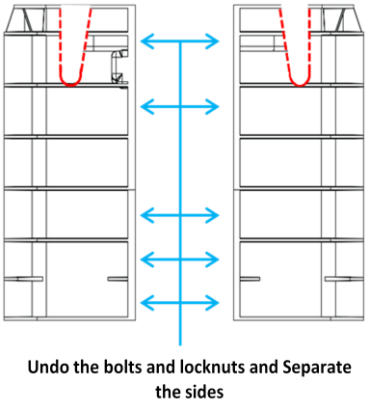
Current concrete slab and manhole cover set.



Method of replacing existing concrete manhole with shallow trench fiber entry using CHANNELL BULK Solution

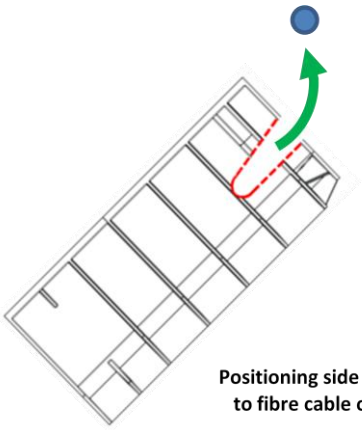
Application





To allow for cable entry of existing shallow trench network drill required diameter hole and cut Mouse Holes, up to the top of the pit with a reciprocating saw @ a 45° angle to allow for the off cut to be re-installed without it falling through in to the Pit, once glued

Example of conduit positioned in a top cut mouse hole



Reinstalled cut out

1. When installing as a replacement to the existing networks, site must be excavated to remove the existing pit structure and allow for the replacement BULK manhole

2. When installing over existing networks, a further 500mm of the approved excavation size should be excavated around the area of the Manhole, this is to give room to the on- site engineers, to reassemble pit (if required) and install the floor of the Manhole.

3. Hole should be drilled from inside the Manhole once position has been marked, always be aware of any steel bolts in cutting or drilling area, these should be removed so as not to damage the cutting blade

4. The mouse hole slot should be done from the outside to assist in cutting the ribs, and ensuring a good angle is achieved to ensure once glued back, it will hold and not fall in the Manhole, during and after compaction (please follow glue manufactures instructions concerning setting time).

5. To install the pit under shallow trench network the 2 halves of the BULK manhole can be disassembled and position under the shallow trench infrastructure and reassembled.

6. Re-Compact soil as normal, ensuring compaction is also done under existing pipe, this can be done as normal procedure, at a slight angle until required density is achieved by hand compaction (mechanical compaction not recommend to reduce risk of damaging existing pipe.

6. Care should be taken once back filled above existing network, not to damage the existing pipe by over compacting the soil, Hand Compaction over any existing network should be done by hand, other areas around the Manhole can be done carefully using normal mechanical compaction methods.