

Installation Manual



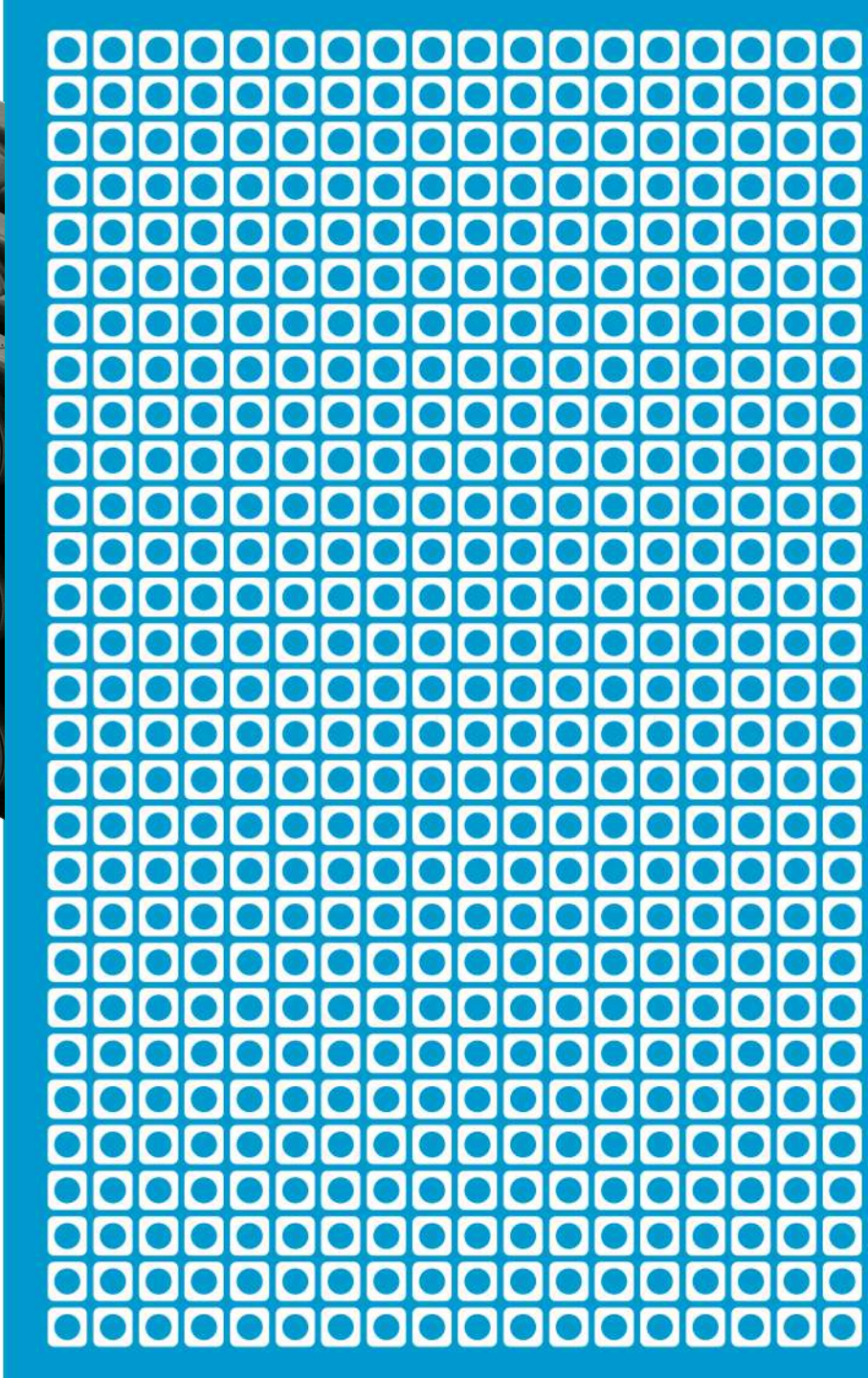
EFLEX SQUARE
A FURUKAWA ELECTRIC PRODUCT

INTRODUCTION

This manual will provide an overview and guide for the installation of EFLEX Square cable ducts and associated accessories.

Available in 5 sizes, with a range of innovative accessories. EFLEX Square is an incredibly versatile system which enables simple and fast installation of buried cable routes, especially where conditions provide challenges such as limited space, obstacles and shallow burial depths.

The 5.3m units have built-in male and female connectors which provide a watertight connection, while the units flexible construction allow obstacles to be navigated without the need for dedicated bend units.





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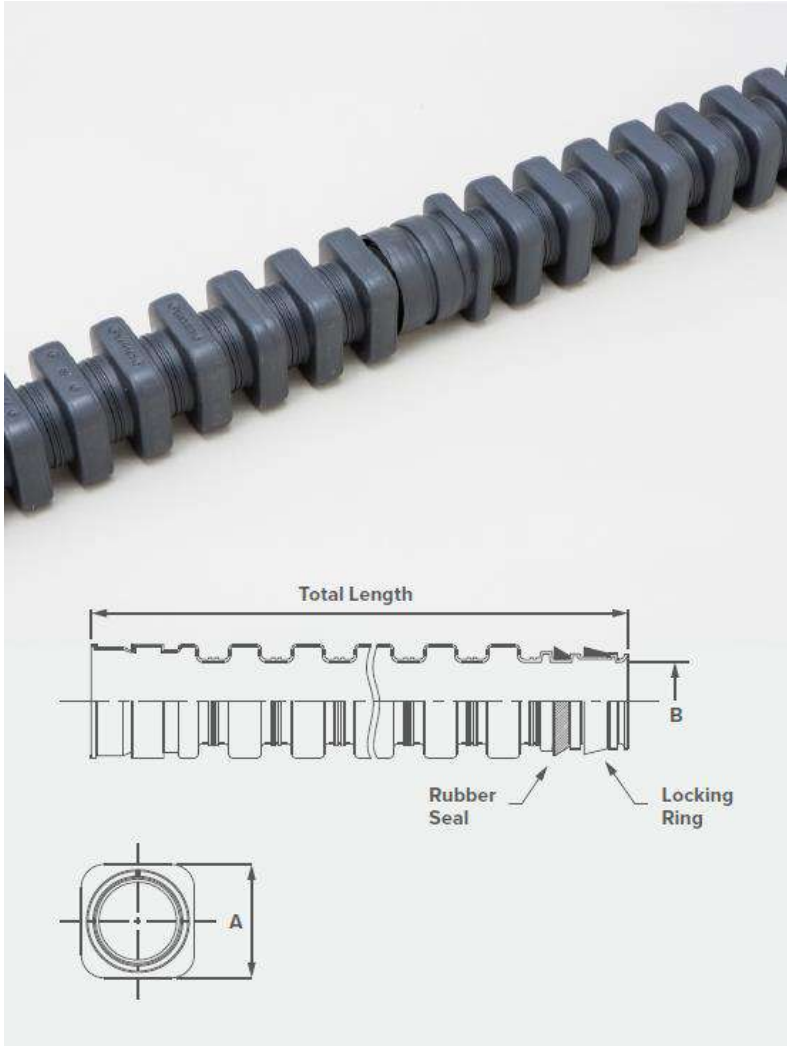
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PRODUCT OVERVIEW



- Stackable and customisable
- Manufactured from HDPE
- Designed for subterranean cable protection
- Supplied in 5.3m units
- Built-in watertight connectors
- 25 tonne load bearing capacity at 300mm burial depth from bottom of road surface
- Fully recyclable
- Flexible: radius up to 10x inner duct diameter
- Resistant to chemicals
- Lightweight



Series	mm		Total Length	Effective Length	kg
	A: Outer Diameter	B: Inner Diameter			
50	73	50			2.6
75	100	75			4.5
100	125	100	5,300	5,250	6.4
130	162	130			11.5
150	184	150			14.6

TOOLS AND ADDITIONAL ITEMS REQUIRED

Tools required will vary depending on the installation. The below are basic recommended items required for most installations.

TOOLS

Grease or lubricant (Furukawa can supply it's own lubricant 'V-Soap')
Brush: To apply lubricant if not in spray form
Cloth: To clean connecting surfaces

Handsaw: To adjust length of EFLEX Square
Knife: To deburr cut pieces

ADDITIONAL ITEMS

Binding wire or string: To hold EFLEX Square stack in place prior to backfilling

Pilot wire/rope (Not included)

Temporary plug: A Furukawa accessory used to prevent dirt/debris entering EFLEX Square during installation.



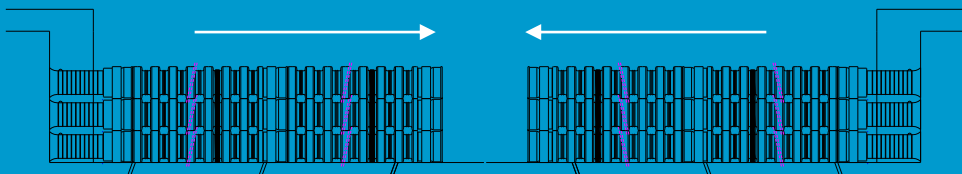
NOTE

- Recommended lubricant quantity if using Furukawa 'V-Soap' lubricant:

Φ50: 5g / joint
Φ75: 8g/joint
Φ100: 10g/joint
Φ130: 13g/joint
Φ150: 15g/joint

EFLEX SQUARE DUCT INSTALLATION

- 1 Dig a trench according to the EFLEX Square size and stack configuration. The trench width and burial depth is determined by the installer and project requirements.
- 2 Prepare a 50mm deep bed of sand or fine soil in the base of the trench and compact to a flat level surface. Ensure that the floor of the trench is at the same level as the access chamber/catchpit interface.
- 3 EFLEX Square units should be connected to the chambers or termination points at either end of each section first. Installation is made in a direction from the termination points to the centre of the duct section, so that the EFLEX Square units meet at the centre point.



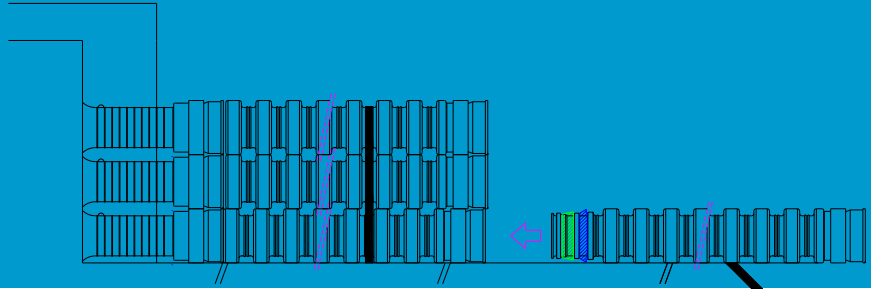
NOTE

- Ensure that the sand/soil underneath the EFLEX Square ducts is sufficiently compacted. If the pressure is insufficient, the ducts may bend after backfilling, and the test rod or cable may not pass through.

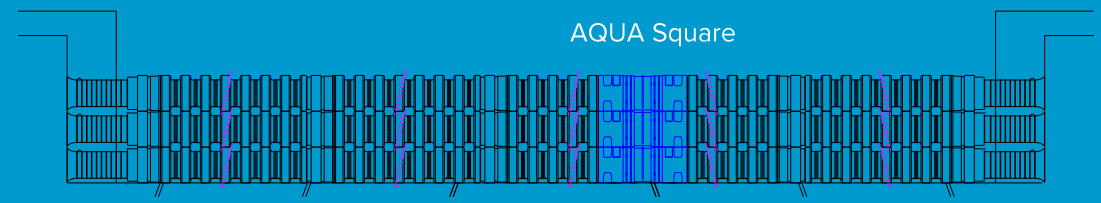
4 A nylon wire or string should be placed on the bottom of the trench at 1m intervals. Once a 5.25m stack is completed this wire is used to hold the stack securely in place until backfilling.

5 Connect the male end of EFLEX Square to the chambers or termination points using the required accessory (AQUA Connector, Long Bell Mouth etc). Always start with the lowest duct first, building the stack from the bottom up.

6 Build a 5.25m stack according to the project and desired stack configuration, secure with the nylon wire/string and repeat the process for the next 5.25m section.



7 When the EFLEX Square ducts meet at the centre point of the section, the length can be adjusted and the AQUA Square accessory is used to complete the installation (see AQUA Square connection procedure on page 9).



8 **Backfilling and compaction**

We recommend backfilling after 3-4 layers of EFLEX Square are installed. If installing more EFLEX Square layers on top of an installed 3-4 layer stack, clear the sand/soil from the top surface of the installed stack and begin installing the next layers.

- Use sand or high-quality soil for backfilling. Once the EFLEX Square is covered, the original excavated earth/soil can be used to fill the remainder of the trench.
- Do not introduce large amounts of backfilling material at once. Fill the material from both sides of the ducts in a balanced manner gradually to ensure that the ducts do not move, ensuring the sand/soil surrounding the stack is well compacted to maximise stability.
- The immediate surrounding sand/soil should have an amount of water content to ensure all gaps/voids are filled.
- Ensure that the wet sand/soil is compacted well to further ensure there are no voids around the EFLEX Square ducts.
- Use a vibrating roller or plate to compact the soil on top of the ducts to a minimum of 300mm. If compacting to less than 300mm, only a vibrating plate should be used to ensure the ducts are not damaged.



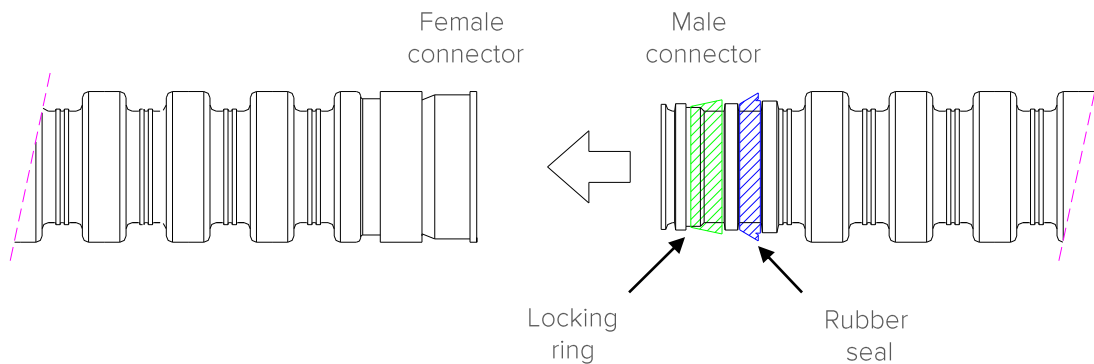
NOTE

- It is recommended that a compactor is used to ensure a firm and flat trench bed.
- Do not overbend EFLEX Square
- Do not use metallic products as the wire or string.
- If water accumulates in the trench, the ducts may float. Please backfill as soon as possible after installing.



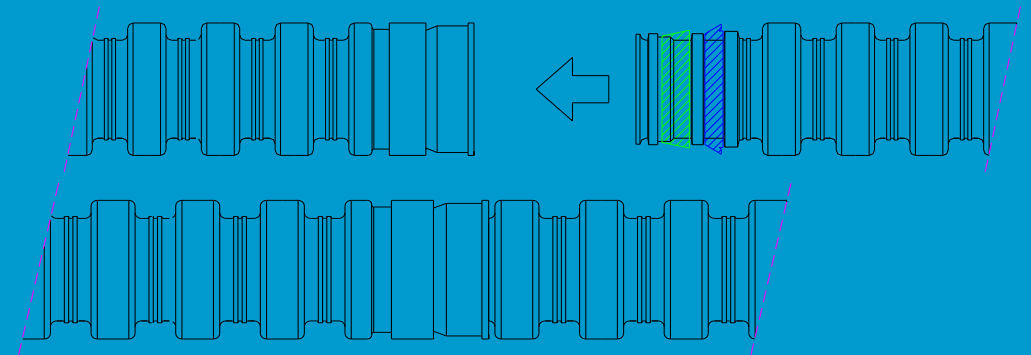
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EFLEX SQUARE CONNECTION PROCEDURE



- 1 Remove the protective cap from the male connector.
- 2 Apply lubrication to the rubber seal on the male connector and the inside of the female connector, to ensure the rubber seal is seated correctly. When completed the rubber seal creates a watertight connection.
- 3 Ensure the connectors are free from dirt and debris. Insert the male connector into the female connector.

Make the connection in a straight line and check that the connection is secure by pulling by hand in the opposite direction.



NOTE

- Connection is permanent and cannot be disconnected
- Do not apply lubrication to the locking ring.



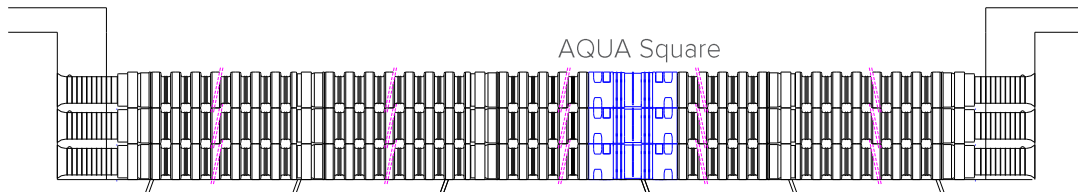
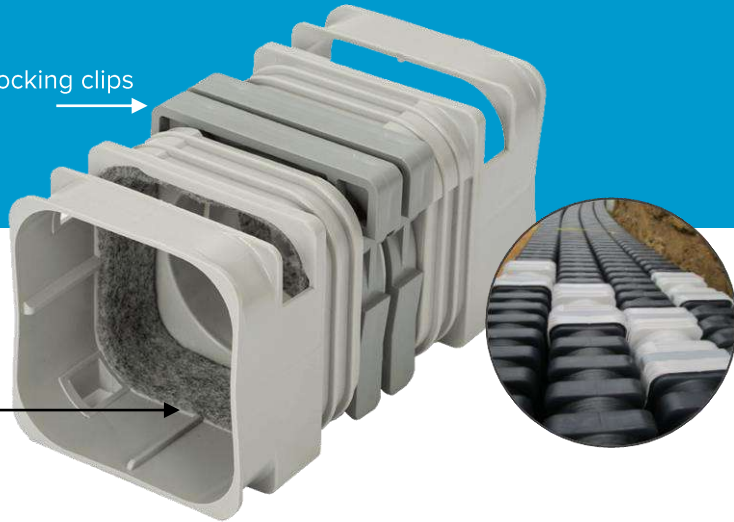
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AQUA SQUARE CONNECTION PROCEDURE

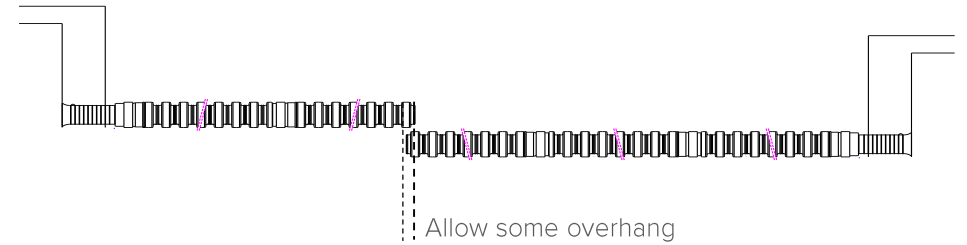
When EFLEX Square ducts meet at the centre point of any given section, the length can be adjusted and the AQUA Square accessory can be used to complete the installation.

Single-action locking clips

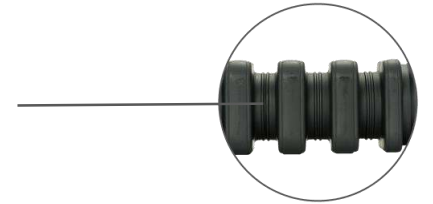
Moisture-activated expanding material



1 Determine the cutting locations:



2 Cut along the built-in cutting guides



3 Insert the cut ends of EFLEX Square into the Aqua Square. Insert the single-action locking clips, checking that it is secure by pulling by hand in the opposite direction.



NOTE

- Deburr the cut pieces of EFLEX Square if necessary
- Install AQUA Square shortly after it is removed from its protective bag. The fabric reacts to moisture in the air to expand and provide a watertight seal.
- Ensure parts being connected are free from dirt and debris.
- Only cut ends of EFLEX Square can be used with AQUA Square.
- Ensure the single-action locking clip is securely in place and flush with the top surface of the AQUA Square body.

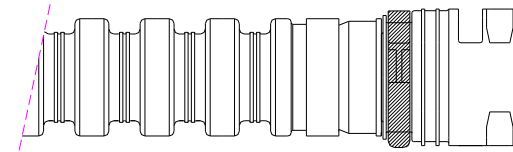
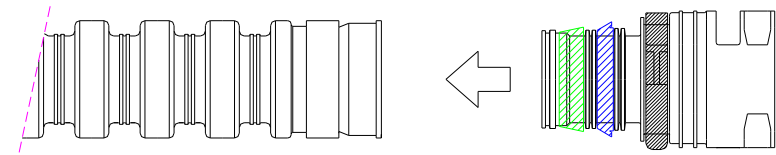
AQUA SQUARE MALE ADAPTOR CONNECTION PROCEDURE

When the EFLEX Square ducts meet at the centre point of any given section, the length can be adjusted and the AQUA Square male adaptor accessory can be used as an alternative to the AQUA Square accessory to complete the installation. This adaptor can also be used in any other scenario where a male connector is required.

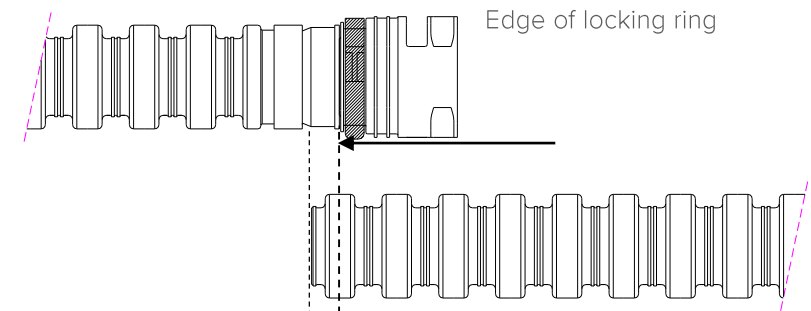


- 1 Apply lubrication to the rubber seal on the AQUA Square Male Adaptor and the inside of the female connector of EFLEX Square, to ensure the rubber seal is seated correctly. When completed the rubber seal creates a watertight connection.

- 2 Ensure the connectors are free from dirt and debris and insert the AQUA Square Male Adaptor into the female connector of EFLEX Square:



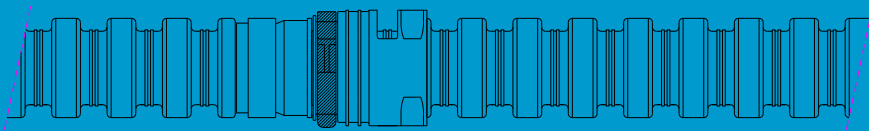
- 3 Determine the cutting location on EFLEX Square:



- 4 Cut along the built-in cutting guide



- 5 Insert the cut end of EFLEX Square into the AQUA Square Male Adaptor.



- 6 Insert the single-action locking clip into the AQUA Square Male Adaptor, checking the connection is secure by pulling by hand in the opposite direction.

The AQUA Square Male Adaptor is not available for 130 and 150 series EFLEX Square. For these sizes please see page 12.



NOTE

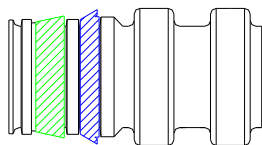
- Deburr the cut piece of EFLEX Square if necessary
- Install the AQUA Square Male Adaptor shortly after it is removed from its protective bag. The fabric reacts to moisture in the air to expand and provide a watertight seal.
- Ensure parts being connected are free from dirt and debris.
- Only cut ends of EFLEX Square can be inserted in the AQUA Square Male Adaptor.
- Ensure the single-action locking clip is securely in place and flush with the top surface of the AQUA Square Male Adaptor body.

AQUA SQUARE MALE ADAPTOR (130 & 150)

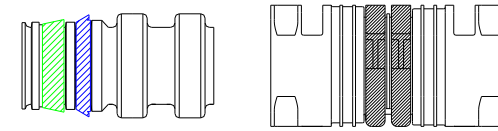
The AQUA Square Male Adaptor is not available for 130 and 150 series EFLEX Square. For these sizes it is possible to convert an AQUA Square into an AQUA Square Male Adaptor.



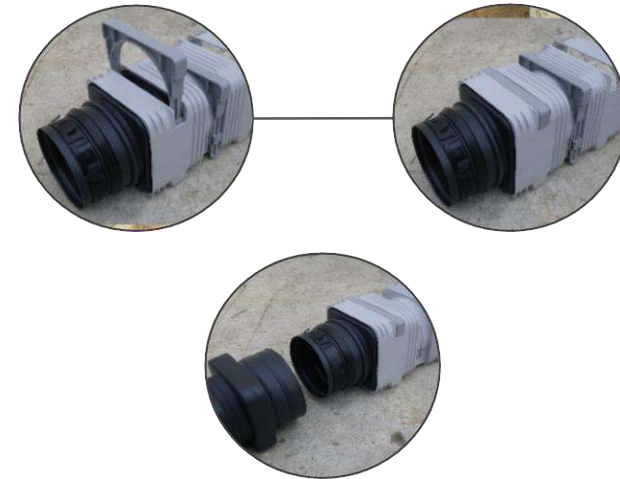
Furukawa can supply an EFLEX Square Male Adaptor for this application, to be used together with the AQUA Square:



- 1 Ensure the connections are free from dirt and debris and insert the EFLEX Square Male Adaptor into the AQUA Square unit:



- 2 Remove the single-action locking clip from its holder and insert into the slot to secure the male end of EFLEX:



NOTE

- Deburr the cut piece of EFLEX Square if necessary
- Install AQUA Square shortly after it is removed from its protective bag. The fabric reacts to moisture in the air to expand and provide a watertight seal.
- Ensure parts being connected are free from dirt and debris.
- Only cut ends of EFLEX Square can be used with AQUA Square
- Ensure the single-action locking clip is securely in place and flush with the top surface of the AQUA Square body.

MALE TO MALE ADAPTOR CONNECTION PROCEDURE

In the event that the installer would like to connect an EFLEX Square unit in the opposite orientation, to have a male connector where there would usually be a female connector, the Male to Male Adaptor accessory can be used to complete the installation.

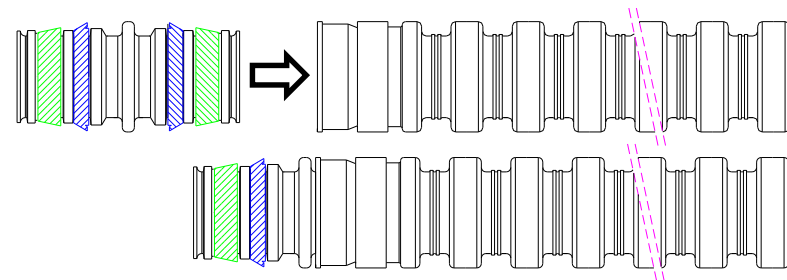
Single-action locking clip



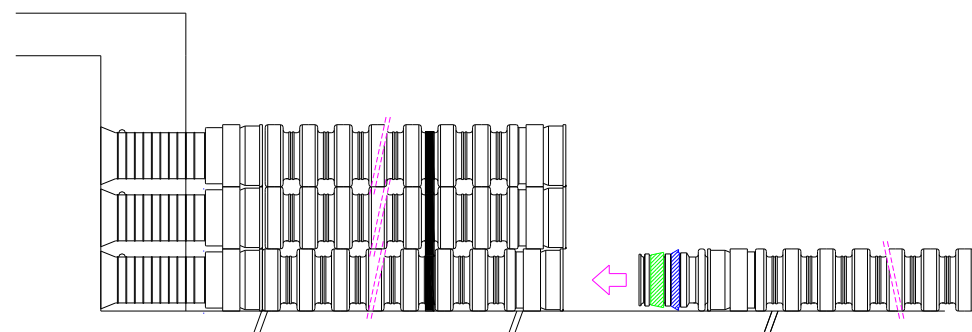
Rubber seal

- 1 Apply lubrication to the rubber seal on the Male to Male Adaptor and the inside of the female connector of EFLEX Square, to ensure the rubber seal is seated correctly. When completed the rubber seal creates a watertight connection.

- 2 Ensure the connectors are free from dirt/debris and insert the Male to Male Adaptor into the female connector of EFLEX Square. Check that the connection is secure by pulling by hand in the opposite direction.



- 3 Insert the opposite end of the Male to Male Adaptor into the female connector of EFLEX Square. Check that the connection is secure by pulling by hand in the opposite direction.



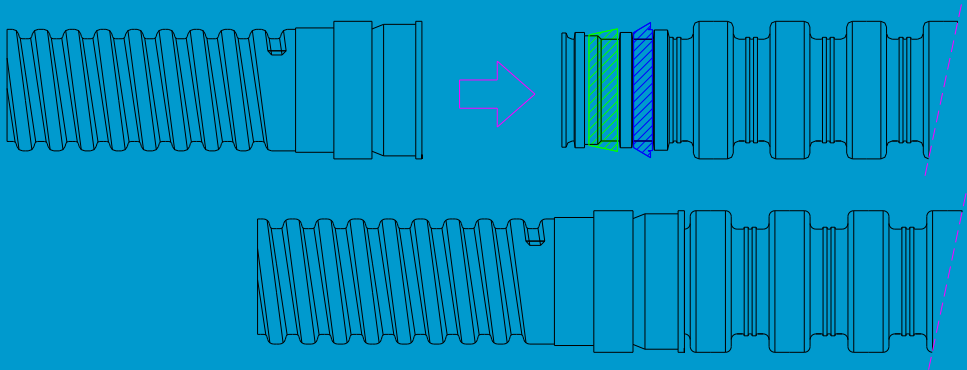
NOTE

- Connection is permanent and cannot be disconnected.
- Do not apply lubrication to the locking ring.

CONVERTER TO EFLEX ROUND

Converting EFLEX Square to EFLEX Round allows EFLEX Square to be used with a wider range of Furukawa accessories and assists with connections to other types of pipes/ conduits, such as steel or PVC. This converter is required when using the AQUA Connector with EFLEX Square (see page 15).

- 1 Apply lubrication to the rubber seal on the male connector of EFLEX Square and the inside of the female connector on the Converter to EFLEX Round.
- 2 Ensure the connectors are free from dirt and debris and Insert the male connector of EFLEX Square into the female connector of the Converter to EFLEX Round:



- 3 Furukawa offers a wide range of adaptors. Please contact us for advice on which Furukawa adaptor to use when connecting EFLEX to other types of pipe/conduit.



NOTE

- Connection is permanent and cannot be disconnected.
- Do not apply lubrication to the locking ring.

AQUA CONNECTOR PROCEDURE

The AQUA Connector can be used to connect EFLEX Square or EFLEX Round to plastic or concrete access chambers/catchpits. The connector requires no tools and can be installed in less than 2 minutes.

PLEASE NOTE: EFLEX Square must be converted to EFLEX round before using the AQUA Connector.



- 1 Cut a hole in the chamber/catchpit according to the table below:

AQUA Connector part No.	Min-max diameter of hole	Recommend size of hole
FOKC-30	42~50	45
FOKC-40	58~65	60
FOKC-50	68~75	70
FOKC-65	89~96	90
FOKC-80	106~112	110
FOKC-100	135~141	135

2 Screw the AQUA-Nut onto EFLEX Round (or converter to EFELX Round).



3 Insert EFLEX into the chamber/catchpit wall.



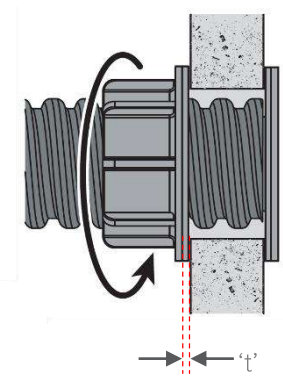
4 From inside the chamber/catchpit, screw the AQUA-Mouth into EFLEX Round.



5 Hand-tighten the AQUA-Nut to the outside of the chamber/catchpit wall.

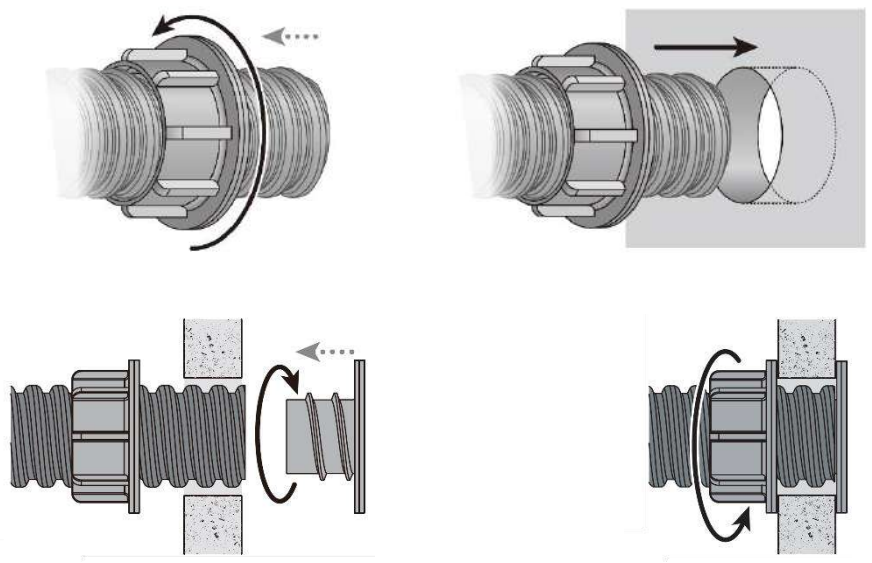


6 Please follow the 't' reference value in the below table when hand-tightening the AQUA Connector:



AQUA Connector part No.	Reference value 't'
FOKC-30	Approx. 6mm
FOKC-40~80	Approx. 7mm
FOKC-100	Approx. 8mm

NOTE
 - The converter to EFLEX Round must be connected to EFLEX Square before using the AQUA Connector

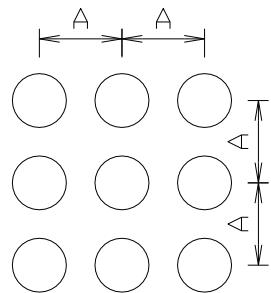


LONG BELL MOUTH INSTALLATION PROCEDURE

The long bell mouth is available in three lengths and can be used to connect EFLEX Square to concrete access chambers/catchpits.

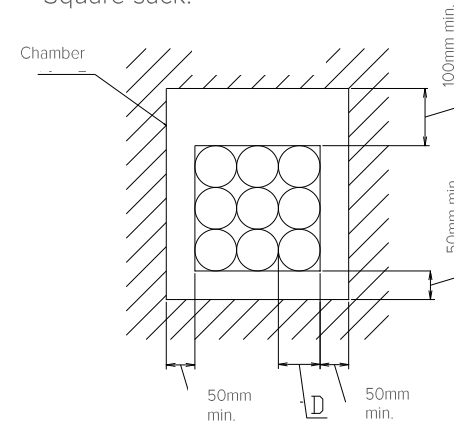


- 1 A Prepare holes in the concrete chamber according to the spacing guidelines below:



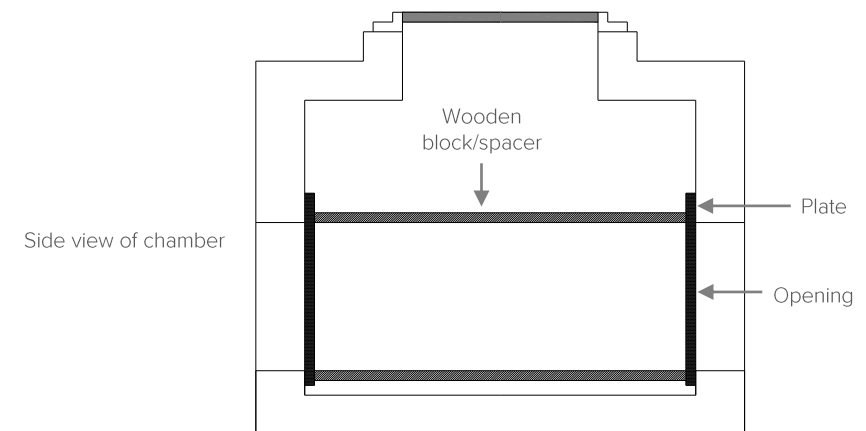
	'A' minimum				
Size	φ50	φ75	φ100	φ130	φ150
φ50	80	95	110	130	140
φ75	95	110	125	140	150
φ100	110	125	135	155	165
φ130	130	140	155	175	185
φ150	140	150	165	185	195

- 1 B Alternatively, create a single opening in the chamber to house the entire EFLEX Square sack:



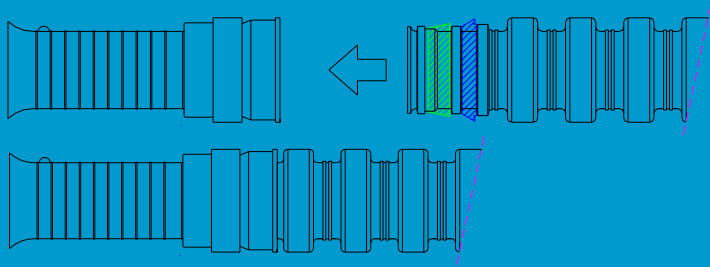
Nominal Diameter	Outer size D
50	74
75	102
100	128
130	164
150	186

- 2 Cover the single opening on the inside of the chamber with a plate or similar and hold it in place with a wooden block/spacer or similar, while work is carried out.

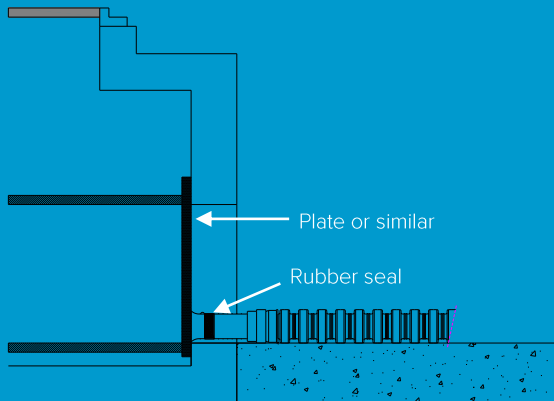


3 Connect the Long Bell Mouth to EFLEX Square

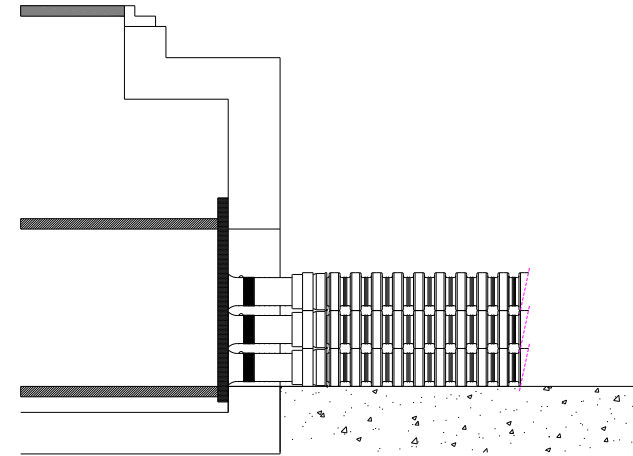
- Remove the temporary cap from the male connector of EFLEX Square.
- Lubricate the rubber seal on the male connector and the inside of female connector of the Long Bell Mouth.
- Ensure that the connection is free from dirt and debris.
- Insert the male connector into the Long Bell Mouth, in a straight line.
- Check that the connection is secure by pulling by hand in the opposite direction.



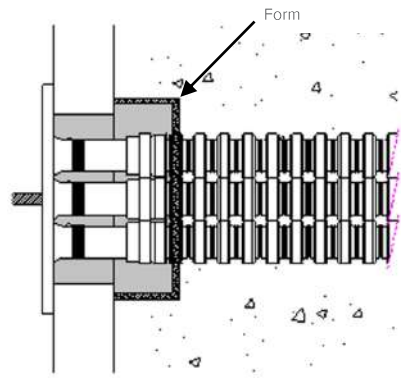
4 Remove the paper backing from the tape seal on the Long Bell Mouth and place in position:



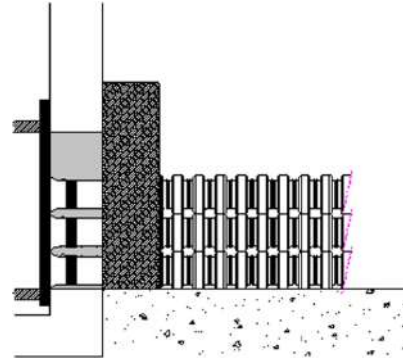
5 Position remaining Bell Mouth/EFLEX units ensuring the end of the Bell Mouth is touching the plate on the inside of the chamber.



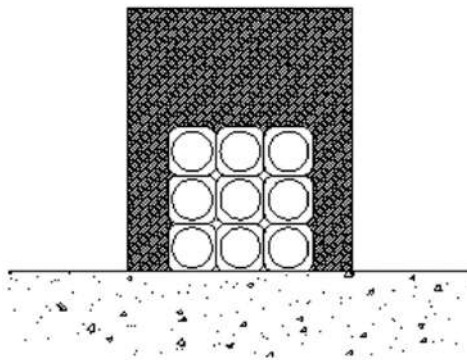
- 6 Assemble a form and pour in concrete. Allow to set before disassembling.



Birdseye view



Side view



Front view

NOTE

- Ensure distance between holes is not too small, otherwise chamber strength can be compromised.
- Be careful not to damage EFLEX Square with heat from curing concrete.
- Ensure concrete does not enter the Long Bell Mouth.
- Do not use in areas at risk from ground subsidence.
- Do not use organic solvents.
- If water tightness is required. Seal the connection to the chamber with epoxy putty or similar.



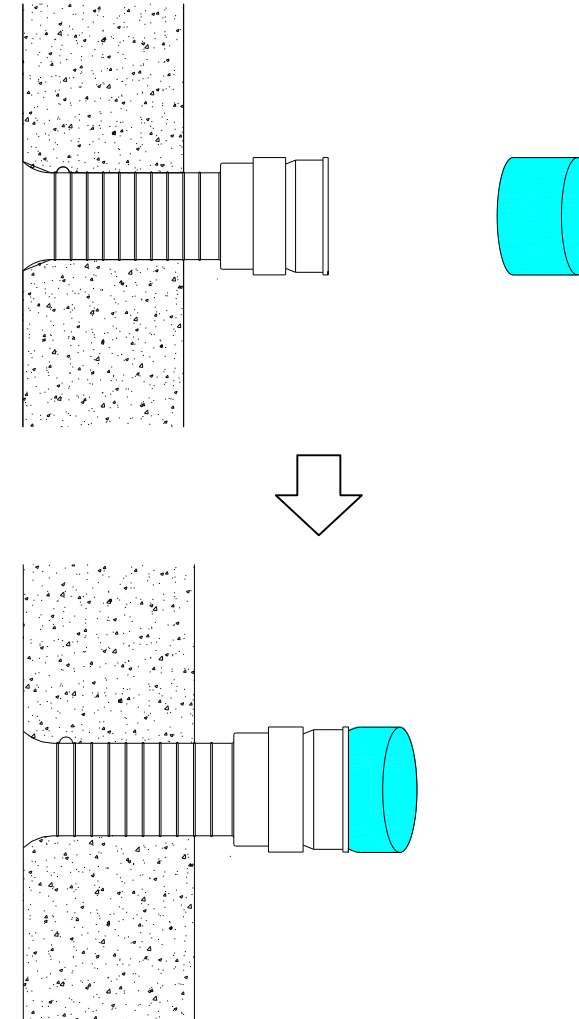
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TEMPORARY PLUG

A temporary plug can be used with the EFLEX Square Long Bell Mouth and the standard EFLEX Square unit to prevent dirt, sand or soil entering the duct during installation.



- 1 Insert the temporary plug into the female connector of the long bell mouth, or female connector of a standard EFLEX Square unit. If installing in a cut piece of EFLEX Square the soft material can be compressed by hand.



NOTE

- The diameter of the temporary plug is larger than the inner diameter of the female connect, therefore, it is necessary to compress the protective cap by hand.
- All EFLEX Square standard units are supplied with a protective cap over the male end.



EFLEX SQUARE
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BELL BLOCK INSTALLATION PROCEDURE

This concrete resin Bell Block can be used as an interface between EFLEX and concrete or polymer chambers/catchpits.

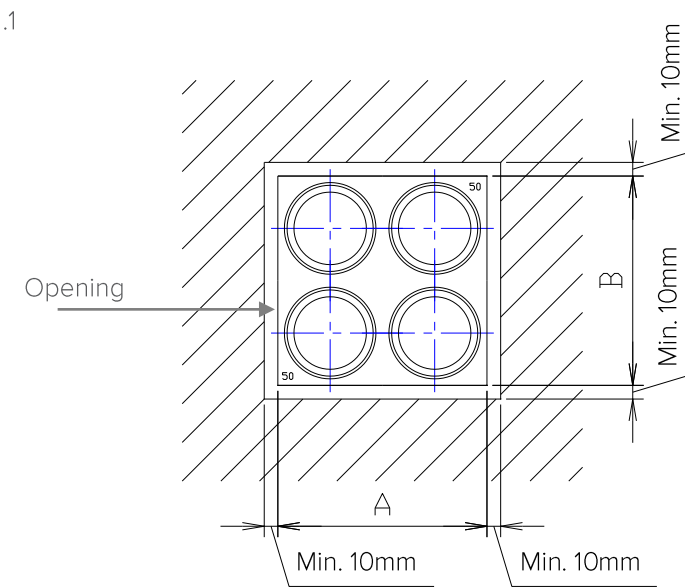
Available in 1, 2, 3, 4, 5, 6 and 9-way profiles. Built-in female connectors.



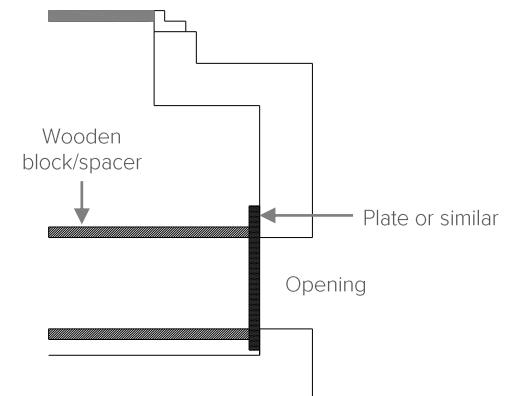
INSTALLING INTO CONCRETE CHAMBER

- 1 Cut an opening in the chamber according to fig.1

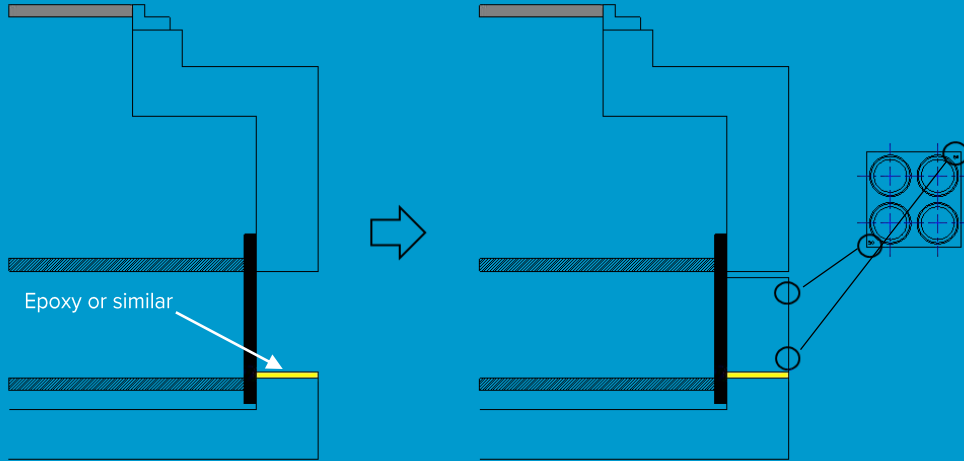
fig.1



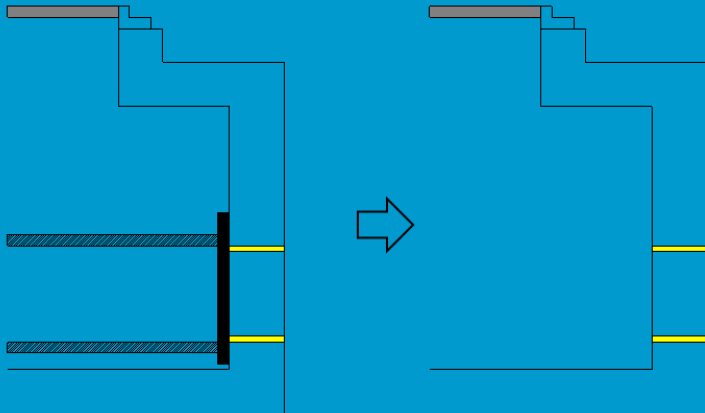
- 2 Cover the single opening on the inside of the chamber with a plate or similar and hold it in place with a wooden block/spacer or similar, while work is carried out.



- 3 Ensure the area is free from dirt/debris and apply epoxy putty or similar to the base of the opening (highlighted yellow) and insert the Bell Block ensuring that the side that has the diameter markings is on the outside.



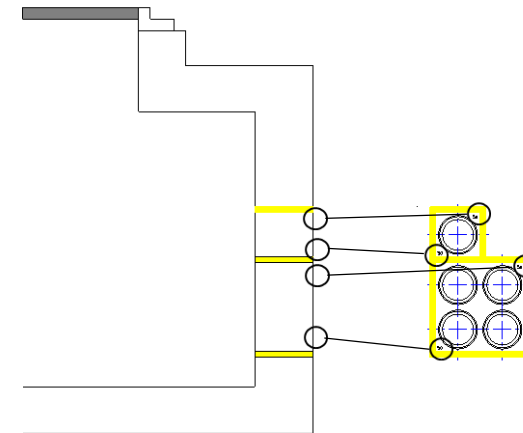
- 4 Fill the gap above the Bell Block with epoxy putty or similar. It may be necessary to use a space to fill the gap if too large. Ensure that the bell block connectors are free from putty to ensure a secure connection to EFLEX Square. If a watertight seal is required apply epoxy putty or similar around the edge of the Bell Block on both the inside and the outside of the chamber. Masking tape can be used to prevent concrete entering the bell block connectors.



INSTALLING MULTIPLE BELL BLOCKS INTO CONCRETE CHAMBERS

NOTE

When installing a Bell Block directly above another, use epoxy putty or similar between the bell blocks. Ensure that there are no gaps to maintain water tightness if required. Ensure that the bell block connectors are free from putty to ensure a secure connection to EFLEX Square. Insert the Bell Blocks ensuring that the side that has the diameter markings is on the outside.



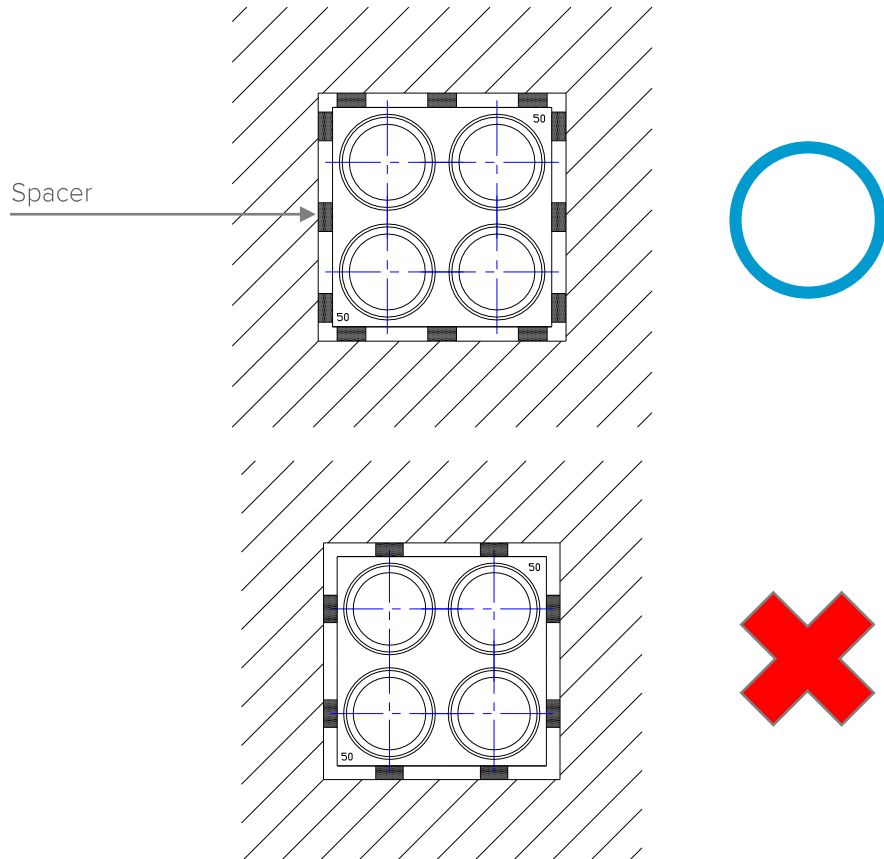
NOTE

- Ensure that the bell block is not chipped or broken during and following installation.
- Ensure that the epoxy putty and debris does not adhere to the inside of the bell block female connectors.
- Pay attention to the orientation of the bell block when installing. The surface which displays the nominal diameter (50 – 150) should be on the outside of the chamber.
- If the bell block and chamber wall are a different thickness. Additional procedures will be required. Please contact us in such scenario.

INSTALLING A BELL BLOCK INTO CONCRETE CHAMBERS USING SPACERS

NOTE

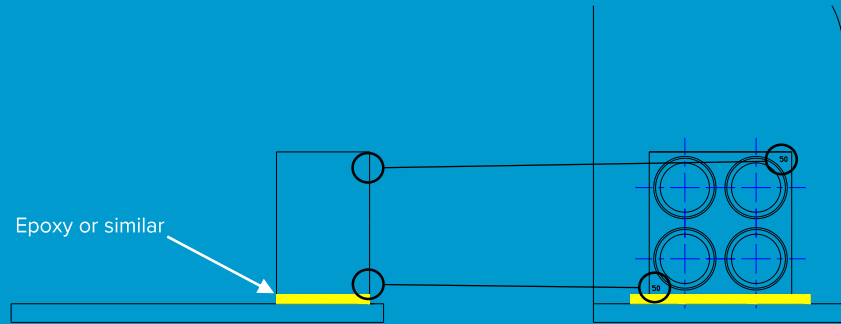
When using spacers to hold the bell block in place while work is completed, ensure that the spacers are inserted next to the thickest sections of the Bell Block to avoid unwanted damage.



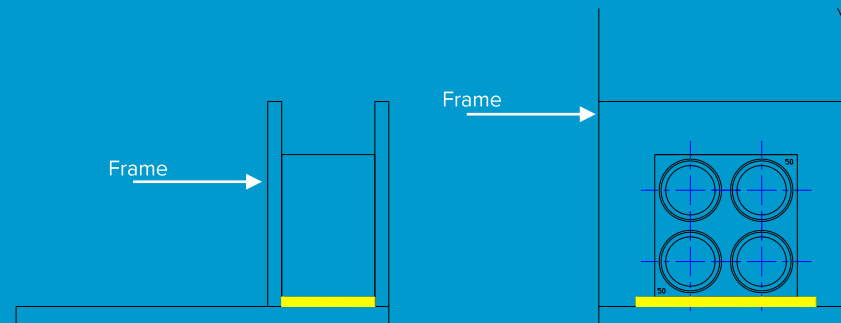
EFLEX SQUARE
A FURUKAWA ELECTRIC PRODUCT

INSTALLING A BELL BLOCK IN CONCRETE (TUNNEL EXAMPLE)

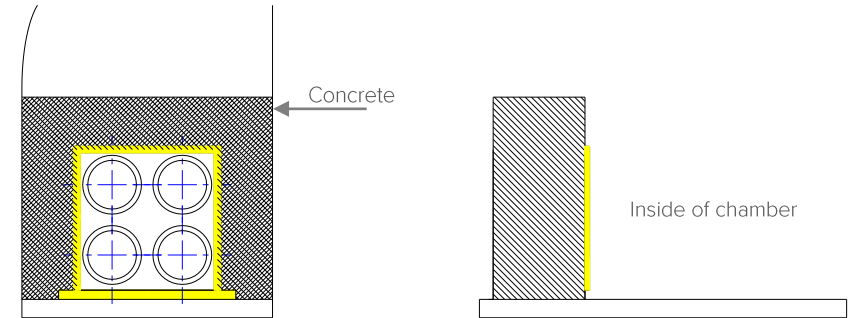
- 1 Place the bell block in the desired position. Apply epoxy putty or similar to the ground surface (highlighted yellow), ensuring even application. The diameter markings on the bell block should be on the outside of the construction.



- 2 Set a frame, to sandwich the Bell Block. Ensure the frame is flush with the Bell Block and that there are no gaps. If necessary mask off the female connectors on the Bell Block to stop dirt/debris or concrete entering the connectors. Ensure the bell block does not move during concrete curing.



- 3 Pour concrete into the frame and ensure there are no leaks. When cured, remove the frame. If a watertight seal is required, apply epoxy putty or similar around the edge of the Bell Block on both the inside and outside of the construction (highlighted yellow)



NOTE

- Check the Bell Block for cracks or damage during and after installation.
- Pay attention to the orientation of the bell block when installing. The surface which displays the nominal diameter (50 – 150) should be on the outside of the chamber.
- Avoid strong impact forces.

CABLE INSTALLATION

The following is intended as a guide for installing cables in EFLEX Square.

BEND RADIUS

The minimum bend radius of EFLEX Square is 10 x the inner diameter of any given EFLEX Square series.

The minimum bend radius of the cables will usually be the limiting factor.

EFLEX Square 100 series example:

Minimum bend radius (10DR) = $100 \times 10 = 1000\text{mm}$ or 1m:



DUCT ROD AND GUIDE TIP

A standard duct rod with a 20mm wide guide tip can be pushed through all sizes of EFLEX Square, providing that the bend radius of EFLEX Square does not exceed 10DR.

Example guide tips:



CABLE INSTALLING PROCEDURE

- 1 Feed the duct rod through the assembled section of EFLEX Square. It takes approximately 2 minutes to feed a duct rod through 75m of EFLEX Square:



- 2 Attach the guide rope/wire to the end of the duct rod and pull the rope/wire back through the EFLEX Square section:



- 3 Attach the end of the rope/wire to the cable(s) using a cable pulling sock:



- 4 Pull the cable(s) through the EFLEX Square section by man power or powered winch:



Pulling the cable(s) through a 75m section of EFLEX Square takes approximately 10 min 30 sec, depending on equipment used.



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