

# EFLEX Square Installation Manual

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AT & Functional Plastics Div.  
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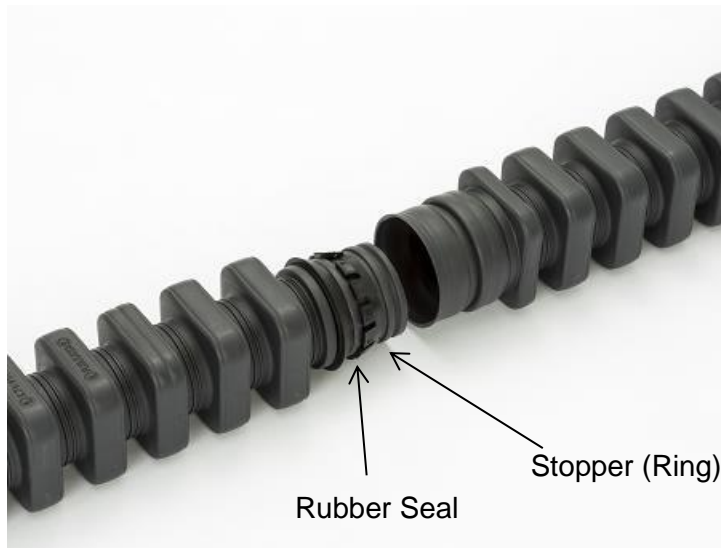
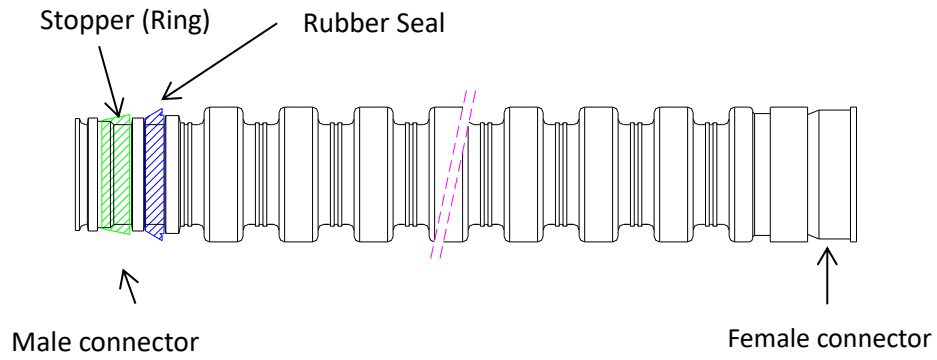
## 1. Tools and miscellaneous materials

Prepare tools and miscellaneous materials for installation of EFLEX Square Duct.

Work	Tools and Misc.	Remarks
Connection of EFLEX units	Lubricant (eg. V-Soap)	Quantity indication $\phi 50$ : 5g / joint $\phi 81$ : 8g/joint $\phi 100$ : 10g/joint $\phi 130$ : 13g/joint $\phi 150$ : 15g/joint
	Brush	USAGE: To apply the lubricant
	Cloth	USAGE: To clean the Surface of the ducts
Connection of Non Standard Length	Handsaw	USAGE: To cut the ducts when adjusting length
Binding	Knife etc.	USAGE: To deburr cuts To cut the binding strap
	Binding strap/string	USAGE: To bind multiple ducts
Retracting Cable	Pilot Wire	* There is no call wire included in the ducts

## 2. Description of Parts

### ■ EFLEX Square Duct



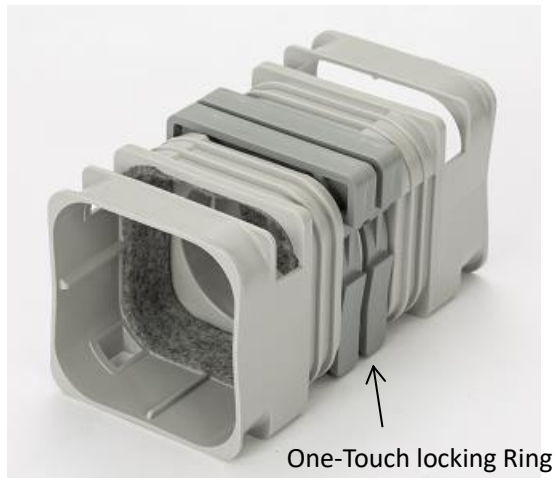
### ■ Long Bell Mouth



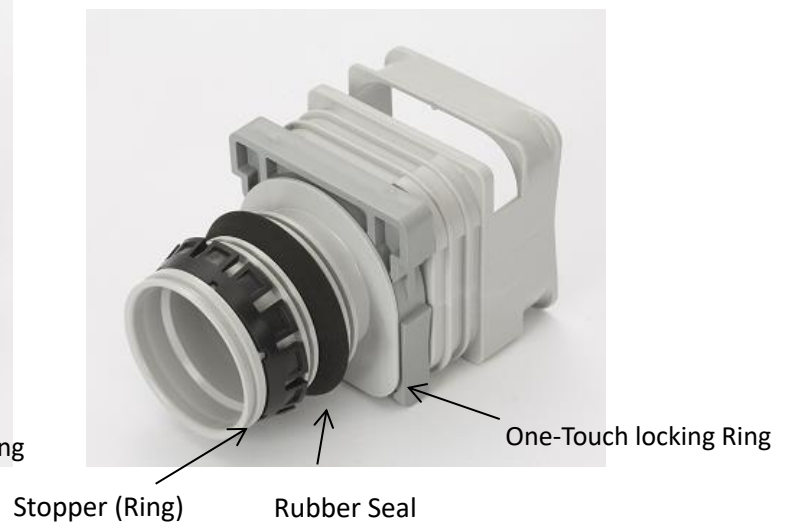
### ■ Bell Block



■AQUA-Square



■AQUA-Square Male Adaptor



■Male Adaptor



■Male-Male Adaptor



■Adaptor for connecting other conduit types



■Temporary plug (for female connector)



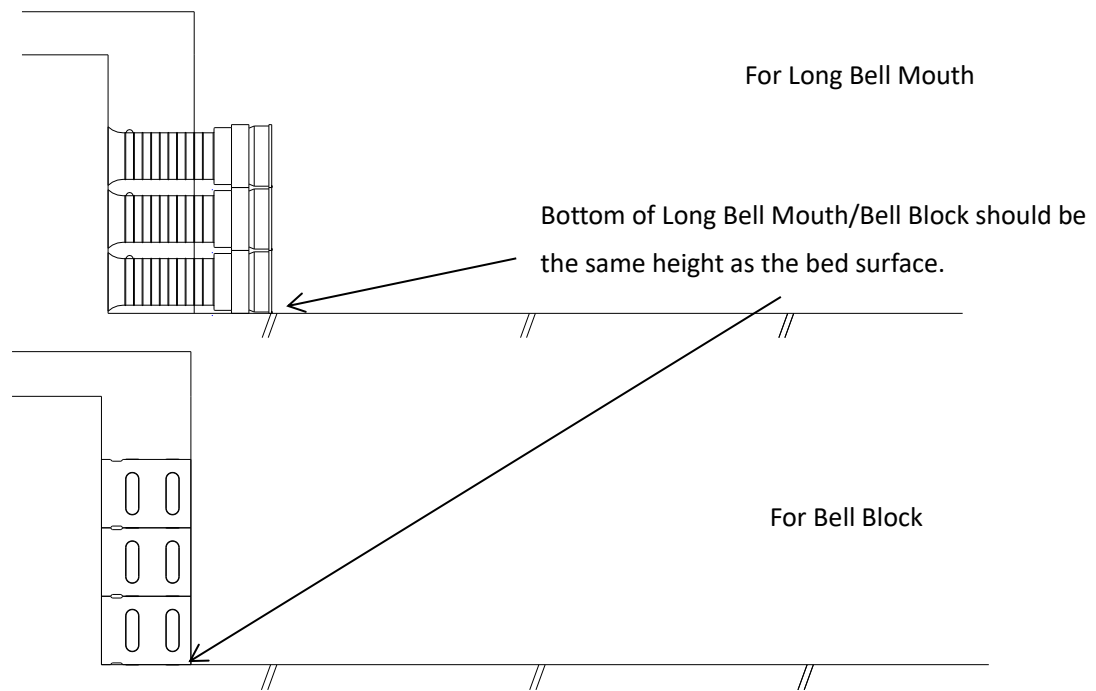
### 3. Installation of Ducts

- 1) Lay at least 50mm of sand in the bed of the trench and compact to a flat, level surface. The bottom of the Long Bell Mouth/Bell Block should be the same height as the bed surface.

This paragraph relates to both installation of long bell mouth and bell block.

→ Installation of Long Bell Mouth into Handhole/Pit P11

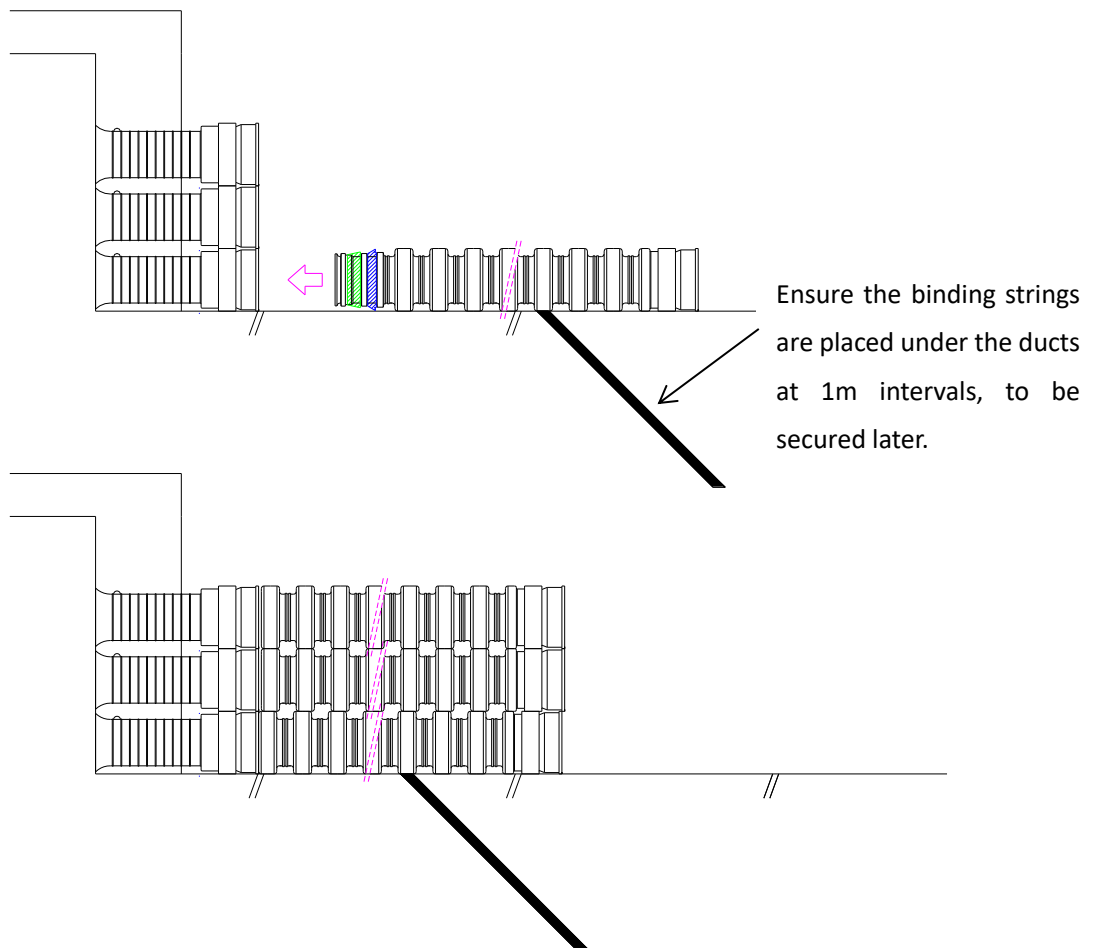
→ Installation of Bell Block into Handhole/Pit P15



- 2) Connect the male part of EFLEX Square Duct into the Long Bell Mouth, starting at the lowest duct.

Ensure the chosen binding string is placed under the ducts at 1m intervals.

→ Long Bell Mouth Connection Procedure P22

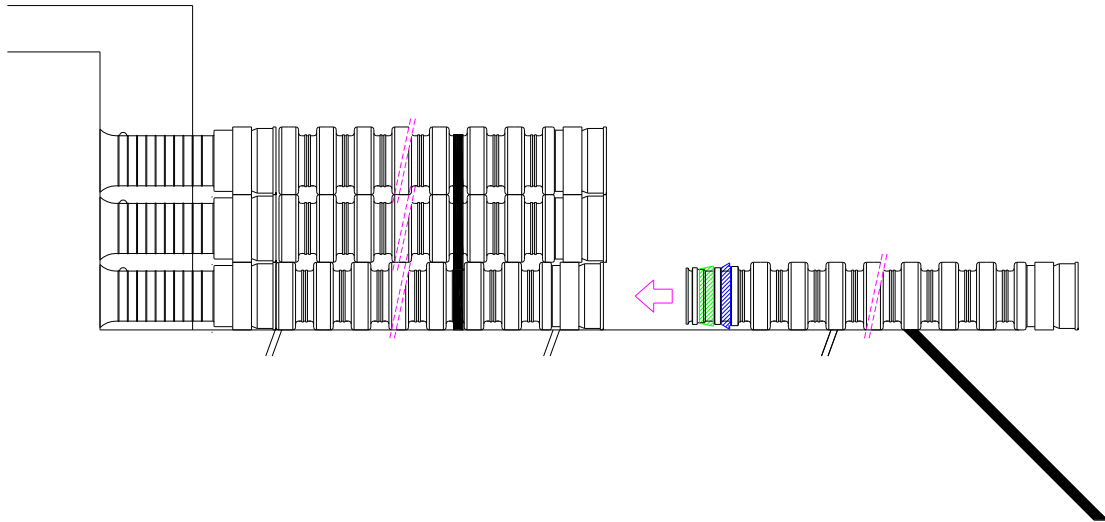


- 3) After stacking is complete, secure the EFLEX Square Ducts together with the binding string to hold the ducts in place.

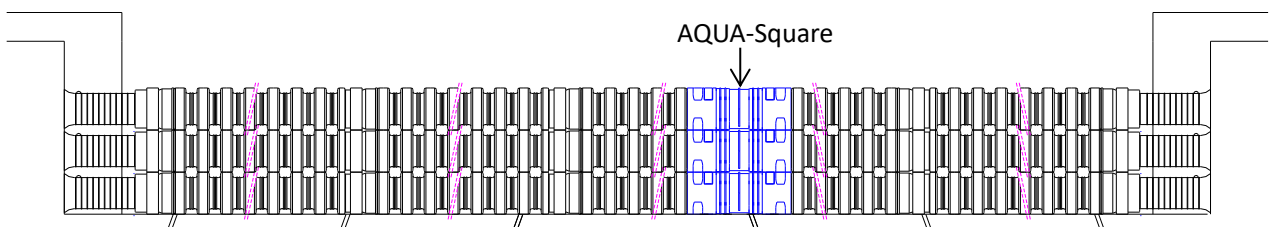
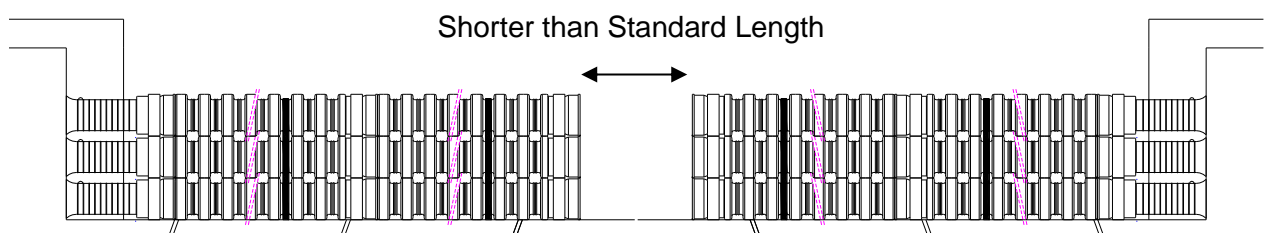
- 4) Always connect each EFLEX Square Duct starting from lowest to highest piece.

→ EFLEX Square Connection Procedure P23

Use binding string to secure the entire stack according to the above procedure 2) and 3) before connecting the next section of EFLEX square.



- 5) When the space between the EFLEX Square Duct installed from handholes at either end is shorter than the standard length, cut to the necessary length and connect the EFLEX Square Ducts using AQUA-Square or AQUA-Square Male Adaptors



→ AQUA Square Connection Procedure

P24

→ Aqua-Square Male Adaptor Connection Procedure

P27

→ Converting an AQUA Square Connector into a Male Adapter

P30



- 6) To install cables in EFLEX ducts, feed an installing rod through the duct until it exits at the opposite end, the cable is then attached to the end of the installing rod and pulled back through the EFLEX duct.



- 7) Before backfilling or during provisional burying, check for any obstructions inside the EFLEX duct by feeding the installing rod through the ducts. In addition to above, it is recommended to perform the same check again after final backfilling of the soil, for confirmation.
- 8) Backfill with a layer of at least 50mm at the top surface with sand or fine damp soil. Tightly compact using tools such as a vibration compactor. Ensure once complete that there is a layer of at least 300mm of sand/soil on top of the ducts.

\* Caution

○ Foundation Works

Make sure that the bottom surface of the trench is smooth by compacting with sand or high-quality soil. It is recommended to use a vibration compactor to ensure a smooth, even and firm bed surface.

○ Avoid stepping on the Long Bell Mouth

Do not step on the Long Bell Mouth which is connected to the handhole/pit nor the connection part of Square EFLEX Duct, as it may cause deformation and/or breakage of the parts.

○ Do not over-bend EFLEX Square Duct

The bending radius of EFLEX Square Duct is more than 10 DR (10 times the inner diameter of the duct). Please also refer to the bending radius of the installed cable.

○ Do not use metallic products for binding the ducts together as it may result in damage to EFLEX Square.

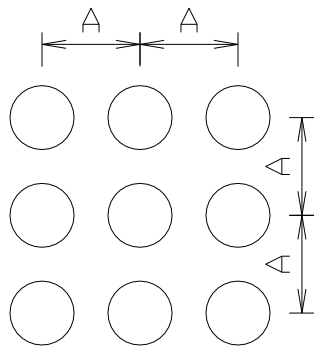
○ Backfilling and compaction

- a) It is recommended to backfill after each layer of EFLEX.
- b) Use sand or high-quality soil for backfilling.
- c) Do not introduce large amounts of backfilling material at once. Fill the material from both sides of the ducts in a balanced manner little by little gradually so that the pipe does not move.  
The surrounding sand/soil should have an amount of water content to ensure there is no subsidence later.
- d) Make sure that sand does not get in between the pipes when water is poured.
- e) Backfill to the top of the pipe and carefully compress the sand/soil to the side of the EFLEX Square ducts.
- f) If installing multiples stacks of EFLEX Square, remove the sand/soil remaining on top of the EFLEX Square and expose the top of the ducts. Install following the standard procedure and repeat bonding, bending check, backfilling and compaction.
- g) The rolling pressure at the top of the tube should be made every 200mm to 300mm with a vibrating roller, vibrating plate etc. However, use a vibrating plate when the soil covering the top of the ducts is less than 300mm.
- h) Connecting to special parts (Handhole etc):  
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. Installation of Long Bell Mouth into Handhole

4-1. When attaching to a handhole/pit made by another manufacturer.

When attaching the long bell mouth to a Handhole/pit, make sure that the spacing (A) between the long bell mouth is equal to or greater than the distance shown in the table below. Remove the paper backing from the rubber seal on the long bell mouth before installation.



A Dimension mm (minimum)

Size	φ50	φ81	φ100	φ130	φ150
φ50	80	100	110	130	140
φ81	100	115	125	145	155
φ100	110	125	135	155	165
φ130	130	145	155	175	185
φ150	140	155	165	185	195

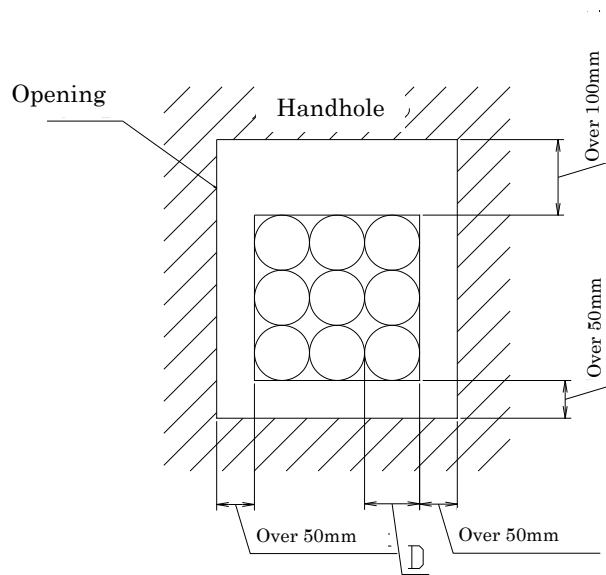
eg.) When φ50 and φ100 ducts are adjacent to each other, center distance must be over 110mm.

#### \* Caution

- Be careful not to make the walls between holes in the handhole too small, otherwise the strength may be compromised.
- Ensure that EFLEX duct is not damaged by heat from curing concrete.
- When embedding in the Handhole/pit, be aware that it may be deformed by curing heat. Ensure concrete does not get inside the long bell mouth.
- Do not use in places where ground subsidence is expected.
- Do not use organic solvents.
- If water seal is required, apply a sealant such as epoxy putty to the interface between Long Bell Mouth and concrete.

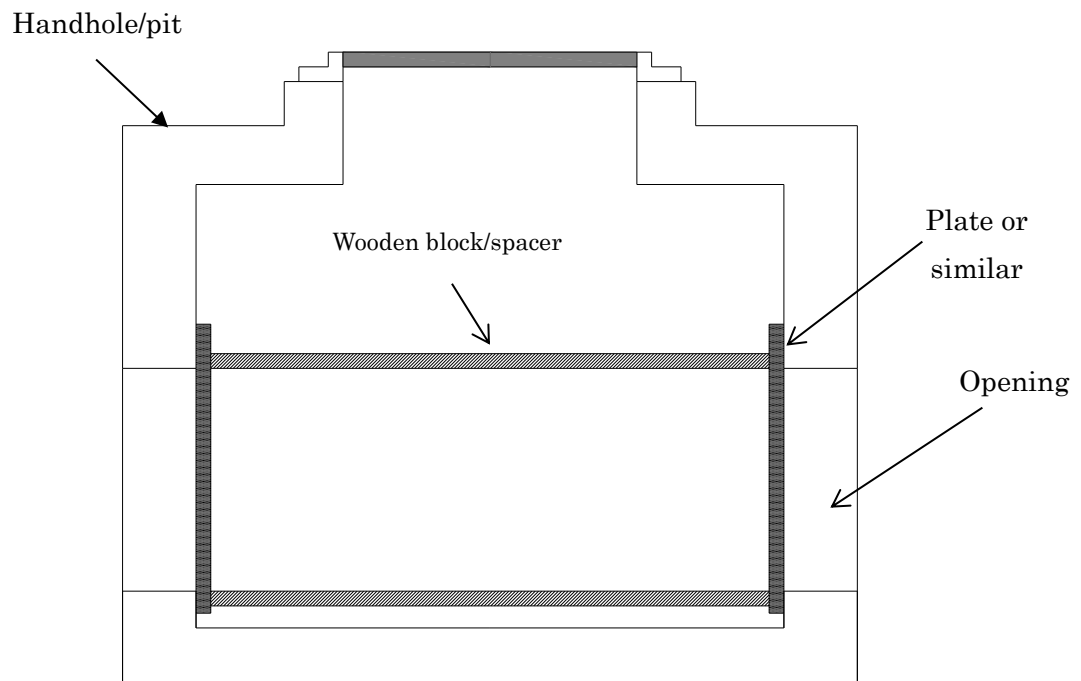
4-2. When attaching at the construction site

1) Cut an opening in the handhole/pit according to the figure below:



Nominal Diameter	Outer size D
50	73
81	105
100	125
130	162
150	184

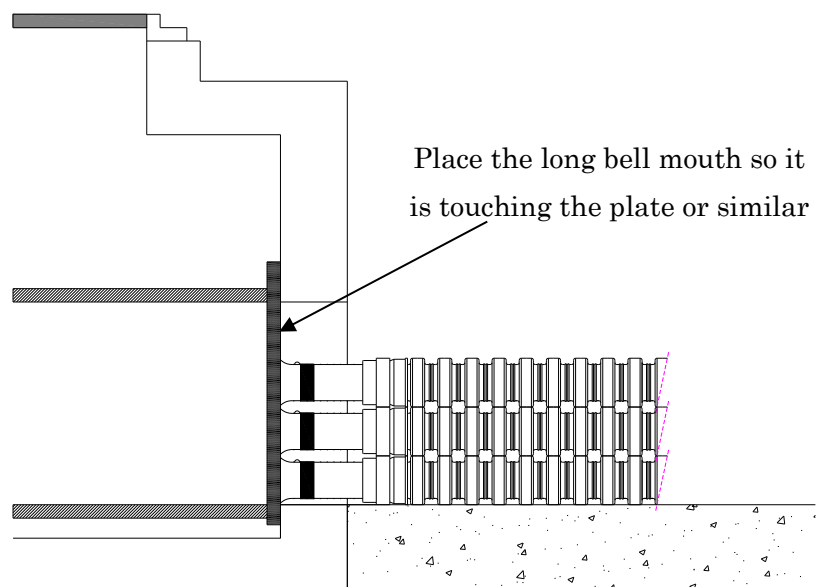
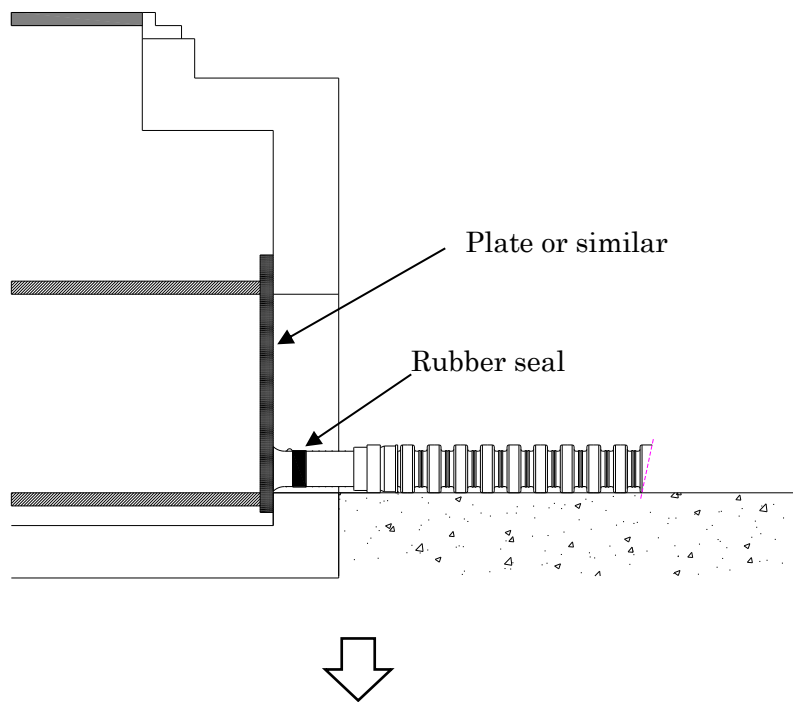
2) Cover the opening with a plate or similar on the inside of the Handhole/pit and hold it in place with a wooden block or similar spacer while work is completed.



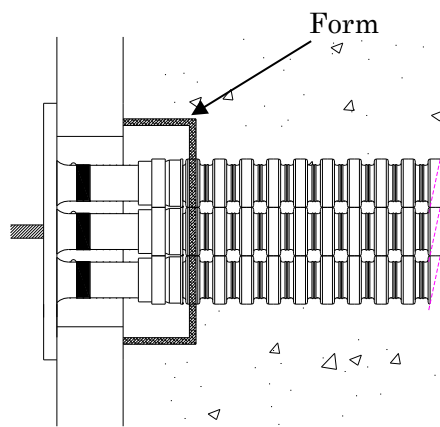
3) Connect the long bell mouth to the square Eflex.

→ Long Bell Mouth Connection Procedure P22

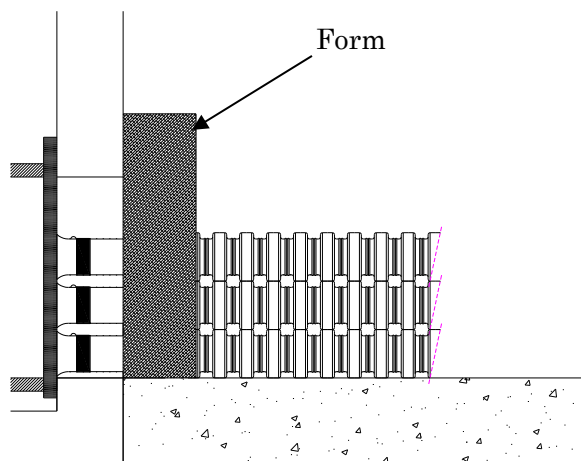
4) Remove the paper backing from the rubber seal on the long bell mouth before installation. fix the long bell mouth and ensure that the fit is snug.



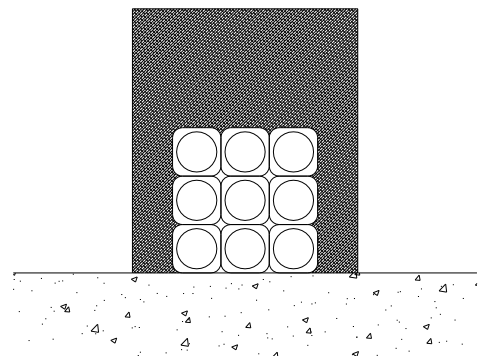
5) Assemble the form for mortar, pour in the mortar to fix the long bell mouse.



<Top view>



<Side View>



<Front View>

\* Caution

- Ensure that EFLEX duct is and long bell mouth are not damaged by heat from curing concrete.
- When embedding in the Handhole/pit, be aware that it may be deformed by curing heat. Ensure concrete does not get inside the long bell mouth.
- Do not use in places where ground subsidence is expected.
- Do not use organic solvents.
- If water seal is required, apply a sealant such as epoxy putty to the interface between Long Bell Mouth and concrete.

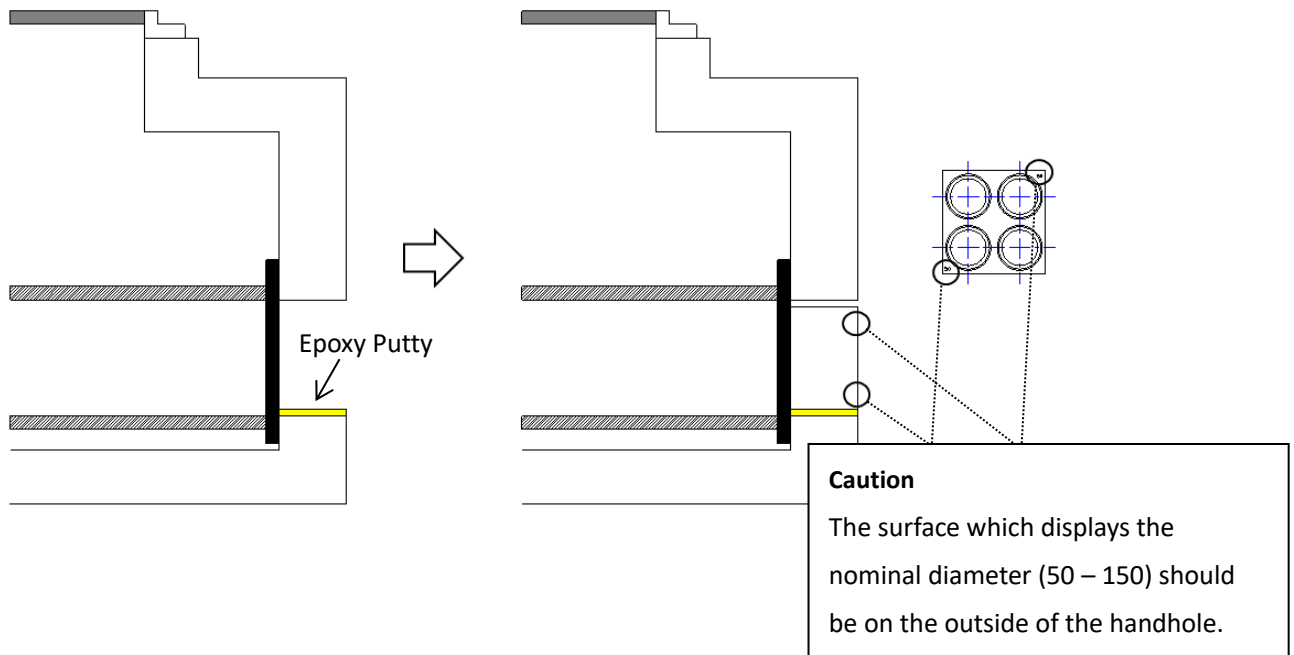
### 5-1. Attaching to a ready-made Handhole

- 
- Technical drawing of a square plate with four circular openings. The plate has a width  $A$  and height  $B$ . The openings are arranged in a 2x2 grid. The distance from the center of each opening to the nearest edge is 50. The plate is surrounded by a hatched area. Dimensions are given as "Over 10mm" for the top and bottom edges, and "Over 0mm" for the left and right edges. An arrow points to the left edge with the label "Opening".

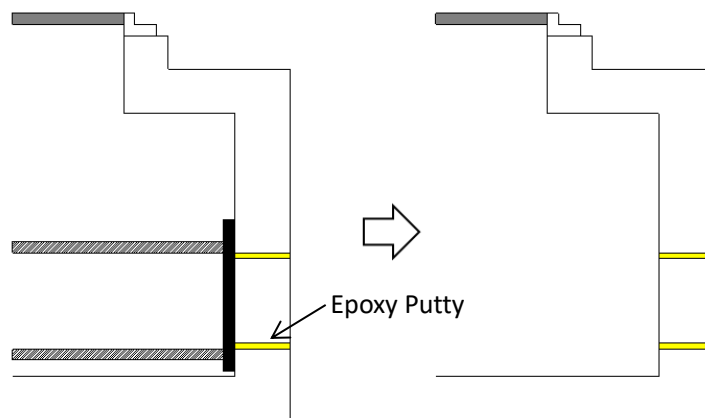
- 
- The diagram illustrates a transition tree for the task of fixing a plate. It shows a sequence of steps: first, a plate is positioned against a wall; then, a screw is inserted into the plate; finally, the screw is tightened. The diagram uses arrows to indicate the flow of the process and labels to identify the components involved.
- Labels in the diagram include:
- Transition Tree (For fixing)
  - Plate etc.
  - Opening

3) At the opening of the Handhole, remove in advance any powder or foreign matter that may interfere with the adhesion of the epoxy putty.

4) Put epoxy putty on the bottom of the opening and place the bell block on top. At this time, ensure the bell block is positioned correctly. (The surface which displays the nominal diameter should be on the outside of the handhole)



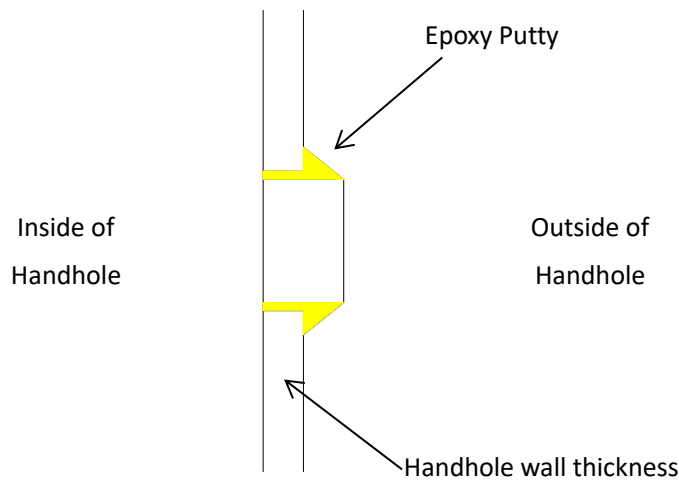
5) Fill the upper gap between the bell block and the Handhole with epoxy putty and attach. If necessary, use a spacer (such as a piece of wood) to reduce the gap before fixing in place. Ensure that the epoxy putty does not adhere to the open side of the bell block and the inside of the holes, this could make connecting the EFLEX pipe difficult and prevent desired water tightness. Applying masking curing tape to the surface of the bell block will prevent epoxy putty getting into the holes.



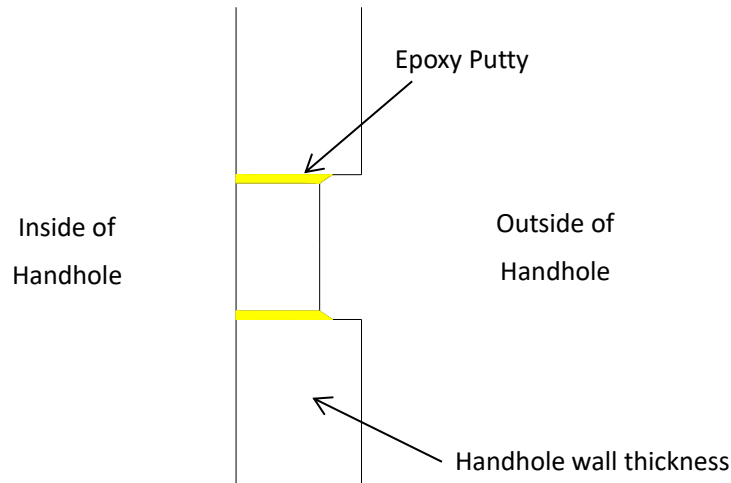


\* Caution

- Ensure that the bell block is not chipped or broken during and following installation.
- Ensure that epoxy putty and foreign matter do not adhere to the inside of the bell block holes or openings.
- Do not drop the bell block or expose to strong impact force.
- Pay attention to the orientation of the bell block when installing. The surface which displays the nominal diameter (50 – 100) should be on the outside of the handhole.
- If the thickness of the bell block does not match the thickness of the Handhole wall, consider the following points:
  - a) When the wall thickness is thin (for example; when attached to the knockout part of a Handhole) there is a risk of damage to the exposed part of the bell block, so ensure epoxy putty is used as shown in the diagram below. Ensure that the epoxy putty does not adhere to the open side of the bell block and the inside of the holes, this could make connecting the EFLEX pipe difficult and prevent desired water tightness. Applying masking curing tape to the surface of the bell block will prevent epoxy putty getting into the holes.

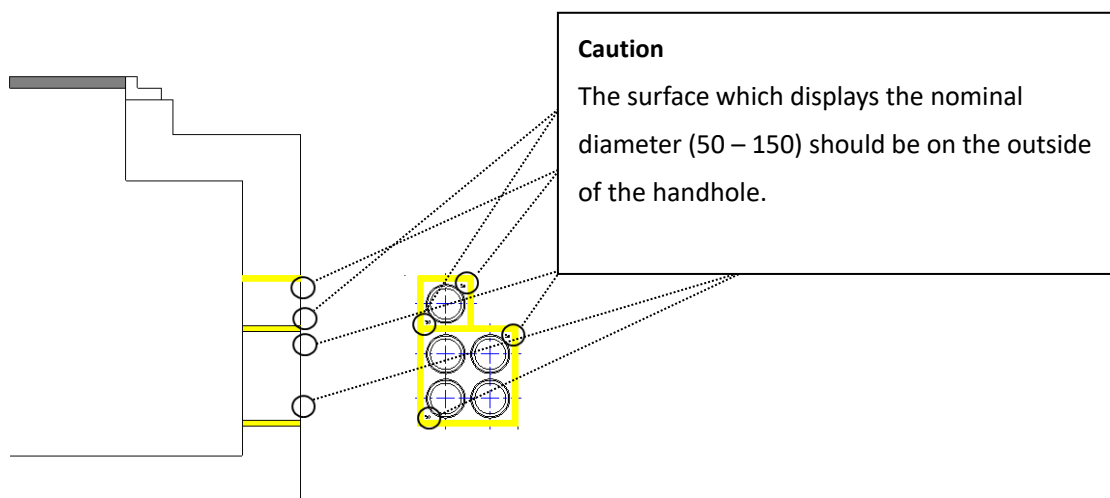


- b) When the wall thickness is larger than the bell block fill the gap between the bell block and the Handhole with epoxy putty. Ensure that the epoxy putty does not adhere to the open side of the bell block and the inside of the holes, this could make connecting the EFLEX pipe difficult and prevent desired water tightness. Applying masking curing tape to the surface of the bell block will prevent epoxy putty getting into the holes.



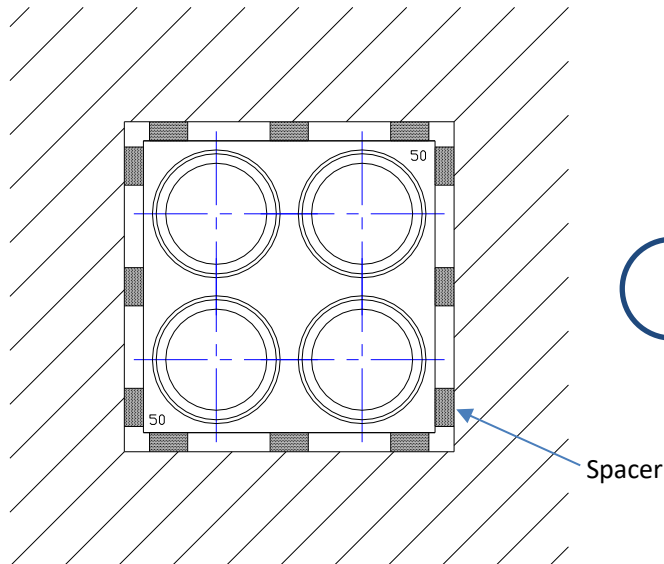
- c) When using bell blocks in layers

When installing one bell block directly above another, use epoxy putty between the bell blocks. Please be aware that if there is a gap between the epoxy putty and the filling is insufficient, water tightness may be impaired. Ensure that the epoxy putty does not adhere to the open side of the bell block and the inside of the holes, this could make connecting the EFLEX pipe difficult and prevent desired water tightness. Applying masking curing tape to the surface of the bell block will prevent epoxy putty getting into the holes. Check for correct orientation of the bell block.

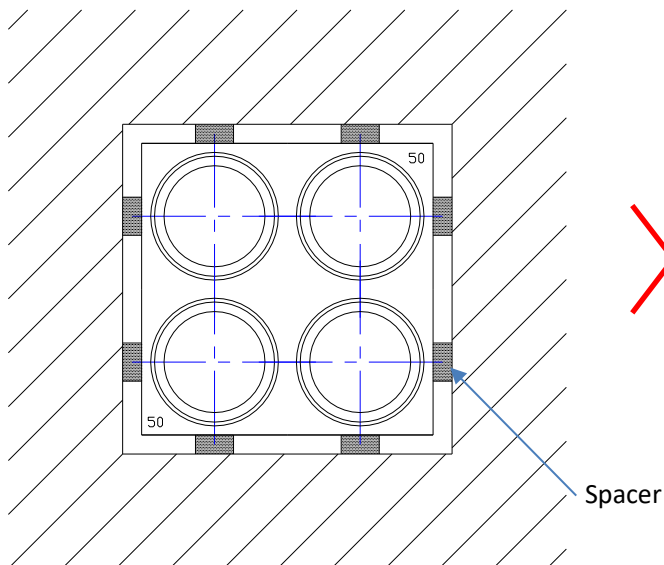


d) Fixing bell block to handhole/pit using wooden spacers.

When using spacers to secure the bell block in the opening of the handhole/pit, ensure that the spacers are inserted at the thickest points on the bell block to avoid causing any damage.



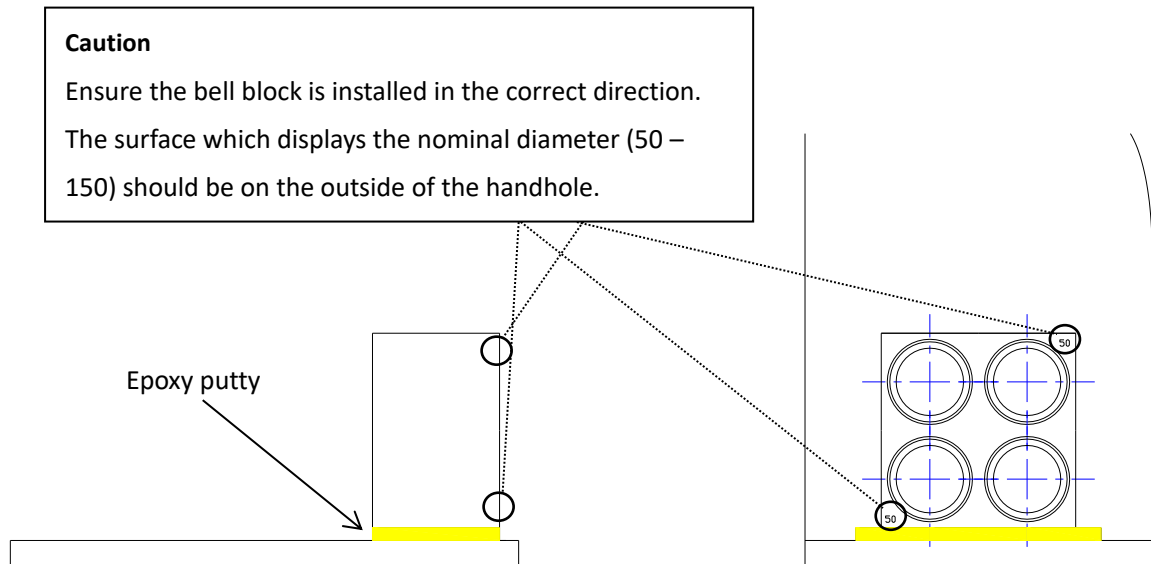
Insert the spacer next to the thickest point.



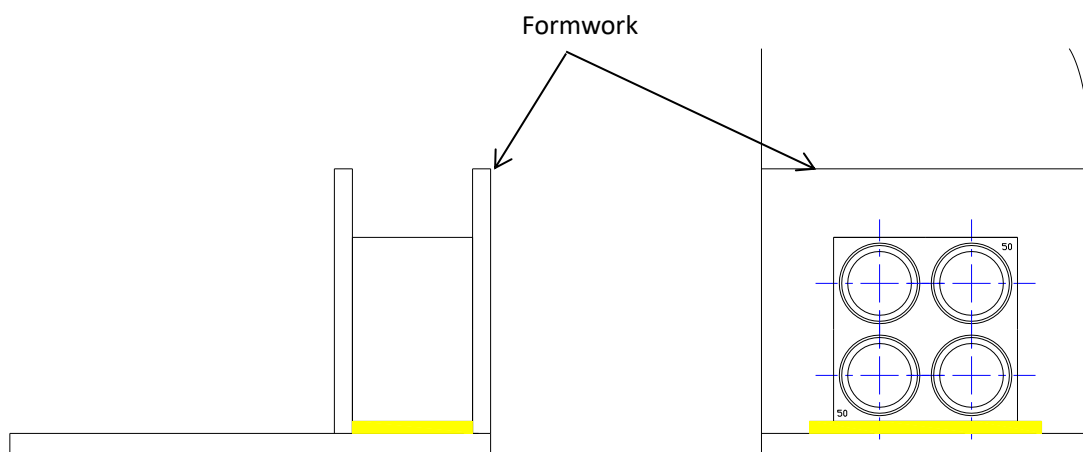
Do not insert spacers next to thin parts of the bell block.

## 5-2. Installing bell block in concrete (Tunnel example).

- 1) Place the Bell Block in the defined position. When sealing the bottom of the bell block to the ground surface, ensure that the EPOXY putty is applied evenly, leaving no gaps.

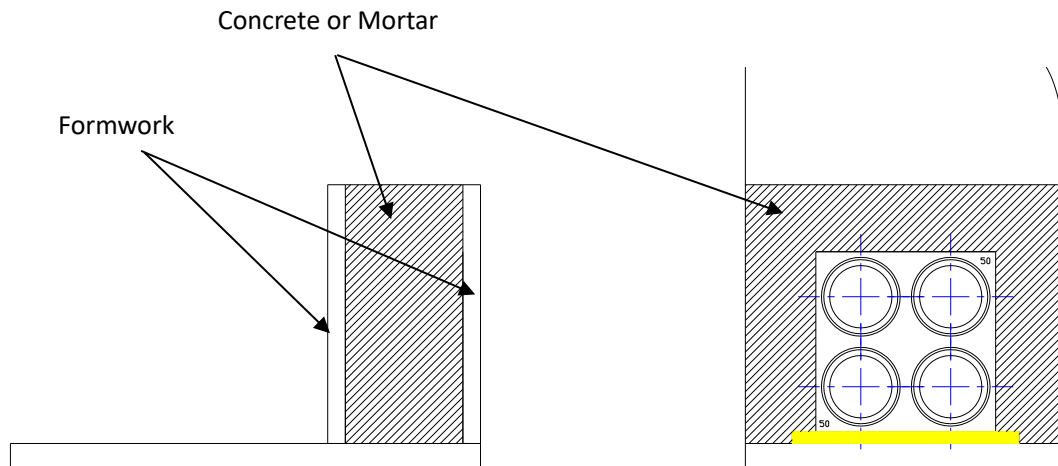


- 2) Set the formwork to sandwich the Bell Block. Ensure the formwork fits flush with the bell block and there are no gaps. It may be necessary to use masking to stop any potential concrete leakage while pouring. Ensure the bell block does not move during casting.



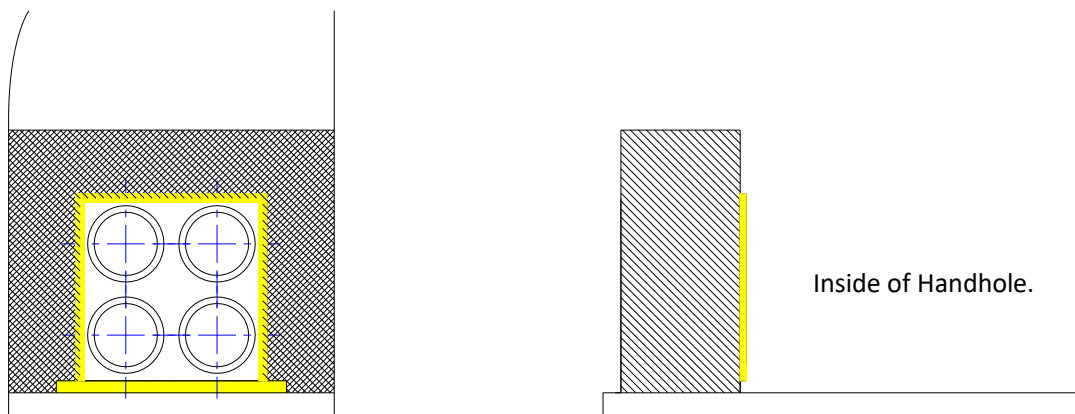
3) Casting with concrete or mortar:

Please ensure that no concrete or mortar is leaking through gaps in the formwork when casting quickly.



4) When the casting is complete, remove the formwork. At this time, check that concrete has not set on the bell block holes. If so, remove it carefully.

5) When watertight joint is required, apply epoxy putty to the outer edge surface of the Bell Block on the outside and inside of the Handhole. Ensure that epoxy putty does not adhere to the inside of Bell Block holes.



\* Caution

- Check the Bell Block for cracks during and after installation.
- Do not drop the bell block or expose to strong impact force.
- The surface which displays the nominal diameter (50 – 150) should be on the outside of the handhole.

## 6. Long Bell Mouth Connection Procedure

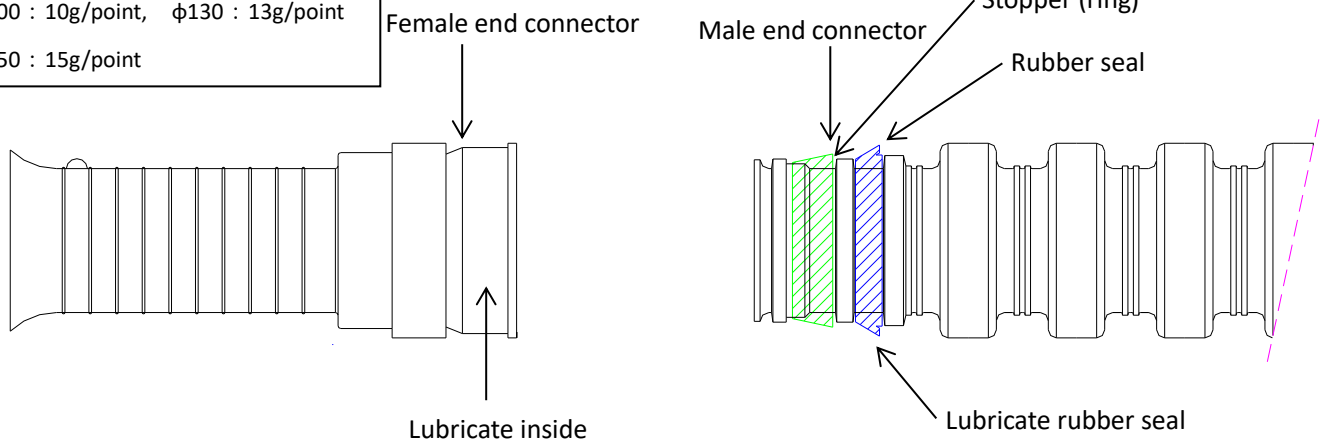
- 1) Remove the temporary protective cap from the male end of the EFLEX Square Duct and apply lubrication to the rubber seal the inside of the female end of the Long Bell Mouth.

Rough standard for lubricant usage

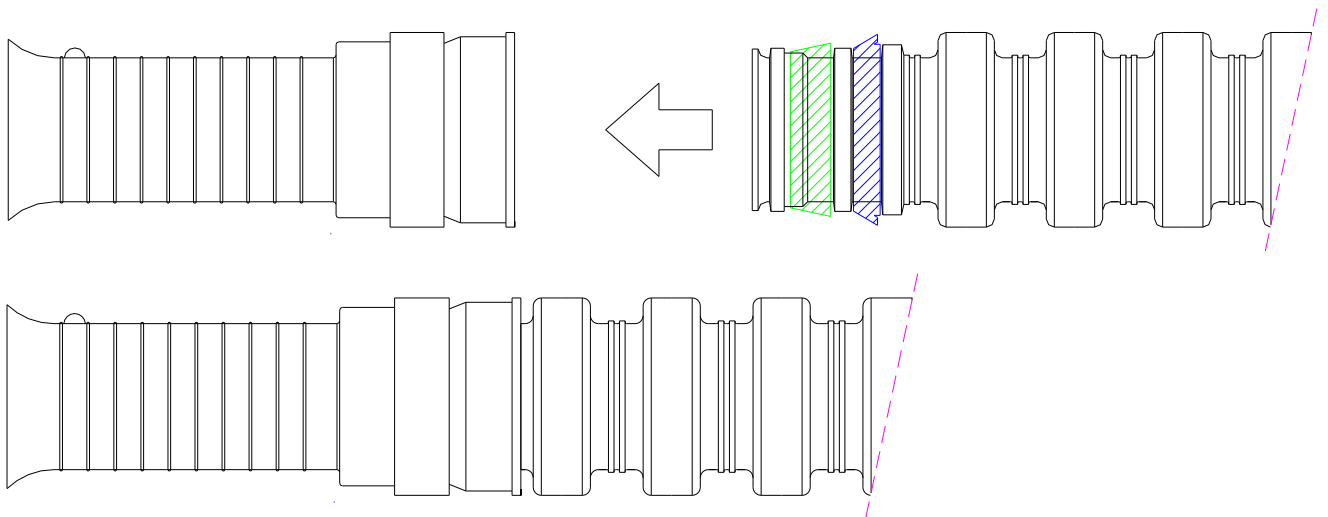
$\phi 50$  : 5g/point,     $\phi 81$  : 8g/point

$\phi 100$  : 10g/point,     $\phi 130$  : 13g/point

$\phi 150$  : 15g/point



- 2) Ensure the female end connector is free from dirt and debris. Insert the male end of EFLEX Square Duct into the female end of the Long Bell Mouth. Ensure the connection is made in a straight line with no angle and once connected check that it is locked in place secure by trying to pull apart by hand.

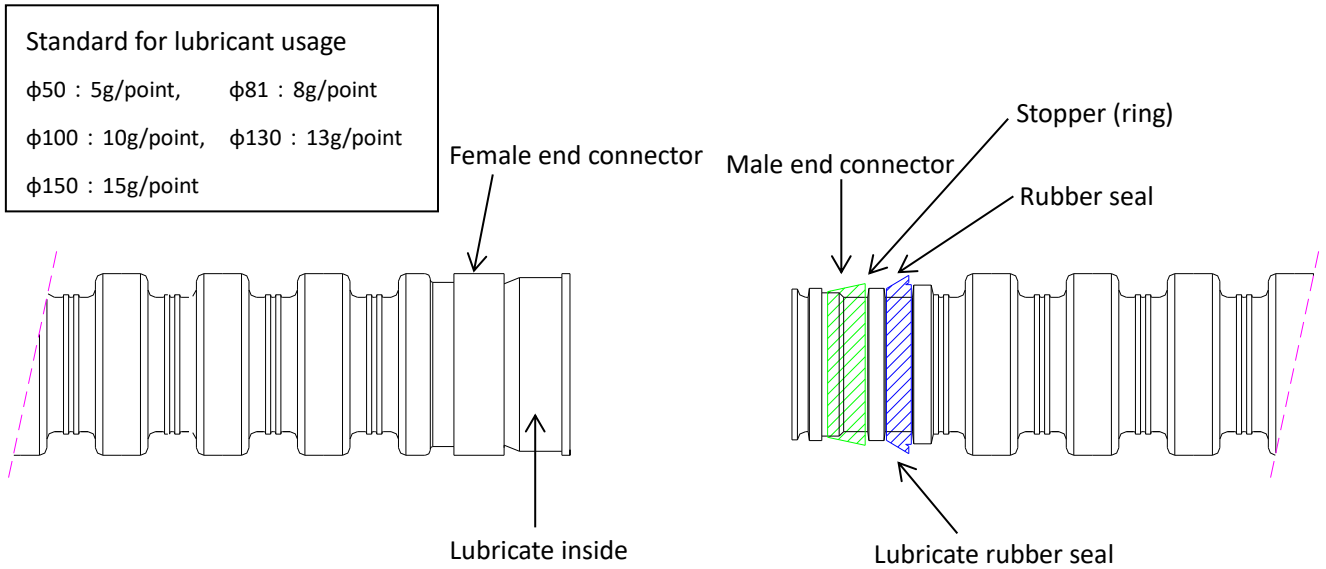


### \* Caution

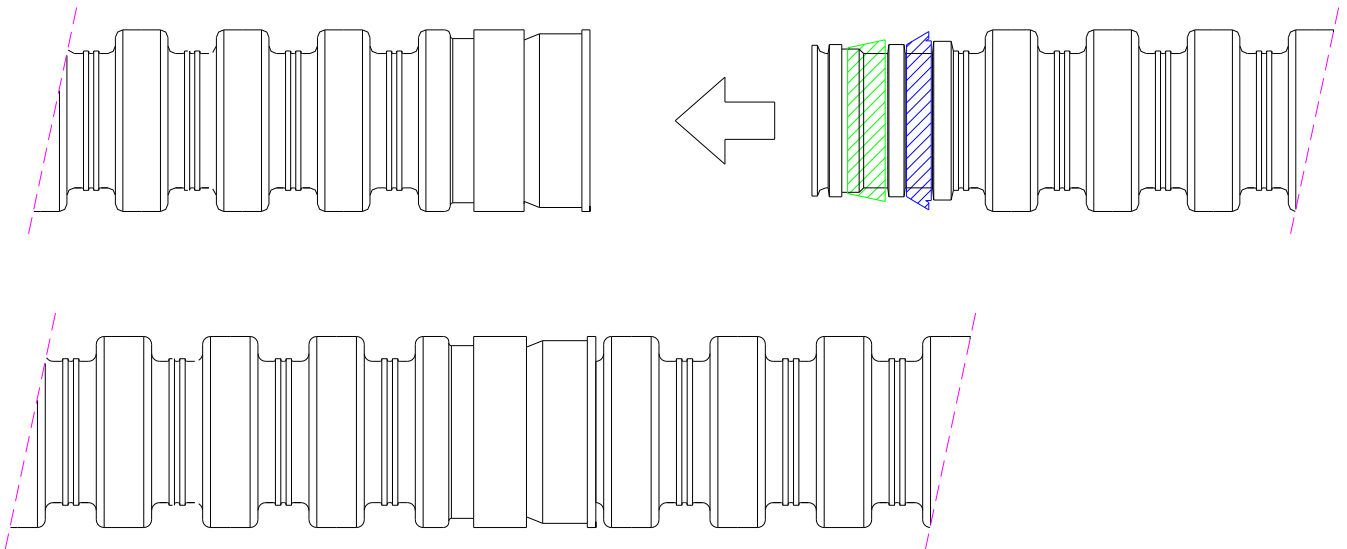
- Once EFLEX is connected it cannot be removed.
- Do not lubricate the Stopper (ring).

## 7. EFLEX Square Connection Procedure

- 1) Remove the temporary protective cap from the male end of the EFLEX Square Duct and apply lubrication to the rubber seal and the inside of the female end connector.



- 2) Ensure the female end connector is free from dirt and debris. Insert the male end of EFLEX Square Duct into the female end. Ensure the connection is made in a straight line with no angle and once connected check that it is locked in place secure by trying to pull apart by hand.

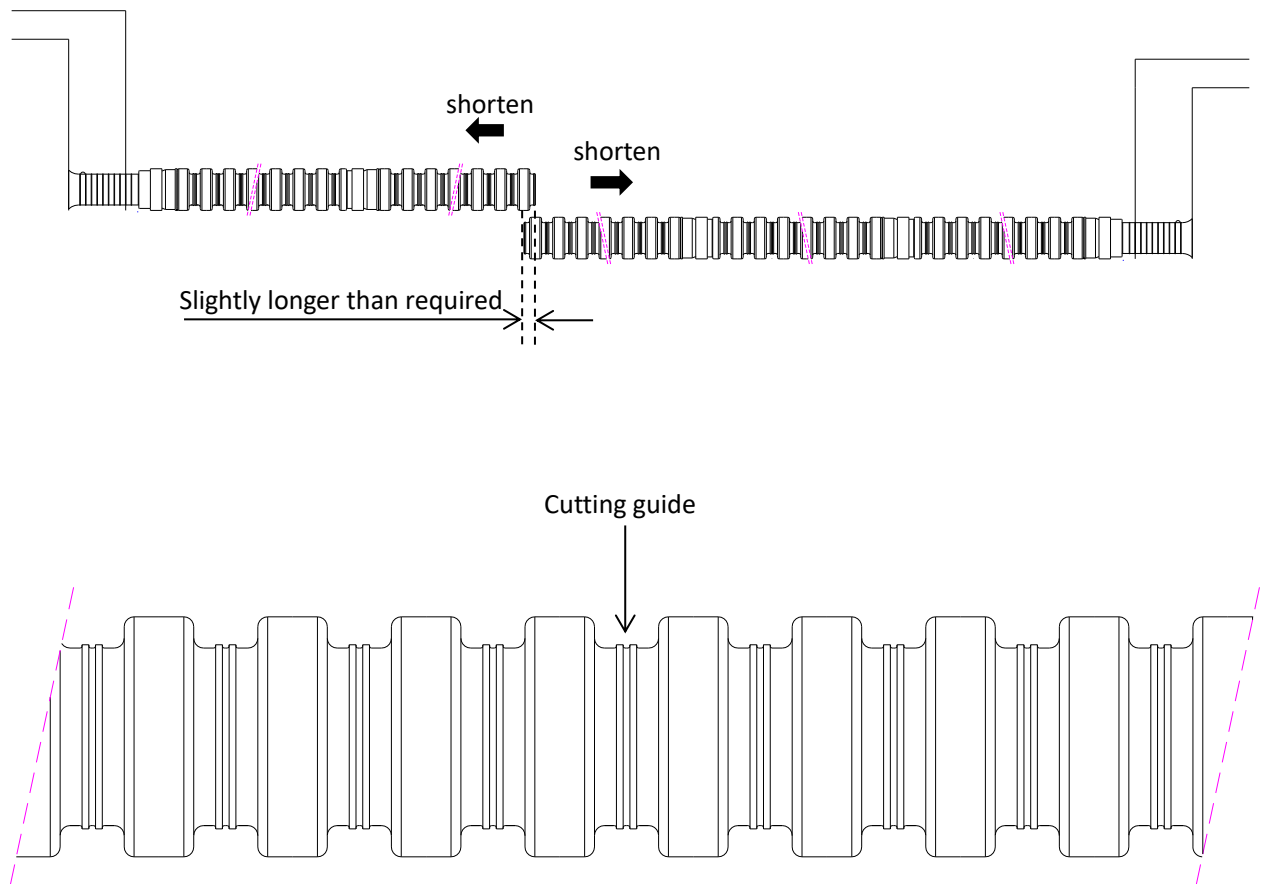


### \* Caution

- Once EFLEX is connected it cannot be removed.
- Do not lubricate the Stopper (ring).

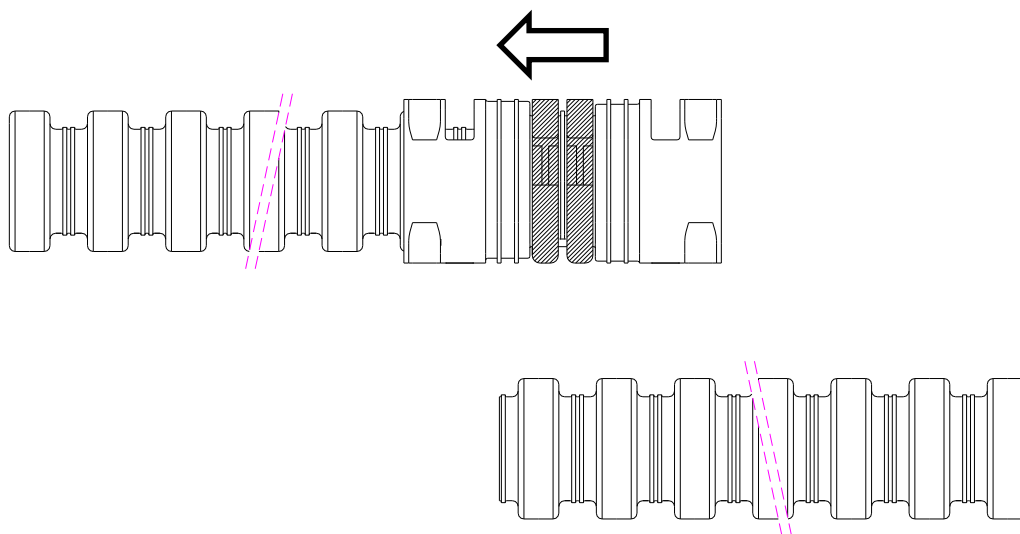
## 8. Aqua Square Connection Procedure

- 1) When the space between the EFLEX Square Duct installed from handholes at either end is shorter than the standard length, connect the EFLEX Square Ducts using our AQUA-Square connector. As EFLEX Square has predefined cutting points, choose a cutting point that results in slightly longer pieces than required, to ensure secure connection. Please deburr with a knife following length adjustment.

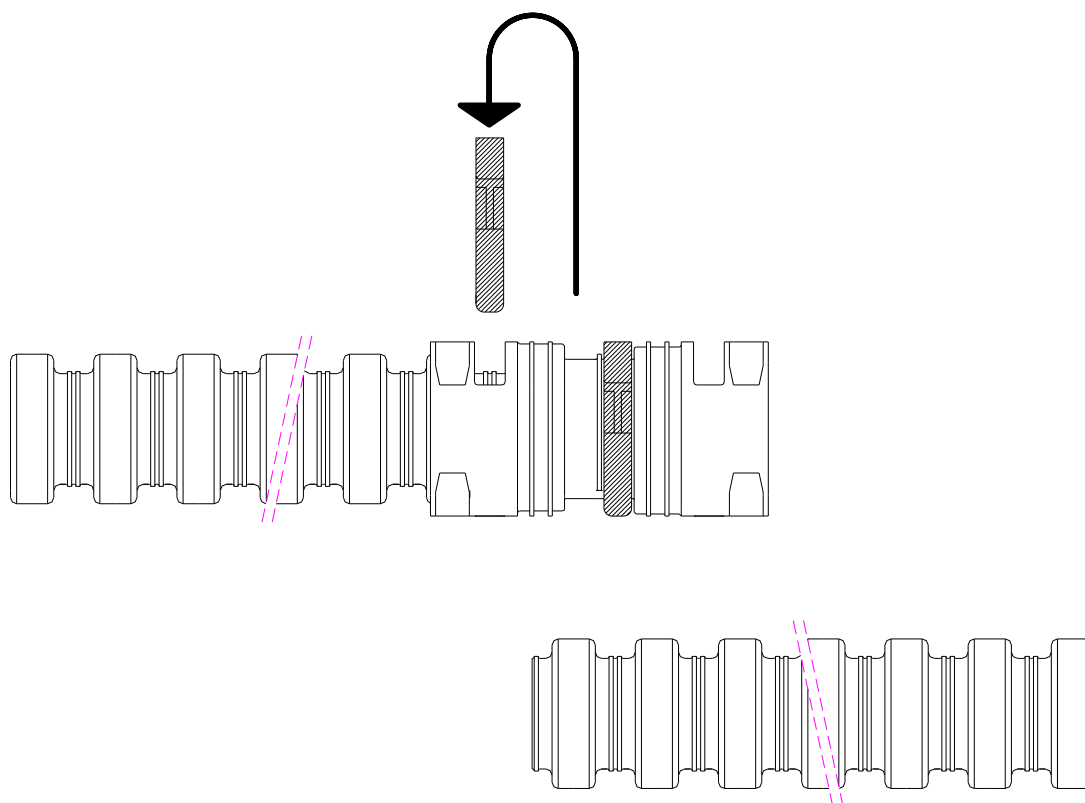




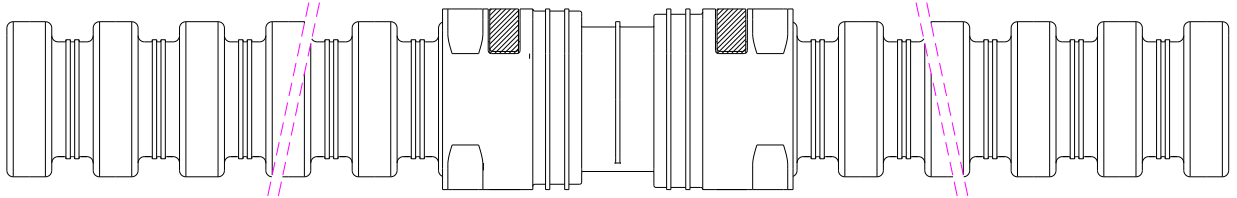
- 2) Insert one end of EFLEX Square into the AQUA-Square connector.



- 3) Remove the One-Touch Ring from AQUA-Square connector and insert into the opening to secure EFLEX Square in place (illustrated below). check that the EFLEX-Square is locked in place by trying to pull apart by hand.

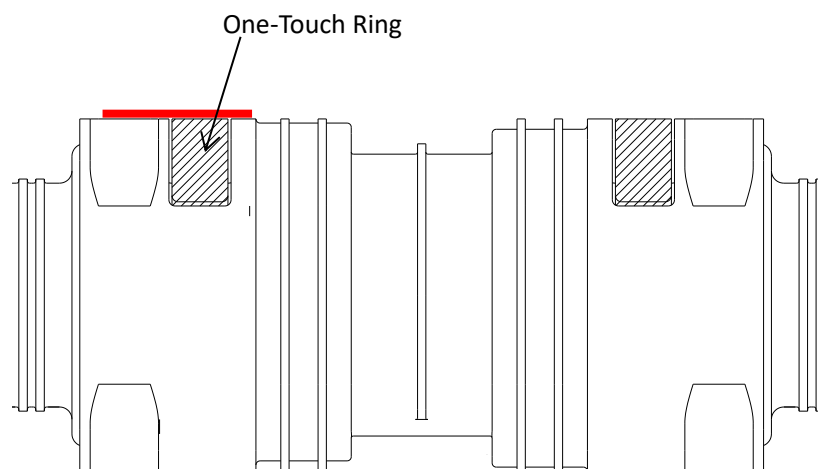


- 4) Insert the remaining piece of EFLEX Square into the other end of the AQUA-Square connector.  
check that the EFLEX-Square is locked in place by trying to pull apart by hand.



\* Caution

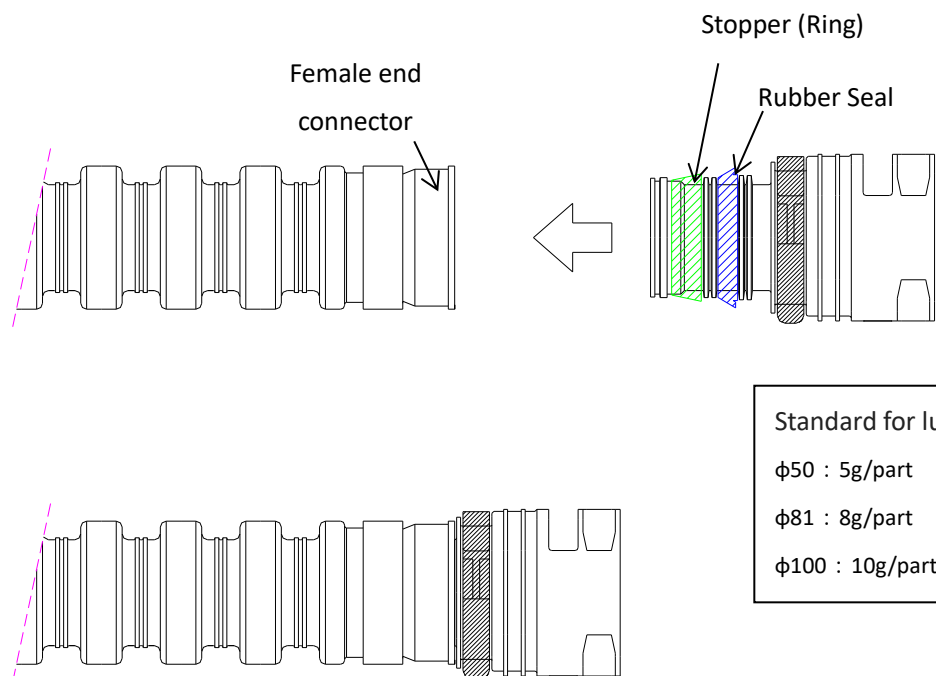
- Install AQUA-Square shortly after removing from its protective plastic bag and ensure that the expanding nonwoven fabric does not contain moisture prior to installation.
- Ensure that parts being connected are free from dirt and debris.
- The EFLEX-Square male end connector is not designed to be used with AQUA-Square connectors.
- Once EFLEX is connected it cannot be removed.
- Ensure the One-Touch Ring clicks into place and is flush the top surface of the connector.



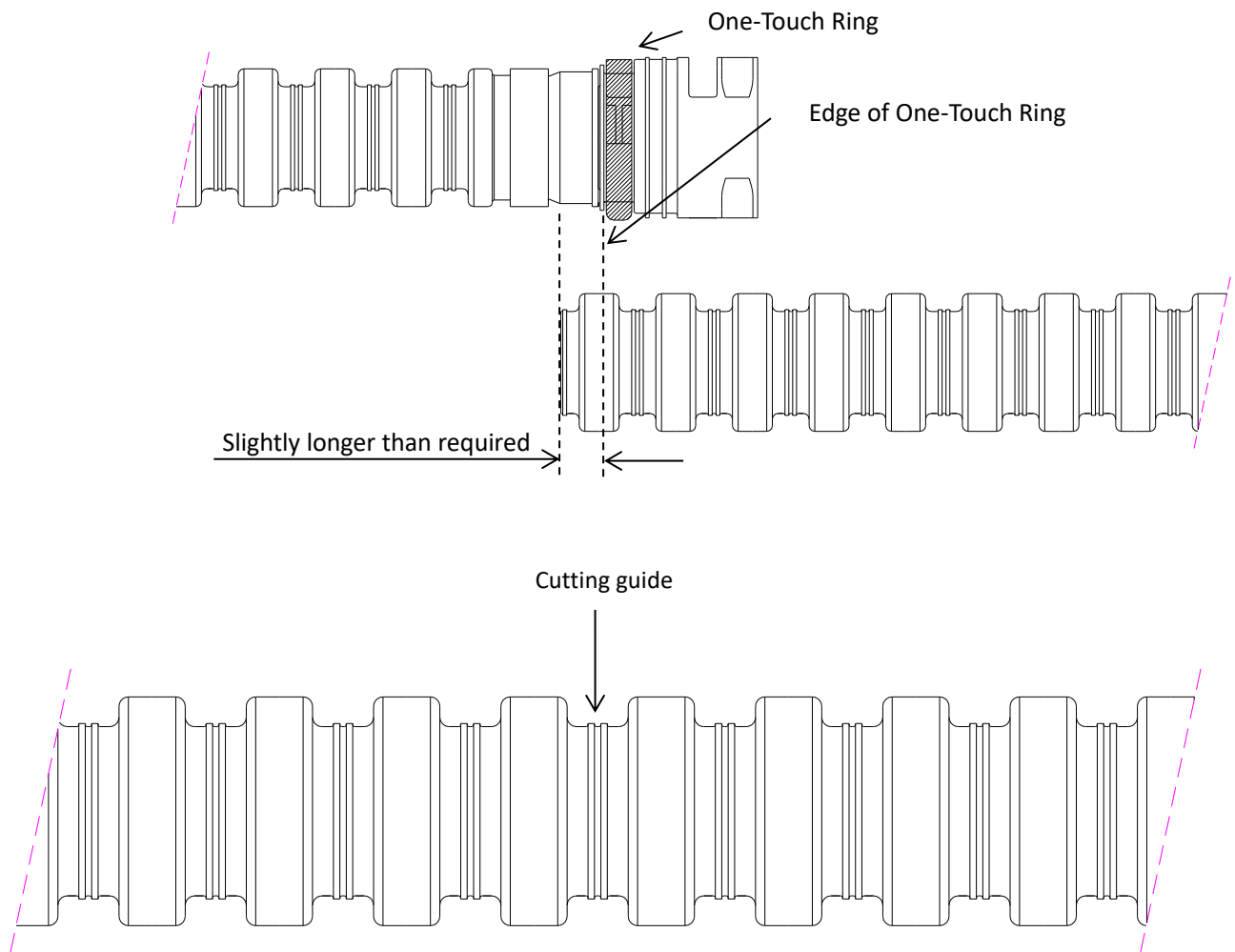
## 9. AQUA-Square Male Adapter Connection Procedure

The following method is used when the installer chooses to adjust the length by only cutting one end of EFLEX Square, resulting in one female connector end and one cut end.

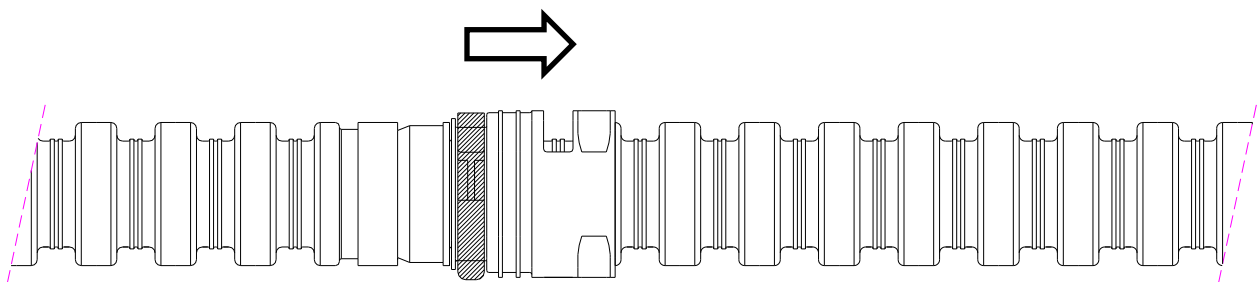
- 1) When the space between the EFLEX Square Duct installed from handholes at either end is shorter than the standard length, connect the EFLEX Square Ducts by attaching our AQUA-Square Male Adapter to the female end of one of the EFLEX Ducts. Apply lubricant to the rubber seal and the inner side of the female joint part of the pipe with a brush. Insert straight so that it does not become oblique and confirm the AQUA-Square Male Adapter cannot be pulled out.



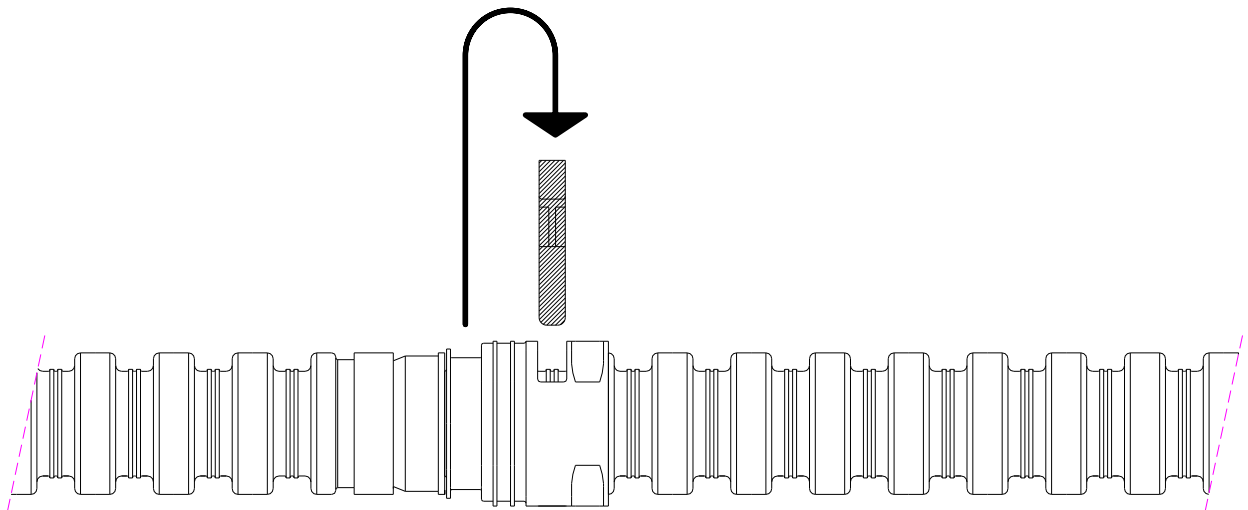
- 2) The EFLEX Square duct not connected to the AQUA-Square Male Adapter can now be cut to length, using the groove in the cylindrical section as a guide. As EFLEX Square has predefined cutting points, choose a cutting point that results in slightly longer pieces than required, to ensure secure connection. Please deburr with a knife following length adjustment.



- 3) Insert the cut EFLEX into the AQUA-Square Male adapter.

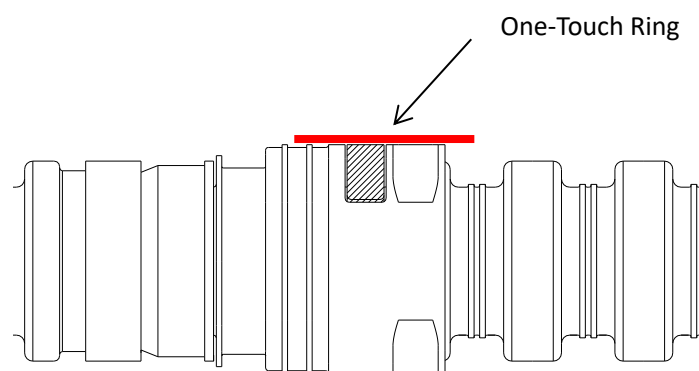


- 4) Remove the One-Touch Ring from the AQUA-Square Male Adapter and insert into the opening to secure the EFLEX Square in place (illustrated below). check that the EFLEX-Square is locked in place by trying to pull apart by hand.



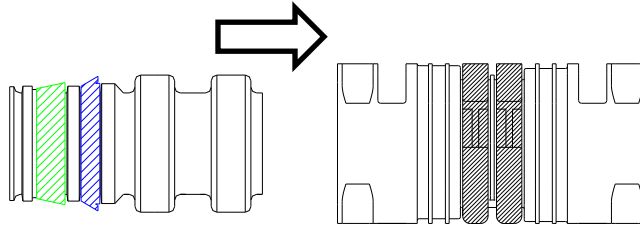
**\*Caution**

- Install AQUA-Square Male Adapter shortly after removing from its protective plastic bag and ensure that the expanding nonwoven fabric does not contain moisture prior to installation.
- Ensure that parts being connected are free from dirt and debris.
- The EFLEX-Square male end connector is not designed to be used with AQUA-Square connectors.
- Once EFLEX is connected it cannot be removed.
- Ensure the One-Touch Ring clicks into place and is flush with the top surface of the connector.
- Do not use when connecting to bell block.
- Do not use if the total combined length of EFLEX Square between handholes/pits is less than 7m as it will be difficult to bend the ducts.
- Be careful not to apply lubricant to the Stopper (Ring).

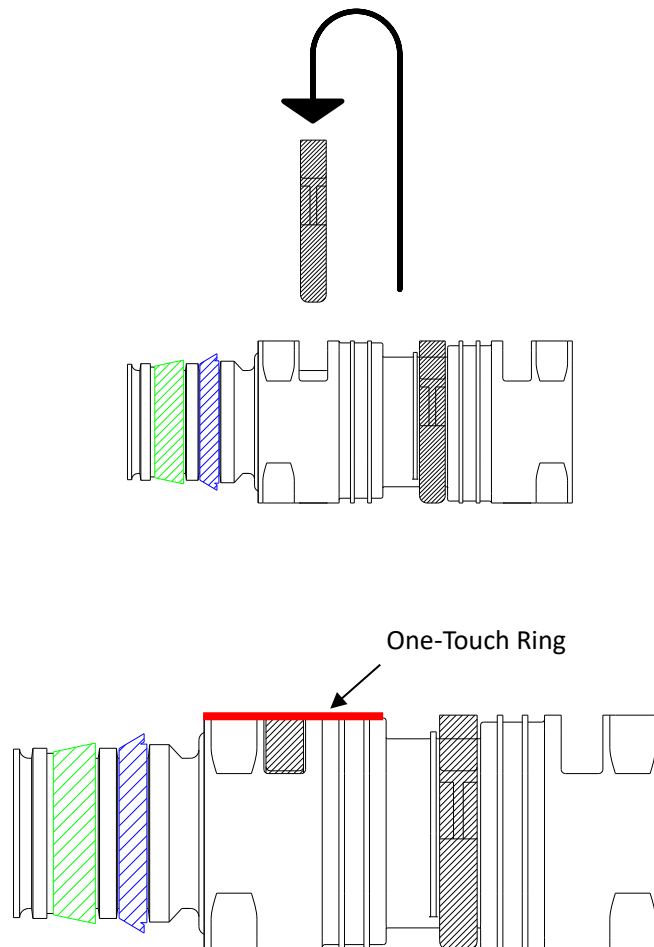


## 10. Converting an AQUA-Square connector into a Male Adapter

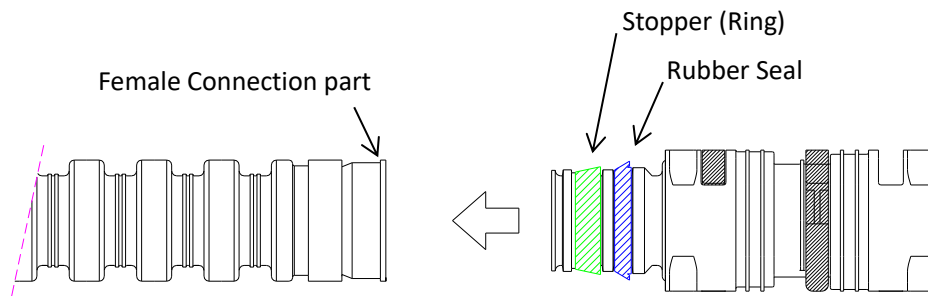
- 1) Insert the male to male adapter until it hits AQUA-Square.



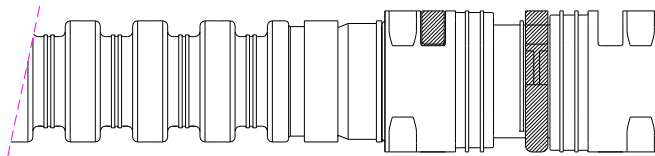
- 2) Remove the One-Touch Ring from the AQUA-Square connector and insert into the opening to secure the EFLEX Square piece in place (illustrated below). Check that the EFLEX-Square is locked in place by trying to pull apart by hand. Ensure the One-Touch Ring clicks into place and is flush with the top surface of the connector.



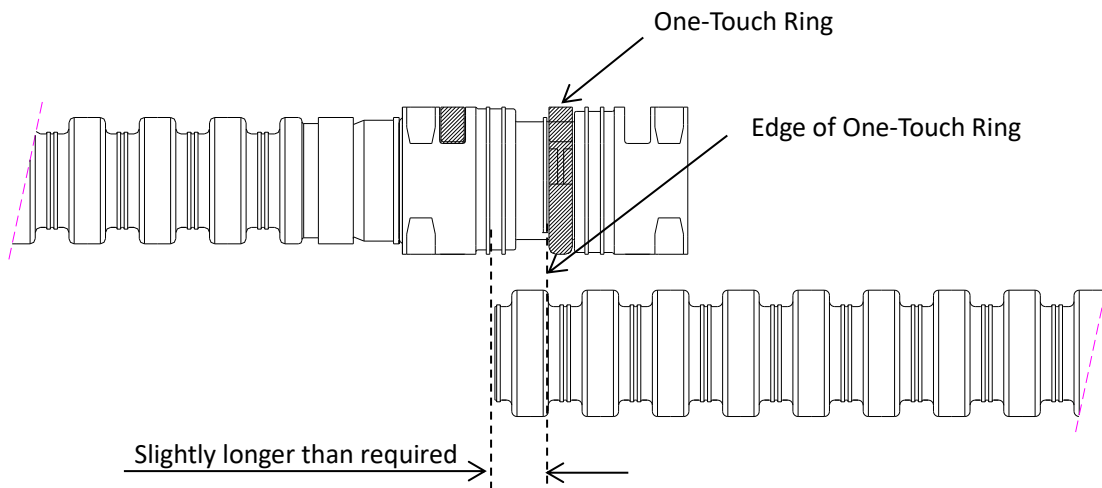
- 3) When the space between the EFLEX Square Duct installed from handholes at either end is shorter than the standard length, connect the EFLEX Square Ducts by attaching newly created Male Adapter to the female end of one of the EFLEX Ducts. Apply lubricant to the rubber seal and the inner side of the female joint part of the pipe with a brush. Insert straight so that it does not become oblique and confirm the AQUA-Square Male Adaptor cannot be pulled out.

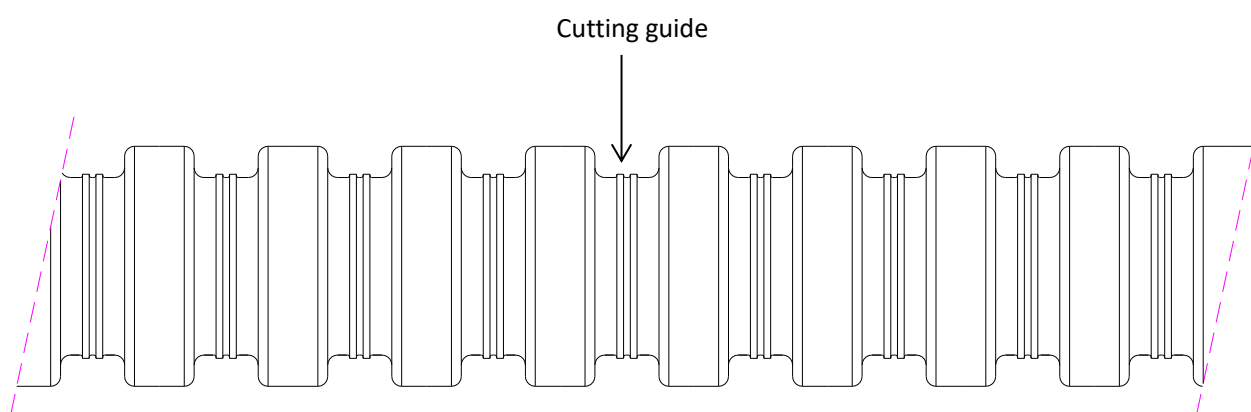


Standard for lubricant usage  
 $\phi 130$  : 13g/part  
 $\phi 150$  : 15g/part

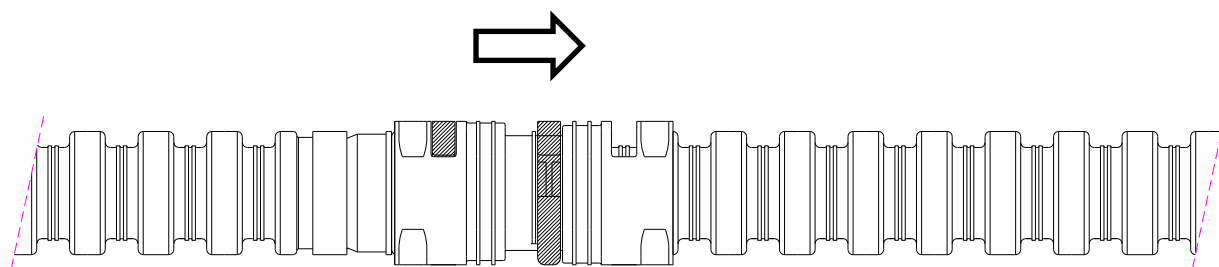


- 4) The EFLEX Square duct not connected to the newly created Male Adapter can now be cut to length, using the groove in the cylindrical section as a guide. Cut slightly longer than the exact length required as shown in the figure below. Cutting is made easy thanks to the groove in the center of every cylindrical section. Please deburr with a knife following length adjustment.



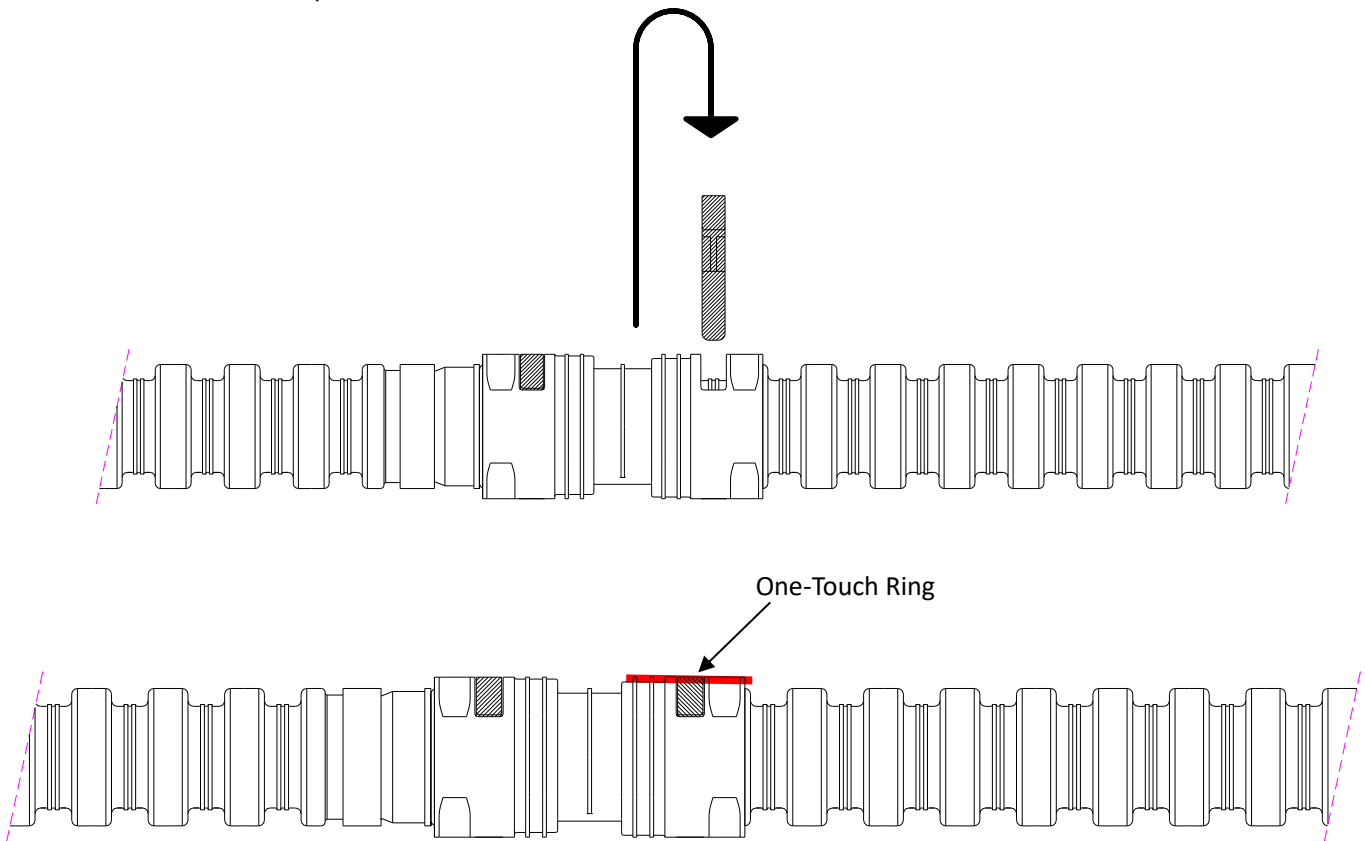


- 5) Insert the cut EFLEX Square until it is fully seated in the AQUA-Square connector.





- 6) Remove the One-Touch Ring from the AQUA-Square connector and insert into the opening to secure the EFLEX Square piece in place (illustrated below). check that the EFLEX-Square is locked in place by trying to pull apart by hand. Ensure the One-Touch Ring clicks into place and is flush with the top surface of the connector.

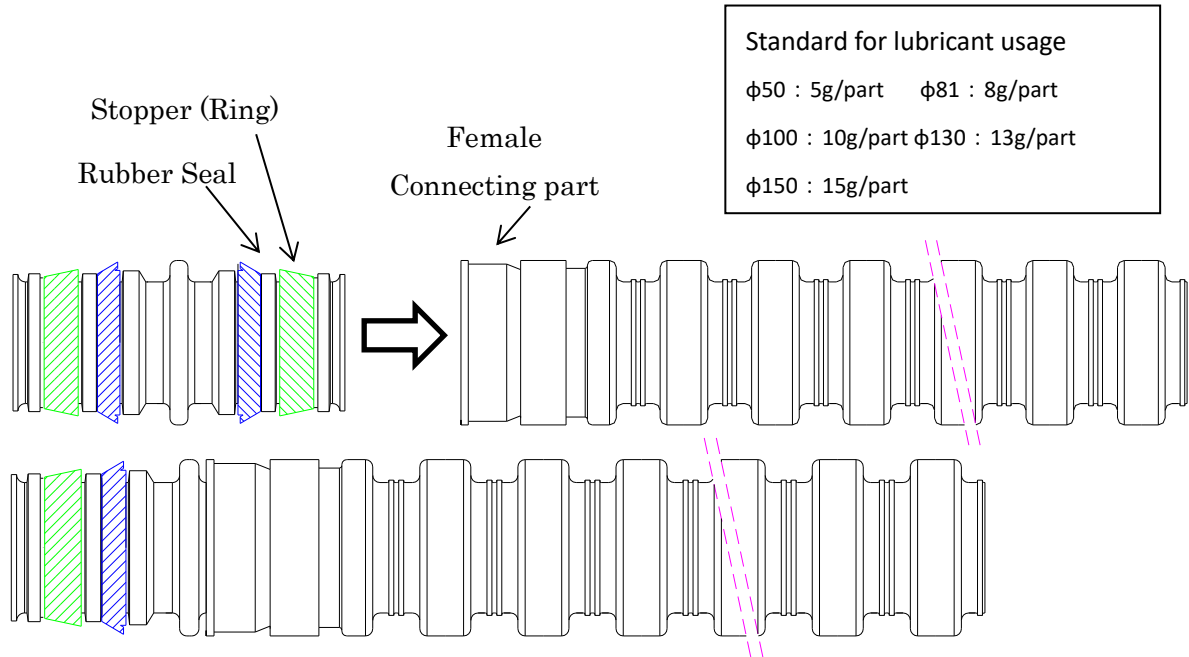


**\*Caution**

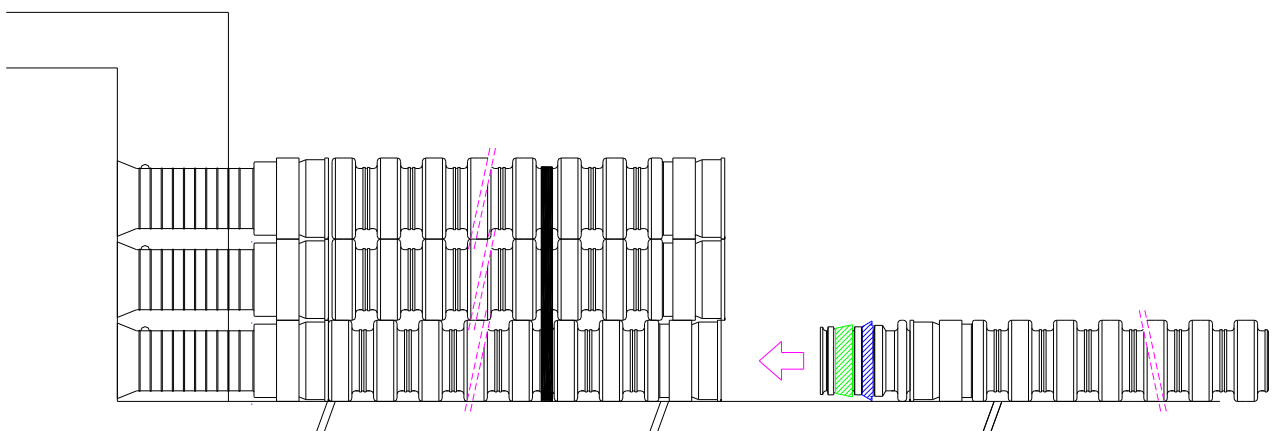
- Install AQUA-Square Male Adapter shortly after removing from its protective plastic bag and ensure that the expanding nonwoven fabric does not contain moisture prior to installation.
- Ensure that parts being connected are free from dirt and debris.
- The EFLEX-Square male end connector is not designed to be used with AQUA-Square connectors.
- Once EFLEX is connected it cannot be removed.
- Ensure the One-Touch Ring clicks into place and is flush with the top surface of the connector.
- Do not use when connecting to bell block.
- Do not use if the total combined length of EFLEX Square between handholes/pits is less than 7m as it will be difficult to bend the ducts.
- Be careful not to apply lubricant to the Stopper (Ring).

## 11. Male to Male Adapter Connection Procedure

- 1) Insert one end of the male to male adapter into the Female end connector of the EFLEX Square duct. Apply lubricant to the rubber seal and inside of the female end connector. Ensure the connection is made in a straight line with no angle and once connected check that it is locked in place secure by trying to pull apart by hand



- 2) Insert the other end of the male to male adapter into the female end connector. Apply lubricant to the rubber seal and inside of the female end connector. Ensure the connection is made in a straight line with no angle and once connected check that it is locked in place secure by trying to pull apart by hand.

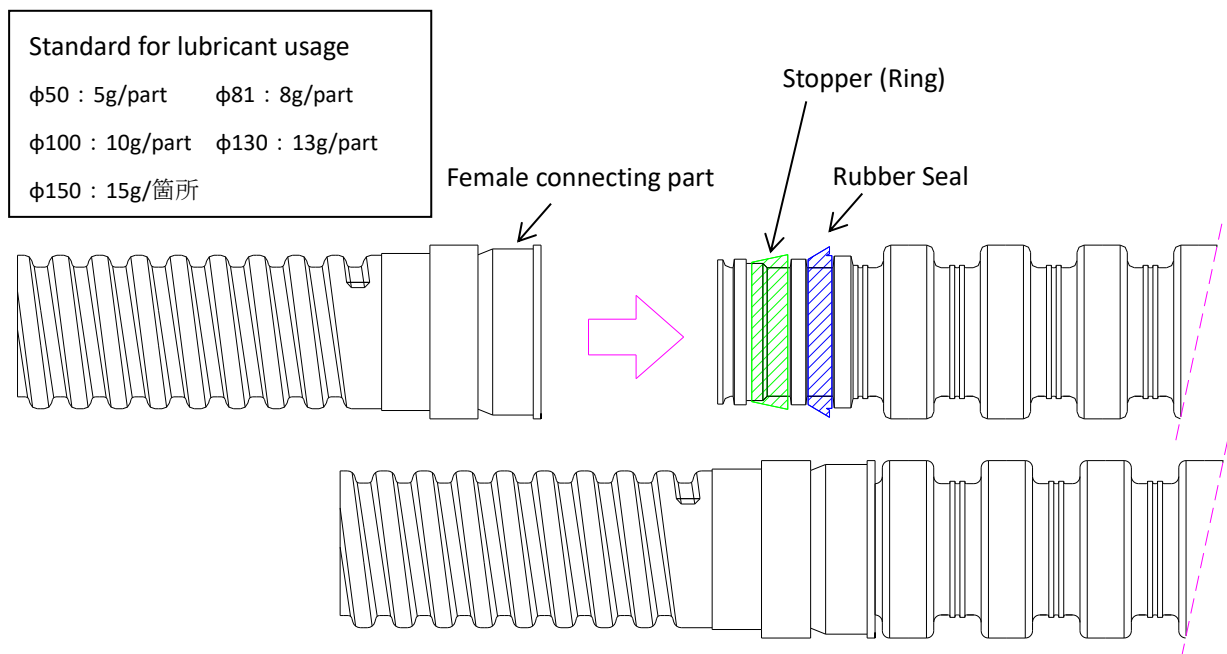


**\*Caution**

- Ensure that parts being connected are free from dirt and debris.
- Once EFLEX is connected it cannot be removed.
- Be careful not to apply lubricant to the Stopper (Ring).

**12. Adapter for joining to other types of pipe conduits**

- 1) Insert the male end of EFLEX Square into the Adaptor for joining to other types of pipe conduits. Insert straight so that it does not become oblique. Ensure the connection is made in a straight line with no angle and once connected check that it is locked in place secure by trying to pull apart by hand.



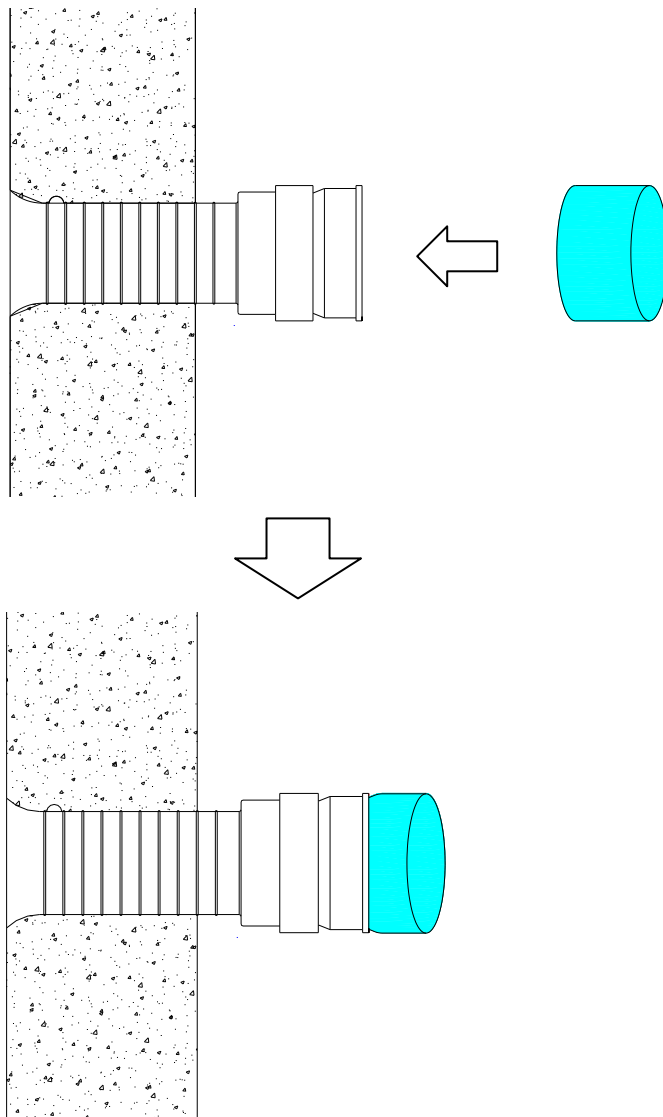
- 2) Use AQUAFIT or flame retardant AQUAFIT to connect the adapter for joining to other types of pipe conduits to round EFLEX, steel pipe, etc. Contact us for details of available connectors.

**\*Caution**

- Ensure that parts being connected are free from dirt and debris.
- Once EFLEX is connected it cannot be removed.
- Be careful not to apply lubricant to the Stopper (Ring).

### 13. Procedure for using the temporary plug

Insert the temporary plug into the female connecting part of the long bell mouth. Compress the plug by hand to fit it into EFLEX Square. It can also be used for EFLEX Square Duct when it has been cut and the female joint part of the bell block.



#### \* Caution

- The outer diameter of the protective cap is larger than the inner diameter of the female coupling. Therefore, when inserting please crush the protective cap by hand to secure in place.
- All EFLEX Square Duct pieces are supplied with a protective cap over the male end.