### Joining Method

#### Joining method for TS joint/Hi-TS joint

1. **Piping tool and material**
   - Saw for woodwork or pipe cutter
   - Bastard cut file (300 mm for ironwork)
   - Measure • Marker
   - ESLON adhesive • Waste cloth
   - Industrial alcohol
   - Slinging wire rope or insertion band
   - ESLON inserter or puller

2. **Pipe cutting**
   Correctly locate the cutting section, and mark a cutting line perpendicularly to the pipe axis with a marker, etc. Cut the pipe with a saw.

3. **Chamfering the pipe opening**
   Finely chamfer the inside and outside of the pipe opening with a file or knife. Especially when the pipe is cut, finish the pipe end beautifully by removing burrs. Unless the pipe opening is chamfered, the adhesive applied to the socket will be removed during connection, causing the socket to slip off. Be sure to finely chamfer the pipe opening.

4. **Cleaning the socket and pipe opening**
   Wipe the inside of the socket at the joint and pipe opening with a waste cloth to remove adhering sand, earth, oil, or water.

5. **Marking the insertion length**
   Lightly insert the pipe into the joint socket to check that the location at which the pipe stops is between 1/3 and 2/3 of the length of the socket. Then mark the socket length on the pipe of 40 mm or less in nominal diameter. When the nominal diameter exceeds 50 mm, mark an insertion line at a location that is equivalent to the zero point plus 1/3 of the socket length.

6. **Installation of slinging wire rope and inserter**
   Manual insertion is possible when the nominal diameter is 50 mm or less and the working condition is satisfactory.

7. **Application of adhesive**
   Uniformly apply an adhesive to the inside and outside of the joint in this order.

8. **Insertion of pipe**
   Align the axis of the pipe socket with that of the pipe opening, and insert the pipe up to the marked line by the inserter.

9. **Retention for curing**
   Allow the connected section to stand for 30 seconds when the nominal diameter is 50 mm or less and for 60 seconds when the nominal diameter is 65 mm or more, and check that the pipe will not come off.

10. **Removal of solvent vapor**
    After completion of piping, be sure to ventilate the work site to remove the vapor of solvent in the adhesive applied to the inside.

---

### Joining method for ESLON Hi joint transparent blue

The ESLON Hi joint transparent blue is a newly developed joint that permits confirmation of the applied condition of an adhesive and inserted state of a pipe. Follow the above-mentioned procedures from pipe cutting to cleaning.

1. **Marking the zero point**

2. **Installation of clamp**
   - Apply a clamp to the pipe and joint.
   - Manual insertion is possible when the working condition is satisfactory.

3. **Application of adhesive**
   - Be sure to use ESLON adhesive No.83 white.
   - Uniformly apply an adhesive to the inside and outside.
   - Brush for application
   - Apply thinly to the inside of the joint.
   - Missing adhesive
   - Excessive application
   - Pay special attention to the underside.

4. **Insertion of pipe**
   - Lightly insert the pipe into the joint for positioning, and hold the clamps with a handle and tighten them. Be sure to insert completely.
   - Insert the pipe as quickly as possible after application of an adhesive.
   - Hammering
   - Joint breakage or water leakage will result.
   - The pipe cannot be inserted.

5. **Retention for curing**
   - Allow the joint to stand with a load
   - The retention time is more than 30 seconds.
Joining method for DV joint/DV-VU joint

The cleaning process is the same as that of TS joints and HI-TS joints.

1. Pipe cutting
   - Mark all around the cutting section or wind tape to cut the pipe perpendicularly to the pipe axis.
   - **CAUTION** Cut off the deformed or scratched section.

2. Chamfering
   - Chamfer the edge of the inside and outside of the pipe to remove burrs.
   - **CAUTION** Do not connect an original pipe or a pipe right after cutting by a saw.

3. Cleaning the socket and pipe opening
   - Wipe the socket and pipe opening with a dry waste cloth to remove water, earth, dust, and oil.

4. Marking the insertion length
   - Mark a line at a location equivalent to the socket length.

5. Installation of insertion fixing jig
   - Be sure to use the ESLON inserter for pipes of 65 or more in nominal diameter.

6. Application of adhesive
   - Thinly and uniformly apply an appropriate quantity of ESLON adhesive to the inside and outside of the pipe in this order.
   - **CAUTION** Do not hammer or insert the pipe slantwise, otherwise water leakage may result.

7. Insertion of pipe
   - Insert the pipe straight up to the marked line.
   - **CAUTION** Insert the pipe quickly at a stroke without stopping halfway.
   - Do not hammer or insert the pipe slantwise, otherwise water leakage may result.

8. Retention (Wipe off the adhesive.)
   - Retain the joint with a load applied.
   - **CAUTION** Wipe off the excessive adhesive.

---

Joining method for transparent DV joint/transparent DV-VU joint

The cleaning process is the same as that of TS joints and HI-TS joints.

1. Pipe cutting
   - Right angle
   - Mark all around the cutting section or wind tape to cut the pipe perpendicularly to the pipe axis.
   - **CAUTION** Cut off the deformed or scratched section.

2. Chamfering
   - All around
   - Chamfer the edge of the inside and outside of the pipe to remove burrs.
   - **CAUTION** Do not connect an original pipe or a pipe right after cutting by a saw.

3. Cleaning
   - Wipe the socket and pipe opening with a dry waste cloth to remove water, earth, dust, and oil.

4. Marking the insertion line
   - Mark a line at a location equivalent to the socket length.

5. Installation of insertion fixing jig
   - Be sure to use the ESLON inserter for pipes of 65 or more in nominal diameter.

6. Application of adhesive
   - Apply thinly to the inside of joint.
   - **CAUTION** Apply special attention to the underside.

7. Insertion of pipe
   - Straight insertion up to the marked line
   - **CAUTION** Insert the pipe quickly at a stroke without stopping halfway.

8. Retention (Wipe off the adhesive.)
   - Retain the joint with a load applied.
   - **CAUTION** Wipe off the excessive adhesive.

---

**CAUTION** When generation of algae due to light transmission on the rooftop is conceivable, apply the light-tight tape.
Installation procedure for ESLON inserter (Example: DT)

1. Apply the fixing jig to the DT socket. Keep the tightening wire pulled out on the slinging side.

2. Double-wind the wire around the fixing jig. Wind the wire so that it will be hooked at the back of the joint socket.

3. Hook the slinging portion of the wound wire on the fixing jig.

4. Pull strongly the wire on the aluminum piece side to sufficiently tighten the fixing jig, and then secure the wire with a wing nut.

5. Check the back of the joint to confirm that the wire is hooked at the back of the socket.

6. Now the fixing jig on the joint side has been attached.

7. Then attach another fixing jig to the pipe in the same method. (Installation at a location 30-40 cm away from the pipe end)

8. After application of an adhesive, set the hook on the wire side of the inserter on the joint fixing jig and the hook on the inserter side on the pipe-side fixing jig.

9. Operate the lever of the inserter quickly for joining. After joining, keep the inserter as it is for some time without removing it immediately.

Fixing jig installation method for each joint shape

- DL
- 45° L
- 45° Y

Precautions as to use of ESLON inserter

**CAUTION**

- Do not attach a pipe, etc. to the handle of the inserter.
- Apply a load to the center of the hook.

Incorrect setting method

Correct setting method

- Double-wind the wire around the drum shaft.
- Periodically check the inserter, and do not use an old or damaged inserter.

Precautions as to execution

**WARNING**

- Ventilate the work site when using an adhesive.
- Be sure to wear gloves to avoid adhesion to the skin during application of an adhesive.
- Be sure to uniformly apply an adhesive to the pipe opening and socket. Apply an adhesive uniformly to the joint and pipe in this order. Thinly apply the adhesive to the joint socket.
- After applying an adhesive, insert the pipe into the joint immediately, and hold the joint as it is until it is confirmed that the pipe will not come off. The standard retention time is shown in the table at right. Spend longer time in summer than in winter. The higher the temperature, the stronger the adhesive force.
- Clean the adhesion surfaces as clean as possible. Avoid oil and water especially.
- Be sure to use an adhesive that matches the type of pipe.

<table>
<thead>
<tr>
<th>Nominal Dia.</th>
<th>$\leq 50$ or Less</th>
<th>$\geq 65$ or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention Time</td>
<td>30 sec. or more</td>
<td>Summer: 1 min. or more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winter: 2 min. or more</td>
</tr>
</tbody>
</table>
Rubber ring joining

ESLON bell pipe-L, HI bell pipe-L gold +(plus), and HI bell pipe long gold +(plus) for waterway

(Piping tool and material)
- Bell support
- Saw for woodworking
- ESLON chamfering tool
- Slinging wire rope
- Inserter: 1/2 ton (capacity)
- Measure and marker
- Lubricant and brush
- Waste cloth
- Clearance gauge

Application of lubricant
- Apply the ESLON lubricant No.2 to the area from the chamfered section of the pipe opening up to the position approx. 1/2 of the insertion length. Slightly apply the lubricant to the rubber ring of the socket.
- Standard quantity of application (Reference)

<table>
<thead>
<tr>
<th>Nominal dia.</th>
<th>50</th>
<th>75</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of application</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Pipe cutting
- Mark a line perpendicularly to the pipe axis with a marker to indicate the cutting section. Perpendicularly cut the pipe with a saw for woodworking.

Chamfering the pipe opening
- Chamfer the cut pipe end at 15° with a bastard cut file for steel working or the ESLON chamfering tool. (Standard-length pipes have been chamfered.)

Marking the insertion length (When pipe is cut)
- To show the reference length of pipe insertion for connection, mark a line on the pipe opening side to indicate the insertion length. (The line has been marked on standard-length pipes.)

Pipe cleaning
- Wipe earth and sand off the inside of socket and the outside of the pipe opening with a waste cloth. When the rubber ring is removed, refer to the correct rubber ring installation method (p.47).

Installation of inserter
- Insertion with bell support (For bell pipe long gold +(plus) and other pipes with nominal dia. 150 or less)
  - Open the clamp to the fullest extent, and set the fixed-side clamp on the socket and the movable-side on the pipe opening. Secure the clamp by the tightening lever. Tighten the movable-side clamp completely so that it will not slip during insertion.

Installation of torque lever
- Set the torque lever on the torque lever receiver for insertion. Check the engagement between the rack and pinion at that time. Exercise care so as not to bite foreign substances.

Insertion of pipe
- While the torque lever gear is engaged, move the handle to the socket side to insert the pipe.
  - Insert the pipe up to the position between the two marked lines. The torque lever is of a ratchet type. Slide the handle to return it to the pipe side and move it to the socket side again, and the pipe can be inserted easily.

Inspection of joint
- After insertion is completed, put a clearance gauge or a thin metallic sheet into the socket to check that the rubber ring is at the uniform depth all around.
Correct installation of rubber ring

When earth and sand enters the socket, it is necessary to remove the rubber ring to wash it. At that time, remove the rubber ring in the manner shown below.

1. Wet the rubber ring with water to make it slippery.

   **CAUTION**
   
   When lubricant is used instead of water, the rubber ring may get out of the groove when the pipe is joined, causing leakage. Never use lubricant.

2. Squeeze the rubber ring into a heart shape to make the diameter smaller. Hold the rubber ring so that the flap of the rubber ring will face the inside of the socket.

3. Put the rubber ring in the groove of the socket, and release your hand slowly to fit the rubber ring in the groove. Be sure to check that the rubber ring is in position. If it is out of position, correct it.

   **CAUTION**
   
   Be sure to use the ESLON lubricant No.2 for pipes for waterway.

---

Installation of ESLON bell grip

Bell grip V type and bell grip for HI bell pipe long gold +(plus)

1. Cleaning

   After inserting the pipe up to the marked line, wipe the earth and sand off the inside of the catcher and the surface of the pipe with a waste cloth.

2. Installation of stopper and connecting rod

   Make a set of upper and lower stoppers, and set the connecting rods. Attach the catcher at a position approx. 10 mm from the edge of a socket in the case of the bell grip V type, and at the position of the marked line of the pipe and joint (third line from the pipe end) in the case of the bell grip for the HI bell pipe long gold +(plus).

3. Bolt tightening

   Refer to the standard tightening torque shown below, and tighten bolts.

<table>
<thead>
<tr>
<th>Nominal dia.</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 or less</td>
<td>400</td>
</tr>
<tr>
<td>125~150</td>
<td>600</td>
</tr>
<tr>
<td>200</td>
<td>800</td>
</tr>
</tbody>
</table>

   **CAUTION**
   
   • Be sure to use the ESLON lubricant No.2 to join the rubber ring.
   • Chamfer the pipe as shown at right, otherwise the rubber ring may be damaged or twisted during insertion. (Standard-length pipes have been chamfered.)
   • When setting the torque lever on the torque lever receiver, check that the teeth are engaged correctly without foreign substances, and gradually apply force.
   • Be sure to set pipes in position when joining them. In the case of the HI bell pipe long gold +(plus), the earthquake-resistant function with ±75 mm (±15% of the pipe length of 5 m) extension/contraction allowance will be lost unless the pipes are set in position.
### Procedure for joining slip-out preventive joints

**ESLON LJ series**  
Refer to “Rubber ring joining” on pages 46 and 47 for details.

1. **Pipe cutting**
2. **Chamfering the pipe opening**  
   Standard-length pipes have been chamfered.
3. **Marking the insertion length**
   ![Nominal dimensions](image)

4. **Inspection of socket and pipe opening**  
   Check that the slip-out preventive ring, rubber ring, and collar are in position.
5. **Pipe cleaning**
6. **Application of lubricant**
7. **Installation of bell support**
8. **Insertion of pipe**
9. **Inspection of connection**

### Procedure for removing slip-out preventive joints

**ESLON LJ series**

#### (Piping tool and material)
- Bell support
- Unlocking jig
- For 50 - 1 set with 2 sheets
- For 175-150 - 1 set with 3 sheets
- Hammer
- ESLON lubricant No.2
- Brush

1. **Cleaning of socket and reinsertion of pipe**
   Remove sand and other foreign substances from the edge of the socket, and then reinsert the pipe completely (up to the position where the slip-out preventive ring can expand).
   ![Cleaning and reinsertion](image)

2. **Installation of unlocking jig**
   Apply lubricant all around the unlocking jig (spatula), and insert it between the pipe and joint.
   (One sheet at the notched position of the ring, and the other two at the locations that will divide the gap into three equal parts. In the case of 50, the notched position of the ring and the opposite position) Hammer the unlocking jig until the spatula holding frame touches the edge of the socket.
   ![Installation of unlocking jig](image)

3. **Installation of inserter**
   Minimize the clamp distance, and set the inserter at the position where the fixed-side clamp touches the spatula holding frame.
   ![Installation of inserter](image)

4. **Tightening the nut**
   Tighten nuts so that the movable-side clamp will be tightened strongly, while the fixed-side clamp will be tightened softly. When the clamp tightening lever on the fixed side is tightened excessively, the clamp will not slip and the pipe will not be pulled out.
   ![Tightening the nut](image)

5. **Installation of torque lever**
   Set the torque lever on the torque lever receiver for extraction in a manner that the gear of the torque lever will be completely engaged with the slide lever teeth.
   ![Installation of torque lever](image)

6. **Removal of pipe**
   Tilt the handle in the direction opposite to the socket to pull out the pipe.
   ![Removal of pipe](image)

**CAUTION**
- Be sure to use the ESLON lubricant No.2.
- When it is necessary to remove the slip-out preventive joint, indicate the position of the notched section of the slip-out preventive ring in advance during insertion.
- Sharp teeth are provided on the inside of the slip-out preventive ring. Be sure to wear gloves when installing it, otherwise your hand may be cut by the teeth when you touch them.
- When the pipe is removed by the unlocking jig, the rubber ring in the socket is damaged. Replace it with a new one.
- Never put in and out the slip-out preventive ring, otherwise the pipe will slip out.
Precautions as to flow examination
Be sure to completely bleed the pipe of air by water pressure before the leakage test after piping. When air pressure is used, the pipe and joint may fly, causing injury.

Removal of adhesive vapor
When the gate valve is closed or the pipe end is sealed with a cap during piping, the pipe may be attacked by the vapor of the adhesive inside the pipe, breaking the pipe when water flows.
Open the gate valve and pipe end after piping in order to release the vapor of the adhesive.
In places where the temperature drops below 5 °C, remove vapor by a blower after piping.
Passing water without pressure is effective.

Relationship between the curing time of ESLON adhesive and contact strength
The value shown in the graph indicates the performance of the adhesive, which does not guarantee the adhesive strength during curing. The strength of a pipe and joint changes according to the size, quantity of application, adhesion temperature, retention time, and quantity of insertion.

Smell of adhesive
The ESLON adhesive contains an organic solvent. When water is passed while the adhesive is not dried sufficiently after application, the water may smell. Dispose of the initial stagnant water.

Measures to cope with SC (solvent crack)
SC (solvent cracking) means cracks in vinyl chloride pipes due to the action of a solvent contained in the adhesive. (Cracks will also be caused by an antiseptic agent.) Cracks will occur easily especially at low temperatures (in winter). Take the following measures against SC.

<table>
<thead>
<tr>
<th>Item</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate quantity of adhesive</td>
<td>thinly and uniformly apply the quick-drying adhesive No.80.</td>
</tr>
<tr>
<td>Wiping off the adhesive</td>
<td>After adhesion, be sure to wipe off the extruded adhesive. Remove the adhesive that dropped on the floor during application.</td>
</tr>
<tr>
<td>Ventilation</td>
<td>After piping, remove the solvent vapor from the pipe by a blower.</td>
</tr>
<tr>
<td>Precautions as to curved piping</td>
<td>Be sure to use a bend.</td>
</tr>
<tr>
<td>Use of sand cushion</td>
<td>A stone striking directly against a pipe will cause local stress. Be sure to provide a sand cushion.</td>
</tr>
<tr>
<td>Adoption of advance joining</td>
<td>Join 2 to 4 pipes in advance. Then after removing the solvent vapor by natural ventilation, connect pipes finally at the premises.</td>
</tr>
<tr>
<td>Quick backfilling</td>
<td>When pipes are exposed for a long time, the temperature difference increases and the tensile stress increases. Be sure to backfill the site quickly as specified.</td>
</tr>
<tr>
<td>Keeping both ends of pipe open</td>
<td>Leave the valve and air valve open for ventilation to remove solvent vapor.</td>
</tr>
<tr>
<td>Washing with water</td>
<td>After piping, wash the pipe with water quickly as much as possible.</td>
</tr>
</tbody>
</table>

Adhesion performance of HI

Relationship between curing time and adhesive strength
The relationship between the curing time and strength when an HI pipe and joint are TS-joined is shown at right, which shows the comparison with the adhesive No.73 for ESLON N/V/P.

Application quantity of adhesive

Application quantity of adhesive per place of pipes with respective diameters

<table>
<thead>
<tr>
<th>Nominal dia.</th>
<th>13</th>
<th>16</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>65</th>
<th>75</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application quantity (g)</td>
<td>0.7</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
<td>3.5</td>
<td>5.0</td>
<td>6.5</td>
<td>10.0</td>
<td>15.0</td>
<td>20.0</td>
<td>30.0</td>
<td>55.0</td>
<td>90.0</td>
<td>125.0</td>
</tr>
</tbody>
</table>

Do not mix different adhesives.
Do not use an adhesive mixed with water or sand, an adhesive that has no irritating smell peculiar to an adhesive, or an adhesive in a jelly state.
When placing an order for an adhesive, specify 1.3 times the required quantity in consideration of the loss during application on site and the change in quantity due to seasonal change.
Use of ESLON DV joint accessories

- **Flange type cleaning hole**

- **Valve socket for drainage**

- **Repairing a pipe with an exchange socket**

- **Trap socket**

- **Steel pipe adapter**

Plug-fit socket 〈ES〉 (Plug-fit socket type S)

- **Precautions as to use of plug-fit socket**

  - **CAUTION**
    1. The box nut section of the plug-fit socket has been bonded to prevent an installation error. The section cannot be disconnected.
    2. When inserting a pipe, apply lubricant to the pipe and the rubber ring of the socket, respectively.
    3. When the pipe is cut, be sure to chamfer the pipe edge by approx. 1-2 mm.

  - **Necessary insertion force for each nominal diameter**

  - **Standard application quantity for ESLON pipe of each diameter** (Reference)

  Notes: 1. The application thickness is assumed to be 200 g/m².
  2. In consideration of the loss at work site, place an order for about 1.3 times the standard quantity.
## Measures against extension and contraction of drainage pipeline (Installation of plug-fit socket)

<table>
<thead>
<tr>
<th>Piping position</th>
<th>Vertical piping</th>
<th>Horizontal piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation standard</td>
<td>Find an appropriate location to install the plug-in socket with its socket side (rubber ring side) facing the upstream side so that the movement of the joint due to the extension and contraction of the pipe will be minimized.</td>
<td>1. Install a socket when the pipe from the junction is longer than 2 m. Install a socket at intervals of 4 m when the pipe from the junction is longer than 4 m.</td>
</tr>
<tr>
<td></td>
<td>1. When the pipe is secured through a floor and there is a junction, install a socket on the upper side of the joint at one location on each floor. (No.1-No.3)</td>
<td>2. When the socket is installed at the junction of a vertical pipe or when the through section is secured by a wall, etc., it is unnecessary to secure the plug-in socket. However, when the socket is installed at a junction of a horizontal pipe and a horizontal branch pipe, secure the plug-in socket.</td>
</tr>
<tr>
<td></td>
<td>2. When the pipe is secured through a floor and there is no junction, install a socket at one location on each floor. (No.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. When the pipe is not secured and there is a junction, install a socket on the upper side of the joint at one location on each floor. In that case, be sure to secure the plug-in socket. (No.5-No.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. When the pipe is not secured to the through section and there is no junction, install a socket at intervals of 4 m. (No.8)</td>
<td></td>
</tr>
</tbody>
</table>

#### Example of good installation

<table>
<thead>
<tr>
<th>When the through section is secured</th>
<th>When the through section is free</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.1</td>
<td>No.2</td>
</tr>
</tbody>
</table>

#### Example of bad installation

<table>
<thead>
<tr>
<th>When the through section is secured</th>
<th>When the through section is free</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.9</td>
<td>No.10</td>
</tr>
</tbody>
</table>

#### Explanation

- When installation is impossible in the case of No.1, install a socket near the joint as much as possible.
- When installation is impossible in the case of No.2, install a socket near the slab as much as possible even if the location is under the slab.
- In the case of No.4, install a socket at any location within the span.
- In the cases of No.9-No.13, there is a junction joint at a location where the influence of the extension and contraction of the pipe is maximum. The worst cases are shown.

#### Installation on soil pipe

1. The installation method is similar to the case of miscellaneous drainage pipes when piping is vertical.
2. In the case of horizontal piping, a socket is necessary when the straight section exceeds 4 m.

The installation interval should be 4 m. In other cases, follow the method adopted for miscellaneous drainage pipes.
### Performance

**Characteristics of ESLON pipe for waterway**

**Hard vinyl chloride pipe and joint for waterway (JIS K 6742/6743: 1999)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength</td>
<td>The breaking strength of 1% at 23°C is 45 MPa or more. (Test at H = 42 MPa)</td>
</tr>
<tr>
<td>Pressure resistance</td>
<td>There shall be no leakage or other abnormality.</td>
</tr>
<tr>
<td>Flatness</td>
<td>There shall be no cracks or fissures.</td>
</tr>
<tr>
<td>Impact resistance[1]</td>
<td>There shall be no abnormality.</td>
</tr>
<tr>
<td>Vicat softening temperature</td>
<td>76°C or more.</td>
</tr>
<tr>
<td>Turbidity</td>
<td>0.5 degree or less.</td>
</tr>
<tr>
<td>Chromaticity</td>
<td>1 degree or less.</td>
</tr>
<tr>
<td>TOC</td>
<td>1 mg/l or less.</td>
</tr>
<tr>
<td>Lead</td>
<td>0.008 mg/l or less.</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.5 mg/l or less.</td>
</tr>
<tr>
<td>Loss of residual chlorine</td>
<td>0.7 mg/l or less.</td>
</tr>
<tr>
<td>Smell</td>
<td>There shall be no abnormality.</td>
</tr>
<tr>
<td>Taste</td>
<td>There shall be no abnormality.</td>
</tr>
<tr>
<td>Opacity[2][3]</td>
<td>Visible light transmissivity is 0.2% or less.</td>
</tr>
</tbody>
</table>

Notes: 1. The impact resistance applies to the impact-resistant hard vinyl chloride pipe (HiP).
2. The test temperature shall be normal.
3. The leachability of joint applies to the vinyl chloride polymer molded section.
The specification will be shown separately for joints with metal in sections in contact with water.
4. The opacity applies to the hard vinyl chloride pipe (VP).

**Characteristics of ESLON PE double-layer pipe**

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
<th>Test temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile yield strength</td>
<td>9.8 N/mm² (100 kgf/cm²) or more</td>
<td>23±2°C</td>
</tr>
<tr>
<td>Water pressure resistance</td>
<td>There shall be no leakage or other defects.</td>
<td></td>
</tr>
<tr>
<td>Leachability</td>
<td>Concentration: 0.5 degree or less</td>
<td></td>
</tr>
<tr>
<td>TOC</td>
<td>1 mg/l or less.</td>
<td></td>
</tr>
<tr>
<td>Loss of residual chlorine</td>
<td>0.7 mg/l or less.</td>
<td></td>
</tr>
<tr>
<td>Smell</td>
<td>There shall be no abnormality.</td>
<td></td>
</tr>
<tr>
<td>Ash content</td>
<td>0.07% or less.</td>
<td></td>
</tr>
<tr>
<td>Chlorine water pressure</td>
<td>There shall be no generation of foam.</td>
<td></td>
</tr>
<tr>
<td>Environmental stress</td>
<td>There shall be no cracks and other defects.</td>
<td></td>
</tr>
<tr>
<td>Carbon concentration</td>
<td>Between 2.0 and 3.0%</td>
<td></td>
</tr>
</tbody>
</table>

**Water examination result (Result of leach test based on the Water Utilities Design Guideline of the Ministry of Health and Welfare)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ESLON Hi pipe gold (plus)</td>
<td>g/cm³</td>
<td>1.43</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>ESLON pipe for waterway</td>
<td>HRR</td>
<td>110–120</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>ESLON hits joint gold (plus)</td>
<td>Water absorption</td>
<td>0.04–0.06</td>
<td>0.04–0.06</td>
<td></td>
</tr>
<tr>
<td>ESLON TS joint for waterway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Physical properties of ESLON pipe**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical characteristics</td>
<td>Density</td>
<td>g/cm³</td>
<td>1.43</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Hardness (Rockwell)</td>
<td>HRR</td>
<td>110–120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water absorption</td>
<td>mg/m²</td>
<td>0.04–0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical characteristics</td>
<td>Tensile strength</td>
<td>MPa (kgf/cm²)</td>
<td>49–53.9 [500–550]</td>
<td>50.3–53.2 [513–543]</td>
<td></td>
</tr>
<tr>
<td>Tensile fracture elongation</td>
<td>%</td>
<td>50–150</td>
<td>140–200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bending strength</td>
<td>MPa (kgf/cm²)</td>
<td>88.3 [900]</td>
<td>68.6 [700]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressive strength</td>
<td>MPa (kgf/cm²)</td>
<td>64.7 [660]</td>
<td>61.7 [630]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shear strength</td>
<td>N/mm² (kgf/mm²)</td>
<td>64 [650]</td>
<td>49.0 [500]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulus of longitudinal elasticity</td>
<td>N/mm² (kgf/mm²)</td>
<td>2.942×10³ [3×10⁴]</td>
<td>2.156×10³ [2.2×10⁴]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poisson’s ratio (Poisson’s number)</td>
<td></td>
<td>0.38 [2.63]</td>
<td>0.37 [2.70]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact strength</td>
<td>kJ/m²</td>
<td>4.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient of linear expansion</td>
<td>/C</td>
<td>7–8×10⁻⁵</td>
<td>7–8×10⁻⁵</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific heat</td>
<td>J/kg–K</td>
<td>1.21</td>
<td>1.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>W/m–K</td>
<td>0.19</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vicat softening temperature</td>
<td>°C</td>
<td>83</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile stress (welding temperature)</td>
<td>°C</td>
<td>180–185</td>
<td>180–185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflammability</td>
<td>Self-extinguishable</td>
<td></td>
<td></td>
<td>Self-extinguishable</td>
<td></td>
</tr>
<tr>
<td>Electric characteristics</td>
<td>Volume resistivity</td>
<td>Ω·cm·m</td>
<td>0.2×10⁵</td>
<td>0.2×10⁵</td>
<td></td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>kV/mm</td>
<td>40</td>
<td>40 or more</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The SI unit (International System of Units) is adopted. [ ]: Conventional unit

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## Chemical resistance of ESLON pipe

- **Not attacked/○:** Regarded to be not attacked in general
- **△:** Attacked slightly and unusable under some condition
- **X:** Unusable

<table>
<thead>
<tr>
<th>Name of chemical</th>
<th>Temperature °C</th>
<th>Name of chemical</th>
<th>Temperature °C</th>
<th>Name of chemical</th>
<th>Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Inorganic acid</td>
<td>100</td>
<td>○ Maleic acid</td>
<td>44</td>
<td>○ Benzene sulfonic acid</td>
<td>50</td>
</tr>
<tr>
<td>○ Sulfuric acid</td>
<td>100</td>
<td>○ Methylsulfuric acid</td>
<td>50</td>
<td>○ Butyric acid</td>
<td>20</td>
</tr>
<tr>
<td>○ Hydrochloric acid30 or less</td>
<td>30 or more</td>
<td>○ Potassium hydroxide</td>
<td>40 or less</td>
<td>○ Calcium chloride sat.</td>
<td></td>
</tr>
<tr>
<td>○ Chloric acid</td>
<td>20 or less</td>
<td>○ Potassium chloride</td>
<td>40 or more</td>
<td>○ Sodium hydroxide (Caustic soda)</td>
<td>40 or less</td>
</tr>
<tr>
<td>○ Chlorine water sat.</td>
<td>10</td>
<td>○ Aqueous ammonia</td>
<td>30</td>
<td>○ Magnesium hydroxide sat.</td>
<td>40 ~ 60</td>
</tr>
<tr>
<td>○ Perchloric acid</td>
<td>10 or less</td>
<td>○ Sodium chloride</td>
<td>10</td>
<td>○ Hexamethylene diamine (DOP)</td>
<td>100</td>
</tr>
<tr>
<td>○ Chromium mixed acid</td>
<td></td>
<td>○ Zinc chloride sat.</td>
<td>40</td>
<td>○ Cyclohexanone</td>
<td>100</td>
</tr>
<tr>
<td>CrO3 (25%):H2SO4 (20%):aq (55%)</td>
<td>40</td>
<td>○ Aluminum chloride</td>
<td>25</td>
<td>○ Cyclohexanol</td>
<td>100</td>
</tr>
<tr>
<td>○ (40): - (20):aq (40)</td>
<td></td>
<td>○ Ammonium chloride</td>
<td>27</td>
<td>○ Cyclohexanol</td>
<td>100</td>
</tr>
<tr>
<td>○ Alkali</td>
<td></td>
<td>○ Potassium chloride</td>
<td>1</td>
<td>○ Cyclohexanone</td>
<td>100</td>
</tr>
<tr>
<td>○ Calcium chloride</td>
<td></td>
<td>○ Mercury chloride sat.</td>
<td>10</td>
<td>○ Dimethyl formamide</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium chloride</td>
<td></td>
<td>○ Stannic chloride</td>
<td>25</td>
<td>○ Tetraethylethylene</td>
<td>100</td>
</tr>
<tr>
<td>○ Magnesium chloride</td>
<td></td>
<td>○ Ferric chloride sat.</td>
<td>10</td>
<td>○ Trichloethylene</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium nitrate sat.</td>
<td></td>
<td>○ Cupric chloride</td>
<td>1</td>
<td>○ Toluene</td>
<td>100</td>
</tr>
<tr>
<td>○ Calcium nitrate</td>
<td></td>
<td>○ Barium chloride</td>
<td>10</td>
<td>○ Nitrobenzene</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium nitrate</td>
<td></td>
<td>○ Magnesium dichromate</td>
<td>5</td>
<td>○ Uric acid sat.</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium sulfate</td>
<td></td>
<td>○ Potassium hydrogen permanganate</td>
<td>40</td>
<td>○ Carbon disulfide</td>
<td>100</td>
</tr>
<tr>
<td>○ Potassium chloride</td>
<td></td>
<td>○ Potassium persulfate sat.</td>
<td>15</td>
<td>○ Pyridine</td>
<td>100</td>
</tr>
<tr>
<td>○ Antimony trioxide sat.</td>
<td></td>
<td>○ Antimony trioxide</td>
<td>15</td>
<td>○ Butane (liquid)</td>
<td>100</td>
</tr>
<tr>
<td>○ Potassium hyochlorite (bleaching powder)</td>
<td>30</td>
<td>○ Antimony pentoxide</td>
<td>30</td>
<td>○ Butanediol</td>
<td>10 or less</td>
</tr>
<tr>
<td>○ Sodium bisulfate</td>
<td></td>
<td>○ Potassium dichromate</td>
<td>5</td>
<td>○ Butyl alcohol</td>
<td>100</td>
</tr>
<tr>
<td>○ Potassium nitrate sat.</td>
<td></td>
<td>○ Calcium nitrate</td>
<td>50</td>
<td>○ Furfural</td>
<td>100</td>
</tr>
<tr>
<td>○ Calcium nitrate</td>
<td></td>
<td>○ Sodium nitrate</td>
<td>50</td>
<td>○ Furfuryl alcohol</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium sulfate</td>
<td></td>
<td>○ Mercury</td>
<td>100</td>
<td>○ Propane (liquid)</td>
<td>100</td>
</tr>
<tr>
<td>○ Zinc sulfate</td>
<td></td>
<td>○ Ammonium carbonate sat.</td>
<td>100</td>
<td>○ Benzaldehyde sat.</td>
<td>100</td>
</tr>
<tr>
<td>○ Ferric chloride</td>
<td></td>
<td>○ Potassium bicarbonate sat.</td>
<td>20</td>
<td>○ Benzyl alcohol</td>
<td>100</td>
</tr>
<tr>
<td>○ Nickel sulfate sat.</td>
<td></td>
<td>○ Potassium ferrocyanide</td>
<td>10</td>
<td>○ Formaldehyde</td>
<td>36</td>
</tr>
<tr>
<td>○ Magnesium sulfate</td>
<td></td>
<td>○ Calcium fluoride</td>
<td>10</td>
<td>○ Methyl alcohol</td>
<td>100</td>
</tr>
<tr>
<td>○ Aluminium nitrate</td>
<td></td>
<td>○ Potassium iodide sat.</td>
<td>10</td>
<td>○ Methyl ethyl ketone</td>
<td>100</td>
</tr>
<tr>
<td>○ Ferric chloride</td>
<td></td>
<td>○ Sodium sulfate</td>
<td>10</td>
<td>○ Sulfuric acid gas</td>
<td>100</td>
</tr>
<tr>
<td>○ Lactic acid</td>
<td></td>
<td>○ Zinc sulfate</td>
<td>28</td>
<td>○ Ammonia</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium nitrate</td>
<td></td>
<td>○ Aluminium sulfate</td>
<td>25</td>
<td>○ Methyl chloride</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium nitrate</td>
<td></td>
<td>○ Potassium hydroxide (Caustic soda)</td>
<td>40 or more</td>
<td>○ Chlorine (dry)</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium nitrate</td>
<td></td>
<td>○ (alum) sat.</td>
<td>10</td>
<td>○ Chlorine (wet)</td>
<td>10</td>
</tr>
<tr>
<td>○ Sodium sulfate</td>
<td></td>
<td>○ Ammonium sulfate</td>
<td>40</td>
<td>○ Ozone</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium sulfate</td>
<td></td>
<td>○ Ferric sulfate sat.</td>
<td>15</td>
<td>○ Hydrogen</td>
<td>100</td>
</tr>
<tr>
<td>○ Ferric sulfate</td>
<td></td>
<td>○ Copper sulfate</td>
<td>15</td>
<td>○ Carbonic acid gas</td>
<td>100</td>
</tr>
<tr>
<td>○ Nickel sulfate</td>
<td></td>
<td>○ Sodium sulfate</td>
<td>10</td>
<td>○ Propane</td>
<td>100</td>
</tr>
<tr>
<td>○ Magnesium sulfate</td>
<td></td>
<td>○ Ammonium phospate sat.</td>
<td>100</td>
<td>○ Butane</td>
<td>100</td>
</tr>
<tr>
<td>○ Ammonium phospate sat.</td>
<td></td>
<td>○ Sodium phospate sat.</td>
<td>100</td>
<td>○ Phosgene</td>
<td>100</td>
</tr>
<tr>
<td>○ Sodium phospate sat.</td>
<td></td>
<td></td>
<td></td>
<td>○ Hydrogen sulfide</td>
<td>100</td>
</tr>
<tr>
<td>○ Butanediol</td>
<td></td>
<td></td>
<td></td>
<td>○ Melting furnace gas</td>
<td>100</td>
</tr>
</tbody>
</table>

**Note:** In the column of concentration, "sat." means a saturated aqueous solution at normal temperature, and the values less than 100 represent the concentration of aqueous solution in percentage.
Piping system with ESLON pipes for waterway

Establishment of an optimum piping system according to the state of ground and the level of expected earthquakes.
※ Examine separately the method of protection to cope with water pressure, etc.

<table>
<thead>
<tr>
<th>Type of ground</th>
<th>ordinary ground</th>
<th>soft ground, non-liquefaction</th>
<th>liquefaction ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>ordinary ground</td>
<td>earthquake motion level 1</td>
<td>earthquake motion level 1</td>
<td>earthquake motion level 1</td>
</tr>
<tr>
<td>type of pipe</td>
<td>ordinary ground</td>
<td>earthquake motion level 2</td>
<td>earthquake motion level 2</td>
</tr>
<tr>
<td>Hi bell pipe-L gold + (plus) 5m + Bell grip for Hi bell pipe long gold + (plus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi bell pipe-L gold + (plus) 5m + Bell grip for Hi bell pipe long gold + (plus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation range of bell grip for Hi bell pipe long gold + (plus)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Earthquake motion level 1: General earthquake that will occur once or twice during the service period of the facilities
Earthquake motion level 2: The incidence rate is low but the magnitude is high (large-scale plate boundary earthquake and earthquake near fault due to inland earthquake)

Straight pipe section (ordinary ground)
(S-1) Hi bell pipe-L gold + (plus) 5m
(S-3) Hi bell pipe long gold + (plus) 5m + Bell grip

Straight pipe section (soft ground and liquefaction ground)
(S-1) Hi bell pipe-L gold + (plus) 5m
(S-3) Hi bell pipe long gold + (plus) 5m + Bell grip

Straight pipe section (liquefaction ground)
(S-1) Hi bell pipe-L gold + (plus) 5m + Bell grip
(S-2) Hi bell pipe long gold + (plus) 5m + Bell grip

L-shaped piping (ordinary ground)
(1-1) earthquake motion level 1 90° bend pipe (LJ) + Hi bell pipe long gold + (plus) 5m
(1-2) earthquake motion level 2 90° bend pipe (LJ) + Hi bell pipe long gold + (plus) 5m

T-shaped piping (ordinary ground)
(1-1) earthquake motion level 1 T pipe (LJ) + Hi bell pipe-L gold + (plus) 5m
(1-2) earthquake motion level 2 T pipe (LJ) + Hi bell pipe long gold + (plus) 5m

Joint with different type of pipe
earthquake motion level 1
Deformed pipe flange + Single flange (LJ)
Hi bell pipe-L gold + (plus) 5m

earthquake motion level 2
Deformed pipe flange + Single flange (LJ)
Hi bell pipe long gold + (plus) 5m
※ Refer to “Surroundings of structure” on p.56 for details.

Surroundings of structure (joint with gate valve for waterway)
(1-1) earthquake motion level 1 Gate valve for waterway + Single flange (LJ) + Hi bell pipe-L gold + (plus) 5m
(1-2) earthquake motion level 2 Gate valve for waterway + Single flange (LJ) + Hi bell pipe long gold + (plus) 5m

Different type of pipe
Single flange (LJ)
Hi bell pipe long gold + (plus) 5m

Installation range of bell grip for Hi bell pipe long gold + (plus)
**Straight piping**

\[<S-1>\]
- Earthquake motion level 1
  - Flat ordinary ground and soft ground

![Image of straight piping](image)

\[<S-2>\]
- Earthquake motion level 1
  - Ground with sudden change
- Earthquake motion level 2
  - Flat ordinary ground

![Image of straight piping](image)

\[<S-3>\]
- Earthquake motion level 2
  - Steep slope of ordinary ground, soft ground (non-liquefaction), and liquefactionground (vicinity of embankment excluded)

![Image of straight piping](image)

\[<S-4>\]
- Earthquake motion level 2
  - Near embankment of liquefaction ground

![Image of straight piping](image)

**T-shaped piping**

\[<T-1>\]
- Earthquake motion level 1
  - Flat ordinary ground, soft ground

![Image of T-shaped piping](image)

\[<T-2>\]
- Earthquake motion level 2
  - Flat ordinary ground

![Image of T-shaped piping](image)

\[<T-3>\]
- Earthquake motion level 2
  - Steep slope of ordinary ground, soft ground (non-liquefaction), and liquefaction ground (vicinity of embankment excluded)

![Image of T-shaped piping](image)

\[<T-4>\]
- Earthquake motion level 2
  - Near embankment of liquefaction ground

![Image of T-shaped piping](image)
L-shaped piping

**<L-1>**
- Earthquake motion level 1
  - Flat ordinary ground and soft ground
  - Hi bell pipe L gold + (plus) 5m
  - 90° bend pipe (LJ)

**<L-2>**
- Earthquake motion level 2
  - Flat ordinary ground
  - Hi bell pipe long gold + (plus) 5m
  - 90° bend pipe (LJ)

**<L-3>**
- Earthquake motion level 2
  - Steep slope of ordinary ground, soft ground (non-liquefaction), and liquefaction ground (vicinity of embankment excluded)
  - Bell grip for Hi bell pipe long gold + (plus)
  - Hi bell pipe long gold + (plus) 5m
  - 90° bend pipe (LJ)

**<L-4>**
- Earthquake motion level 2
  - Near embankment of liquefaction ground
  - Hi bell pipe long gold + (plus) 5m
  - Hi bell pipe long gold + (plus) 2.5m
  - Bell grip for Hi bell pipe long gold + (plus)
  - 90° bend pipe (LJ)

Surroundings of structure

**<V-1>**
- Earthquake motion level 1
  - Flat ordinary ground, soft ground
  - Hi bell pipe L gold + (plus) 5m
  - Single flange (LJ)

**<V-2>**
- Earthquake motion level 2
  - Flat ordinary ground
  - Hi bell pipe long gold + (plus) 5m
  - Single flange (LJ)

**<V-3>**
- Earthquake motion level 2
  - Steep slope of ordinary ground, soft ground (non-liquefaction), and liquefaction ground (vicinity of embankment excluded)
  - Bell grip for Hi bell pipe long gold + (plus)
  - Hi bell pipe long gold + (plus) 5m
  - Single flange (LJ)

**<V-4>**
- Earthquake motion level 2
  - Near embankment of liquefaction ground
  - Hi bell pipe long gold + (plus) 2.5m
  - Bell grip for Hi bell pipe long gold + (plus)
  - Hi bell pipe long gold + (plus) 5m
  - Single flange (LJ)
Matters to be observed for safe, appropriate use are explained below. Indications and their meanings are shown below.

1. Precautions as to use

**CAUTION**

- **Operating temperature**
  Hard vinyl chloride pipes soften when hot water flows continuously. It will expand and contract as the temperature changes, possibly causing the pipe and joint to break. The temperature of supply water should not exceed 40°C when the temperature rise (in summer) around the water supply pipe is taken into consideration. Even if the ambient temperature is 40°C, avoid using the piping where temperature can be raised by some heat source.
  In the case of drainage, use a plug-in socket or some other device to cope with expansion and contraction. When appropriate measures are taken, it can be used as a drainage pipe at 60°C or less. In consideration of safety, however, the operating temperature should not exceed 45°C, because the types of indoor drainage pipeline are diverse in many cases and the force due to temperature change acts in a complicated manner, not permitting effective measures to cope with expansion and contraction.

- **Usage**
  Use hard vinyl chloride pipes for water supply and drainage.

- **Embedding**
  Calculate the strength.

2. Precautions as to transportation

**WARNING**

- **Wear gloves.**
  Wear hard-to-slip rubber-coated gloves during work to prevent injury.

- **Do not step on pipes.**
  The surface of vinyl chloride pipes is slippery, possibly causing an accident. Do not step on pipes.

- **Handle pipes carefully.**
  Do not throw or drag vinyl chloride pipes when loading them on or unloading them from a truck. Handle pipes carefully to prevent damage to pipes, breakage, or injury.

- **Exercise care when lifting pipes up and down.**
  When using a truck with a crane, pay attention to the hoisting balance to prevent injury.

- **Careless handling is dangerous.**
  Apply a cushion material to the section in contact with the truck and the section where rope is secured in order to prevent damage to pipes and deformation of pipes.

- **Prevention of pipes from dropping during transportation**
  Exercise sufficient care so that pipes will not drop because of loose or disconnected rope.

**CAUTION**

- **Utilization of cushioning materials**
  Apply cushioning materials to the contact section between pipes and the load-carrying platform of a truck and to the rope securing sections so as to prevent damage to and deformation of pipes.

3. Precautions as to storage

**CAUTION**

- **Indoor horizontal storage**
  Heap up pipes in a parallel cross form or staggered form to prevent warpage and deformation of pipes. Be sure to apply a block to pipe ends to prevent pipes from falling.

- **Parallel cross form**
  (Nominal diameter: 150 or less)

- **Staggered form**
  (Nominal diameter: 200 or more)

- **Vertical storage**
  When it is inevitable to stand pipes for storage, stretch rope around pipes to prevent them from falling.

- **Outdoor storage**
  When storing them outdoors, provide a simple roof or cover them with an opaque sheet to avoid direct sunlight. When a sheet is used, keep the space under the sheet well ventilated.

- **Joint storage**
  Store pipes and joints indoors, in principle, to prevent deformation and staining. Avoid storage in a high-temperature atmosphere (in a vehicle in summer) especially, otherwise joints can deform.

4. Precautions as to installation

**WARNING**

- **Flow examination**
  Be sure to use water pressure during a leakage test and a pressure test of hard vinyl chloride pipelines. A pneumatic pressure test is very dangerous, possibly allowing joints to be blown off or broken pieces to scatter. Buy the pipe before flow examination of rubber ring joints. When it is inevitable to apply water pressure before buying pipes, secure all joints with clamps, otherwise pipes will be disconnected, which is dangerous.

**CAUTION**

- **Use of appropriate tools**
  Select appropriate tools for cutting, drilling, and joining for proper installation and safety.
  Thoroughly understand the instruction manuals of respective tools.

- **Precautions as to adhesion joining**
  Well ventilate the inside of the pipeline after adhesion joining. When the pipeline is closed after joining, small cracks called solvent cracks, which are caused by solvent vapor remaining in the adhesive, may be generated in vinyl chloride pipes. Solvent are difficult to vaporize in winter especially. Install expansion joints for adhesion joining so as to prevent separation and breakage of pipes due to thermal expansion and contraction.

- **Be careful of organic chemicals**
  The material of vinyl chloride pipes and joints may be attacked by organic solvents. Avoid contact with cresol (antiseptic for wood), terma eliminator, insecticide, or paint. When pipes are buried shallowly, these compounds spilt on the ground may penetrate through the ground, attacking buried pipes and joints. Exercise sufficient care. For example, use a polyethylene tube for protection.

- **Installation of protective cover**
  Install a protective cover to prevent deterioration of pipes due to direct sunlight or take some appropriate measures to avoid external shock when pipes are exposed outdoors. When pipes are to be exposed, coat them with the paint that our company recommends.

<table>
<thead>
<tr>
<th>Paint</th>
<th>Name of company</th>
<th>Number of pipes</th>
<th>Diorient</th>
</tr>
</thead>
<tbody>
<tr>
<td>SunCoat No.915</td>
<td>Nagahra Special Paint</td>
<td>11</td>
<td>SunCoat No.915 thinner</td>
</tr>
<tr>
<td>Vinybon No.100</td>
<td>Kansai Paint</td>
<td>40</td>
<td>Vinybon No.100 thinner</td>
</tr>
<tr>
<td>Acri No.1000</td>
<td>Kansai Paint</td>
<td>6</td>
<td>Acri No.1000 thinner</td>
</tr>
<tr>
<td>SilverTop</td>
<td>Dai Nippon Toyko</td>
<td>Silver Alcohol-based thinner</td>
<td></td>
</tr>
</tbody>
</table>

- **Prohibition of curving at site**
  Be sure to use joints for curved piping. When pipes are curved at site, strain will remain, causing property damage.

- **Prohibition of heating pipes at site**
  Do not heat pipes at site, otherwise pipes may be scorched or burned, lowering the strength.

- **Prohibition of thread cutting on vinyl chloride pipes and joints**
  The notch effect is great in vinyl chloride pipe, and cracks and notches lower the strength; therefore, do not cut threads directly on vinyl chloride pipes and joints.

- **Prevention of freezing**
  Install pipes 20 cm deeper than the maximum freezing depth in cold areas.
  Wind heat insulation material around the exposed rear section of the feed water pipe to prevent freezing.

- **Special lubricant for rubber ring joining**
  Use the special lubricant for rubber ring joining. Adhesives, oil, and grease may damage the rubber ring. Never use them.
5. Precautions as to handling of adhesive

**WARNING**

- **Prohibition of squeeze-off tools**
  Do not use squeeze-off tools for polyethylene pipes when repairing small-diameter water supply pipes. Vinyl chloride pipes have smaller ductility than polyethylene pipes. When squeeze-off tools for polyethylene pipes are used for water shut-off work, bleaching occurs due to plastic deformation, causing breakage in future.

- **Use of sealing material**
  Some sealing materials (polyethylene sealing materials, etc.) used when pipes pass through walls and floors contain plasticizers (phthalic acid ester, DOP, etc.) and organic solvents (ethylene, toluene, etc.) that will adversely affect hard vinyl chloride pipes and joints. Check the ingredients before use.
  (Recommended products: Silicone sealing materials and modified silicone sealing materials made by Sekisui Fuller Co., Ltd.)

- **Legitimate storage**
  The adhesive is classified as a dangerous substance in the Fire Protection Law. When storing the adhesive, observe the laws and ordinances of the local government.

- **Prohibition of incineration at site**
  Do not incinerate vinyl chloride pipes and joints at site, otherwise hazardous hydrochloric acid will be generated, which is very dangerous.

- **Subject to recycling**
  The hard vinyl chloride pipes and joints listed in the "General catalog of ESOLON pipes for building piping" are subject to recycling specified by Japan PVC Pipe and Fittings Association.

- **Estimation of wastes**
  Carry waste hard vinyl chloride pipes and joints to a cooperative recycling company, intermediate dump, or small dump (dump of plumbing association).

- **Advance contact**
  Contact the destination of wastes before taking wastes in.

- **Inquiry**
  Contact Japan PVC Pipe and Fittings Association for the details of the destination of wastes, carrying-in standard, and recycling of hard vinyl chloride pipes and joints.
  Japan PVC Pipe and Fittings Association
  Tobu Bldg., 1-5-26, Moto Akasaka, Minato-ku, Tokyo 107-0051
  Phone: 03-3470-2251

6. Recycling vinyl chloride pipes and joints

**WARNING**

- **Prohibition of use for other purposes**
  Use specific ESOLON adhesives for bonding ESOLON pipes and joints. Do not use the adhesives for other purposes.

- **Do not use old adhesives or adhesives containing foreign matter**
  Do not use adhesives containing earth, sand, or water, and do not use old adhesives that have been solidified after diluting with thinner. The bonding effect will wear off, causing pipes to come off.

- **Drain initial stagnant water away**
  ESOLON adhesives contain organic solvents. If water is allowed to flow when a large quantity of an adhesive is applied or when the adhesive has not dried completely after installation, the water may smell. Drain the initial stagnant water away.

- **Do not mix**
  Do not mix different types of adhesives or old and new adhesives, otherwise the bonding effect will wear off, causing pipes to come off.

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### Notations on container

<table>
<thead>
<tr>
<th>Notation on container</th>
<th>Adhesives classified as hazardous substances (Class 4, Type 1 Petroleum). Handling precautions and precautions as to joining are shown on respective containers. Be sure to read these precautions before use.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2 (Inflammable, Solid)</td>
<td>Danger rating III Infammables</td>
</tr>
<tr>
<td>Class 1 (Inflammable, Liquid)</td>
<td>Danger rating II Infammables</td>
</tr>
<tr>
<td>Class 0 (Acute toxicity, Low toxicity)</td>
<td>Carcinogenicity, etc.</td>
</tr>
<tr>
<td>Inflammable liquid and steam</td>
<td>Notation unnecessary</td>
</tr>
<tr>
<td>Inflammable liquid and steam</td>
<td>Notation unnecessary</td>
</tr>
<tr>
<td>Skin and eye irritation</td>
<td>Notation unnecessary</td>
</tr>
<tr>
<td>Carcinogenicity, etc.</td>
<td>Notation unnecessary</td>
</tr>
<tr>
<td>Notation unnecessary</td>
<td>Notation unnecessary</td>
</tr>
</tbody>
</table>

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**Model recycling system of vinyl chloride pipes and joints**

For "elimination of disposability and landfilling", SEKISUI is engaged in recycling of waste vinyl chloride materials.

- **Landfill site**
  - Production of brackish water feed
  - Glassification
  - Solvent separation

- **Recycling and disposal**
  - Sludge recycling
  - Feed stock recycling

- **Sales**
  - Intermediary acceptance point
  - Sale

- **Japan PVC Pipe and Fittings Association**
  - Cooperative recycling company
  - Sale

- **RS standard**
  - Japan PVC Pipe and Fittings Association
  - SEKISUI
  - JPEC PVC Environmental Affairs Council
  - VEC: Vinyl Environmental Council
  - RS: Recycling station