Instruction Manual for Toyo Clean Copper (7002)
—Operation Procedure—

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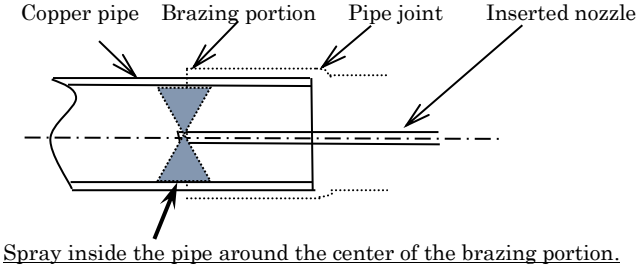
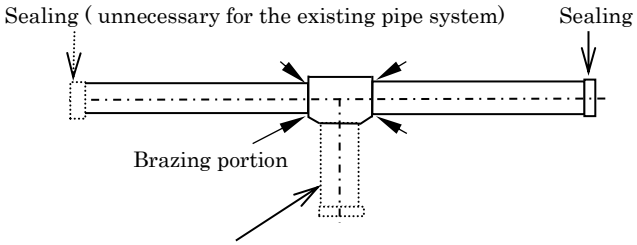
<table>
<tr><th>Procedure</th><th>Work Instruction</th><th>備　　考</th></tr>
<tr><td>1, Cutting method of copper pipe</td><td>＊Cut a copper pipe at a right angle with a pipe-cutter.
—Pay attention to keep the pipe from deformation.</td><td>  </td></tr>
<tr><td>2. Deburring</td><td>＊Make flat the cutting plane by removing inside and outside burrs and flashes with the use of a scraper, reamer, and file.
—Take care not to leave the burrs inside of the pipe.</td><td>  </td></tr>
<tr><td>3. Cleaning</td><td>＊Remove stains from the inside and outside surfaces of the pipe joint with non - woven fabrics or emery cloth in order to clean the surface of the base metal.
＊Remove dirty fats and oil from the pipe surface with acetone.</td><td>  </td></tr>
<tr><td>4. Coating of oxidation inhibitor</td><td>＊Shake well a spray can.
＊ Spray uniformly the oxidation inhibitor at the brazing portion of the inside surface of the copper pipe (20-30 mm apart from the end of the pipe). The recommended number of spraying depends on the outside diameter of the pipe:
＊Table of recommended number of spraying
<table>
<tr><td>O. D.[1]</td><td>~15.88</td><td>19.05</td><td>22.23</td><td>25.40</td><td>28.58</td></tr>
<tr><td>N. S.[2]</td><td>1</td><td>2</td><td>3</td><td>3</td><td>4</td></tr>
<tr><td>O. D.[1]</td><td>31.75</td><td>34.92</td><td>38.10</td><td>41.28</td><td></td></tr>
<tr><td>N. S.[2]</td><td>5</td><td>6</td><td>7</td><td>8</td><td></td></tr>
</table>
O. D[1]: Outside diameter (mm) of the copper pipe.
N. S.[2]: Number of spraying of the oxidation inhibitor.
 

Spray inside the pipe around the center of the brazing portion.</td><td> 
Spraying in the horizontal direction.
 
Spraying in the vertical direction.</td></tr>
</table>

5. Insertion	＊Insert the pipe into the pipe joint. —Confirm the pipe is smoothly inserted.	
6. Sealing of the pipe	＊Seal the two ends of the pipe with the copper caps or tape. ＊Seal another side, when one side of the existing pipe system is sealed,  Branch pipe joint portion is sealed with a temporal short-pipe (20 cm), if necessary.	 
7. Heating	＊Heat homogeneously and quickly around the pipe joint with a gas torch having a relatively large nozzle. ＊ Heat the whole pipe joint. —Take care because a fire sometimes breaks out in a moment at the clearance between the pipe and the pie joint. No problems on performance.	
8. Flowing of brazing filler metal	＊Put the tip of the filler metal at clearance between the pipe and the pipe joint, when the brazing area surface is heated to proper temperatures, 760-850 ℃. Then, the molten filler metal flow smoothly into the clearance. ＊ Confirm that the molten filler metal fully fills clearance between the pipe and the pipe joint. —The color of the pipe surface turns reddish purple by heating when the temperature is appropriate to brazing.	
9. Curing	＊After completion of brazing, the heated pipe is cooled by natural cooling for two minutes (the temperature becomes below 300 ℃). Then, the pipe is forcibly cooled down to room temperature with the use of a wetted waste cloth. —Cooling of the pipe after brazing aims to keep the effects of the oxidation inhibitor as well as to maintain the safety for workers. The oxidation inhibitor is effective when the pipe temperature is lowered below 300 ℃.	

10. Opening of the brazed pipe into atmosphere	＊After confirming that the brazed portion is cooled down to room temperature, the inside surface of the brazed pipe is exposed to air by removing the copper caps or tape attached at the both ends of the pipe. —When the brazed pipe is exposed to atmosphere, white smoke of the harmless reductive gas comes out.	
11. Appearance check	＊Check visually pinholes, pits, dripped molten filler metal, fusion of base metal, and through-holes at the brazing area.	