Notice: While every effort has been made to ensure the accuracy of the information contained within this publication, the use of the information is at the reader’s risk and no warranty is implied or expressed by NIPPON STEEL CORPORATION with respect to the use of the information contained herein. The information in this publication is subject to change or modification without notice. Please contact the NIPPON STEEL CORPORATION office for the latest information. Please refrain from unauthorized reproduction or copying of the contents of this publication. The names of our products and services shown in this publication are trademarks or registered trademarks of NIPPON STEEL CORPORATION, affiliated companies, or third parties granting rights to NIPPON STEEL CORPORATION or affiliated companies. Other product or service names shown may be trademarks or registered trademarks of their respective owners.
Material Series for Nuclear Application

NIPPON STEEL has developed "Fit for Purpose" materials for Nuclear applications with its sophisticated technologies.

Material Grade

Stainless steels and Ni base alloys (see table below) in addition to carbon and low alloy steels can be manufactured.

<table>
<thead>
<tr>
<th>Category</th>
<th>ASME</th>
<th>EN</th>
<th>JIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austenitic stainless steel</td>
<td>SA-213</td>
<td>TP304</td>
<td>SUS304TP</td>
</tr>
<tr>
<td></td>
<td>SA-312</td>
<td>TP316</td>
<td>SUS304L</td>
</tr>
<tr>
<td></td>
<td>SA-376</td>
<td>TP316L</td>
<td>SUS304LTF</td>
</tr>
<tr>
<td>Ferritic stainless steel</td>
<td>SA-268</td>
<td>TP410</td>
<td>SUS410</td>
</tr>
<tr>
<td></td>
<td>SA-279</td>
<td>X6CrNiMo17-12-2</td>
<td>X2CrNiMo17-12-2</td>
</tr>
<tr>
<td></td>
<td>SB-163</td>
<td>X5CrNiMoN17-12-2</td>
<td>X2CrNiMo17-12-2</td>
</tr>
<tr>
<td></td>
<td>SB-167</td>
<td>X6CrNiMo17-12-2</td>
<td>X2CrNiMo17-12-2</td>
</tr>
<tr>
<td>Ni base alloy</td>
<td>SB-160</td>
<td>TPXM-19</td>
<td>SUS446</td>
</tr>
<tr>
<td></td>
<td>SB-165</td>
<td>X10NiCrAlTi32-20</td>
<td>NCF800</td>
</tr>
</tbody>
</table>

Basic Function

- **ISO 9001**: International Organization for Standardization
- **ASME Sec. III**: American Society of Mechanical Engineers
- **HAF604**: Code on Supervision of Civil Nuclear Safety Equipment

- **Dimensional range**: From 6 to 962.5 mm (0.24 to 37.5 inches) in outside diameter.
- **High corrosion resistance**: High corrosion resistance achieved by optimizing the chemical composition and manufacturing processes. Nuclear grade 304 and 316 with high IGSCC resistance (‘IGSCC: intergranular stress corrosion cracking)
- **Extra low cobalt (Co<0.02%)**: Stainless steels with extra low Co are available for dose reduction.
- **High cleanliness**: Sulfur (S), phosphorus (P) and/or impurities can be minimized with sophisticated melting and refining processes.
- **Pre-filming**: Tight and uniform protective film prevents metal release such as Cr or Ni to coolant. The technology was applied to TP304 feed water heater tubes and contributed the dose reduction in the actual nuclear power plant. (ABWR, Higashidori Unit 1 in Japan)
- **Good weldability**: Ferrite content in the steel can be controlled for better weldability upon customer’s request for further reliability of nuclear power plant.

Typical Application of NIPPON STEEL's Pipes and Tubes

- **U-bent tube**: (304, 316, Alloy690)
- **PRHR (Alloy690)**
- **Stick elbow**: (316L)
- **Hollow piston tube**: (XM-19)
- **Low fin tube**: (410Ti, TP439)

Manufacturing Equipments

- Steel making
  - Blast furnace
  - Electric arc furnace
- Discharging
  - Ladle pouring equipment
- Rolling
  - Cold pilger mill
  - Hollow forging pipe mill
- Heat treatment
  - Continuous type furnace
  - Shot blast equipment
- Bending
  - Die bender
  - Dieless bender
- Pipe finishing
  - Oil and gas tubing machine
- Examination
  - Ultrasonic testing
  - Hydro test

Products

- U-bent tube
- CRDM nozzle tube (Alloy690)
- PRHR (Alloy690)
- Stick elbow (316L)