Stainless Steel in Plumbing Systems

Pravin Goel
August 21, 2010
ISSDA Workshop, Ahmedabad
Stainless Steel in Water Applications

- **Antibacterial and Hygienic**: Recommended for Food products.
- **Handling of drinking water**: Does not change the taste of the water.
- **Surfaces are smooth, hard and homogenous**:
  - difficult for Bacteria and Fungi to adhere.
  - deposits are minimal.
- **Stainless Steel is not affected by vandalism and graffiti**.

Source: Eurolnox: The stainless steel lining of drinking water reservoirs – Initial erection and refurbishment.

SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
Stainless Steel in Water Applications

• **Low Surface roughness** (only 0.15 to 0.25 μm)
  – a. Reduces deposits and film formation
  – b. Facilitates Cleaning
  – c. Makes chemical cleansers redundant

• **Strong material:** Not easily damaged by use in Public Buildings.

• **Wear resistant:**
  – Remarkable for its abrasion and erosion resistance.

Source: Eurolnox: The stainless steel lining of drinking water reservoirs –Initial erection and refurbishment
Extending building life to 200 years

• A new Concept for Japanese High Rises
• An ‘all-stainless-steel’ piping system aims to extend the life of residential high-rises.

According to the report titled 200 Years Housing Vision, the average apartment building in Japan lasts only 30 years, compared with 55 years for American homes and 77 for English ones. The short lifespan is an economic burden for residents as well as a hindrance to conservation efforts.

Source: www.nickelmagazine.org/apartments
SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
Global References

Taipei Financial Center

Petronas Towers, Malaysia

Aurora Residential Towers, Australia

304 grade SS Press Fitting type piping
To accommodate High Pressures and Vibration.
Fire protection
Hot and Cold Water Supply

Source: High pressure Urban water Distribution Nickel Vol20, number 2, March 2005
Global References

Lightweight bridges are used to carry potable water and pedestrians across river spans up to 632 m in Japan

- 85% Type 304
- 10% Type 316
- Some 2205 near the coast

- No repainting
- 40% cheaper over 30 years
- First one built: 1983
- Max pipe diameter: 0.8 m
- There are now ~3000 such bridges in Japan

Source: Peter Cutler, NiDI, JSSA, Nickel Magazine Mar2005
SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
Mettur Dam, Tamil Nadu

- Raw water handing in Mettur Dam, Cauvery River
- First stainless steel raw water pipe in India (1998)
- Lightweight meant easy installation in hilly country
- >50 year life expected (2 replacements of cast iron in that time)
- Smooth bore meant sustained low pumping costs
- LCC analysis: 60% saving over 50 years

Source: Peter Cutler, NiDI
SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
SS Plumbing

- No general corrosion so no need for corrosion allowance
- No Threading required, hence thinner – 1/3rd the weight of GI pipe
- No need for protective coating
- No need to control water chemistry- suitable for both Soft as well as Hard Waters
- Water purity is maintained
- Lightweight
- Easy to Install
- Equipment is durable with Low Life Cycle Cost
Applications in Hospitals

As per "Scottish Health Technical Memorandum 04-01:"
11.8 The materials generally used for the conveyance of water in healthcare premises are **stainless steel** or plastics. **Copper is only used in exceptional circumstances** such as, an extension to existing premises with short life expectancy, or very small stand alone premises.

**System can be pressure tested up to 25 Bar**

*Source: Bright Future for SS Plumbing, Association of Plumbing and Heating contractors*

SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
Effect of water velocity on corrosion rate

Flow rate (ft/sec)

Corrosion rate (mpy)

- Copper
- Mild steel
- Stainless steel

SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
## Differences between traditional materials and stainless steels in potable water

<table>
<thead>
<tr>
<th></th>
<th>Steel, iron copper alloys</th>
<th>Stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water contamination</strong></td>
<td>Fe, Cu, Pb, Zn</td>
<td>Almost nil after system stabilises</td>
</tr>
<tr>
<td><strong>Velocity</strong></td>
<td>&lt; 2 m/sec</td>
<td>Up to 40 m/sec</td>
</tr>
<tr>
<td><strong>Water chemistry</strong></td>
<td>Limited</td>
<td>Unlimited within range of potable waters</td>
</tr>
<tr>
<td><strong>Durability</strong></td>
<td>20 – 40 years</td>
<td>100 years</td>
</tr>
</tbody>
</table>
View of environmental load reduction
Formation of a long-life life

If environment is chosen correctly, it is considered that stainless steel pipe would have semi-permanent life, and the usual life of stainless steel piping under use of hot water of 80°C, is set up as “at least 40 years” by JSSA, considering the life rubber packing used for mechanical joints. It is also possible to set up as “more than 100 years” under use in normal temperature of 25°C.

<table>
<thead>
<tr>
<th>Temp</th>
<th>80°C</th>
<th>70°C</th>
<th>25°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>40yrs</td>
<td>80yrs</td>
<td>100yrs</td>
</tr>
<tr>
<td>Usage</td>
<td>Hot Water</td>
<td>Hot Water</td>
<td>Water</td>
</tr>
</tbody>
</table>

Source: Stainless steel piping guide 2002
Edited by Japan Stainless Steel Association
Durability Tests in Japan

Toilet sewage piping 26 years After construction

If life prediction is performed from the maximum penetration depth, it will have been 135 years for part of mother material Pipe, and 60 years for part of lap joint. The observation shows actual life becomes longer than these result, since corrosion speed gets slower year by year.
Application in Fire Fighting Systems

The examples of Fire Department Stand Pipe

Office building
- 125A
- 100A 65A

Apartment
- 150A
- 100A 65A

Water Supply Pipe 40Su

Reference
Approvals to use stainless steels

- National approvals in EU Member States will be replaced by European Acceptance Scheme
- USA:
  - specified grades approved for public water supply without restriction under ANSI/NSF 61
  - approved under International Building Code
  - approved under International Residential Code
- National approvals in Australia/New Zealand, China, Malaysia
- India .....
Galvanised Iron:

- Water Pipes & Fittings made of galvanised iron shall not be recommended in piping systems used to convey potable water.
Product

- Pipe – SS Grade (AISI 304 grade)
- Fittings – Innovative Press Fit Design (AISI 304 grade)
  - Sealing Ring: CIIR/EPDM
- Press fitting Tools
  - Manual / Hydraulic
  - Battery Operated
Stainless Steel Plumbing System
Pressing / Cutting Tools

Pipe Cutter

Manual Pressing Tool
Joining Systems

Fast, Clean & Safe
No Soldering, Welding, or Screwing

After Pressing
Joining

Before Pressing

After Pressing

O-Ring

No gap between fitting & pipe, no water reaches O ring
Waste water treatment - LCC

Huddersfield, UK

Waste water treatment

- 98% reduction in maintenance costs
- 25% extra plant capacity

SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
Easy to install

Easy to use in Difficult areas

Time taken:
About 8 hrs against 2-3 days for GI& Copper (1/3rd time).
Expected to come down further to 4-5 hrs.
Photographs of Installations

Ambala - House
Gwalior – Heritage Hotel
Mumbai - Flat

Delhi - House
Hisar - Hospital
Delhi - House
Estimated Cost of Plumbing in a typical Bathroom

<table>
<thead>
<tr>
<th>Cost</th>
<th>GI</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Cost</td>
<td>4,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Labor Cost</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Total Cost</td>
<td>8,000</td>
<td>14,000</td>
</tr>
</tbody>
</table>

SS costs an additional Rs 6,000/- per bathroom (approx)

Savings:
Stainless Steel allows for use of lower size of pipes thereby saving in both material and labor costs

Fast Installation
## Life Cycle Costs

<table>
<thead>
<tr>
<th>Cost</th>
<th>GI</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost</td>
<td>8,000</td>
<td>14,000</td>
</tr>
<tr>
<td>Average Life</td>
<td>10 years</td>
<td>50 years</td>
</tr>
<tr>
<td>- Repairs</td>
<td>1 times</td>
<td>Nil</td>
</tr>
<tr>
<td>Cost of Repair (5 times)</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>- Replacement</td>
<td>4 times</td>
<td>Nil</td>
</tr>
<tr>
<td>Cost of Replacement</td>
<td>60,000</td>
<td>0</td>
</tr>
<tr>
<td>Cost of Interiors</td>
<td>60,000</td>
<td>0</td>
</tr>
<tr>
<td>Total Lifecycle Costs</td>
<td>138,000</td>
<td>14,000</td>
</tr>
</tbody>
</table>

**VIDEO of Joining Process**

SS Plumbing Systems, ISSDA Workshop, 21st Aug 2010, Ahmedabad
For more details please contact

PRAVIN GOEL
+91 98107 06415
JSL Stainless Limited
pravin.goel@jindalsteel.com
pgoel@hotmail.com

Thank You