API Draft Spec 17G
Subsea Well Intervention Systems HPHT considerations

January 28th 2014
BSEE MEETING
Introduction

- API RP 17G 1st edition: released 1995 for Completion/workover risers

  - Introduced the limit state design approach
  - Major updates on design requirements for pipe, connectors, material and connector qualification
  - Advanced riser design and connector qualification in the industry

- API 17G 3rd edition: (Ballot Draft) Excludes HPHT
  - Transition from RP to Spec. (Major Revision) – Advances design process for WCP, SSTT & forms the basis for emerging well intervention systems
  - Fully self contained, ensuring system and component life cycle integrity
  - Includes:
    - Well Control Package,
    - Landing String
    - Intervention Work Over Control System
API SPEC 17G ENHANCEMENTS

- **Safety Strategy**
  - Improved alignment between the End User and the Design / Performance of the Equipment and Operational Program

- **Material Integrity**
  - Chemistry
  - Prolongations
  - True Stress / Strain Curves to optimize for non Linear analysis Process
  - Charpy / Lateral Expansion

- **Design Process**
  - Static
  - Cyclic loads
    - Fatigue (SN or Fracture Mechanics methods)

- **Enhance Qualification** and Environmental Simulation process
  - Annex K, L, and I
  - Sand Slurry
  - Dynamic Closure Testing –

- **Testing Methods**
  - FAT/ EFAT & SIT
  - Crew drills
API Spec17G Safety Design Strategy

- Physical Protection (loading limiting devices)
- Safety Instrumented System
- Monitoring, Alarms, Operator intervention
- Normal control functions
- Subsea Well Intervention System
Material properties, NDT, QC requirements compatible with the static and cyclic design methodologies

Static design capacity methodology based on ASME VIII Div 2/Div 3, modified for offshore applications:

- Strain limited approach to ensure:
  - Consistent structural design margins (Structural failure mode)
  - Component functionality (functional failure mode)
  - Assure NACE limits

Look to TR8 for stress relaxation and operational aging of seals.
## Comparison of codes

<table>
<thead>
<tr>
<th></th>
<th>API 17D</th>
<th>API SPEC 17G</th>
<th>ASME VIII 2</th>
<th>ASME VIII 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure limit</strong></td>
<td>15K</td>
<td>15K</td>
<td>5K and above</td>
<td>10k and above</td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td>Linear Elastic FEA</td>
<td>EP – 0.2% str/ Mod Limit Load</td>
<td>Elastic or EP + Str Hrd</td>
<td>EP + Str Hrd</td>
</tr>
<tr>
<td><strong>Charpy V&lt;sup&gt;1)&lt;/sup&gt;</strong></td>
<td>20 J</td>
<td>40 J – 65 J</td>
<td>41 J (2 in)</td>
<td>41 J</td>
</tr>
<tr>
<td><strong>Test specimens</strong></td>
<td>QTC or Prolongation</td>
<td>Prolongation</td>
<td>Prolongation</td>
<td>Prolongation</td>
</tr>
<tr>
<td><strong>Yield de-rating</strong></td>
<td>180°C</td>
<td>50°C</td>
<td>40°C</td>
<td>40°C</td>
</tr>
<tr>
<td><strong>Accidental load</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Cyclic load</strong></td>
<td>No/Yes&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Surface NDE</strong></td>
<td>3/16” (5 mm)</td>
<td>“No detectable cracks (&lt; 1/16”)” @ fatigue hot spots</td>
<td>3/16” (5 mm)</td>
<td>1/16” (1,6 mm)</td>
</tr>
</tbody>
</table>

1) 75 ksi steel, 2 in thick
2) 17D mentions “fatigue considerations” but does not specify requirements and refers to 17G

---

Status: Draft
Code Split between API 17G and API 17D

**API 17G**
- Open Water Intervention Riser System including WCP
- Landing String and Subsea Test Tree Assembly

**API 17D**
- XT
- TH, THRT and Wellhead System

**Open Water Intervention Mode**

**Thru-BOP/Drilling Riser Intervention Mode**
Summary

- Design method consistent to dovetail with TR8:
  - The static design method gives consistent safety margin against failure
  - Provides consistent results for complex geometries and loads
  - The use of elastic-plastic method provides knowledge of strain in components

- Fatigue failure criteria dovetails with TR8 (below WCP, SSTT where primary barrier resides) so:
  - S–N curves applicable for environmental cyclic loads (>10,000 cycles per day) and pressure cycles (1,000 cycles for total life) for riser sections
  - Use of calibrated fatigue design factors for offshore applications (i.e. high fatigue design factor to limit potential crack size)
  - Inspectable components (i.e. temporary equipment)