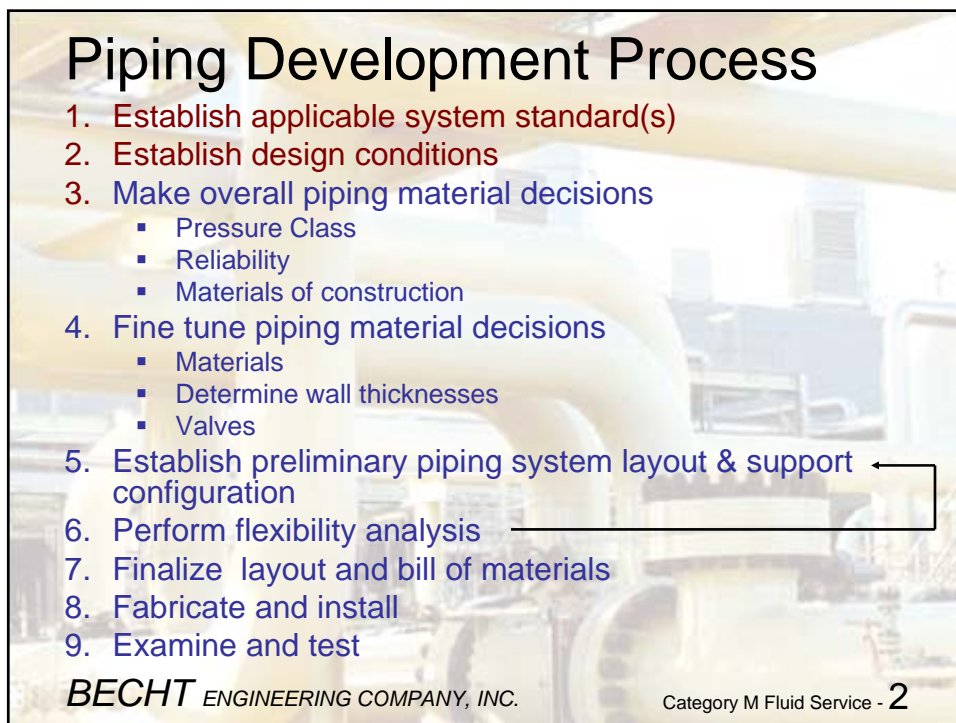




ASME B31.3 Process Piping

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Piping Development Process

1. Establish applicable system standard(s)
2. Establish design conditions
3. Make overall piping material decisions
 - Pressure Class
 - Reliability
 - Materials of construction
4. Fine tune piping material decisions
 - Materials
 - Determine wall thicknesses
 - Valves
5. Establish preliminary piping system layout & support configuration
6. Perform flexibility analysis
7. Finalize layout and bill of materials
8. Fabricate and install
9. Examine and test

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16. Category M Fluid Service

- General
- B31.3 Requirements
 - Design
 - Fabrication
 - Examination
 - Testing
- Typical Owner Added Requirements

The Material in This Section is
Addressed by B31.3 in:

Chapter VIII - Piping for Category M Fluid
Service

General

Category M: A fluid service in which the potential for personnel exposure is judged to be significant and in which a single exposure to a very small quantity of a toxic fluid, caused by leakage, can produce serious irreversible harm to persons upon breathing or on bodily contact, even when prompt restorative measures are taken.

Often characterized as “lethal”

Design Requirements

- Consideration of need for safeguarding is required
- There are no provisions for piping under severe cyclic conditions
- Impact, shock and vibration loads must be considered
- Allowances for variations in pressure and temperature are not permitted
- Maximum relief pressure limited to 110% of design pressure

Design Requirements

- Consideration of valve design features that prevent stem leakage is required
- Valve body joints to be
 - Flanged and secured by 4 or more bolts
 - Pressure seal design
 - Welded , or
 - Union with a seal weld
- Instrument tubing to be 5/8" (16 mm) OD or less and have an accessible block valve to isolate tubing from piping
- The use of flared laps is restricted

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Design Requirements

- Metallic piping, B31.3 prohibits the use of
 - MSS SP-43 "CR" fittings
 - Type C stubends
 - Taper threaded flanges
 - Taper threaded joints > NPS 1
 - Socket welding joints > NPS 2
 - Caulked joints
 - Solder and brazed joints
 - Adhesive joints
 - Cast irons except ductile
 - Single joint miters >22.5°
 - Corrugated bends

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Design Requirements

- Nonmetallic piping, B31.3 prohibits the use of
 - Thermoplastic piping
 - Nonmetallic valves
 - Nonmetallic specialty components
 - Threaded flanges
 - Threaded joints
 - Adhesive bonded joints
 - Caulked joints

Fabrication Requirements

- Metallic
 - Fabricated branch construction is permitted only if suitable fittings are not available
 - Heat treatment in accordance with base code requirements is required following any “rose budding”
 - Slip-on flanges must be double welded
- Nonmetallic
 - Fabricated branch construction is prohibited
 - Fabricated miter bends are prohibited
 - Fabricated laps are prohibited

Examination Requirements - VT

Metallic Piping	Normal	Category M
Materials & components	Random to extent needed to satisfy the examiner	Random to extent needed to satisfy the examiner
Fabrication, including welds	5% Random	100%
Longitudinal welds	100%	100%
Bolted, threaded & other joints	Random to extent needed..., except 100% for pneumatic test	100%, threads to be examined for cleanliness and compliance with ASME B1.20.1 prior to assembly
Supports, alignment, erected piping	Random	Random

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Examination Requirements - Other

Metallic Piping	Normal	Category M
Circumferential groove welds	5% Random RT or UT	20% Random RT or UT
Brazed joints	5% in-process examination	(brazed joints not permitted)
Solder joints	(solder joints not permitted)	(solder joints not permitted)

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Metallic Leak Test Requirements

- A hydrostatic test is required except:
 - The owner may choose a pneumatic leak test if s/he considers the hydrostatic test impractical
 - The owner may use the alternative leak test if s/he considers both the hydrostatic and pneumatic tests impractical, and if
 - Hydrostatic test would cause damage or residual liquid would be hazardous, or there is danger of brittle fracture; and
 - Pneumatic test would present an undue hazard, or there is danger of brittle fracture
- A Sensitive leak test is also required

Nonmetallic Examination and Testing Requirements

Examination and testing requirements are the same as that for nonmetallic piping in normal service, except

- All fabrication shall be visually examined
- All mechanical joints shall be visually examined
- A sensitive leak test is required

Typical Owner Added Requirements

- Fire resistance
- Blow-out resistance
- No nonmetallic components
- All welds to be suitable for radiography
- 100% radiographic examination of welds
- Special examination procedures for valves