



CANADOIL GROUP

Presentation  
On  
Buttwelding Fittings

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Presentation will include  
following:

- Girth Weld Alignment
- Fitting Manufacturing  
Limitations (primarily elbows)
- Heat Treatment Issues
- Field Cutting Elbows
- Hydrotesting of Fittings

## Girth Weld Alignment

Must first understand differences in end bevel requirements between pipe and fittings (24-56" welded )

Pipe	Ends	OD $\pm 1/16''$ OOR .01D (max 0.5")
	Body	OD $\pm .16''$ OOR .015D (max 0.6")
Fittings	Ends	ID $\pm 3/32''$ OOR .01D
	Body	ID None OOR .025D (.01D for segmenting)

# Girth Weld Alignment

Can be held by:

Sizing

Expanding

Taper Boring

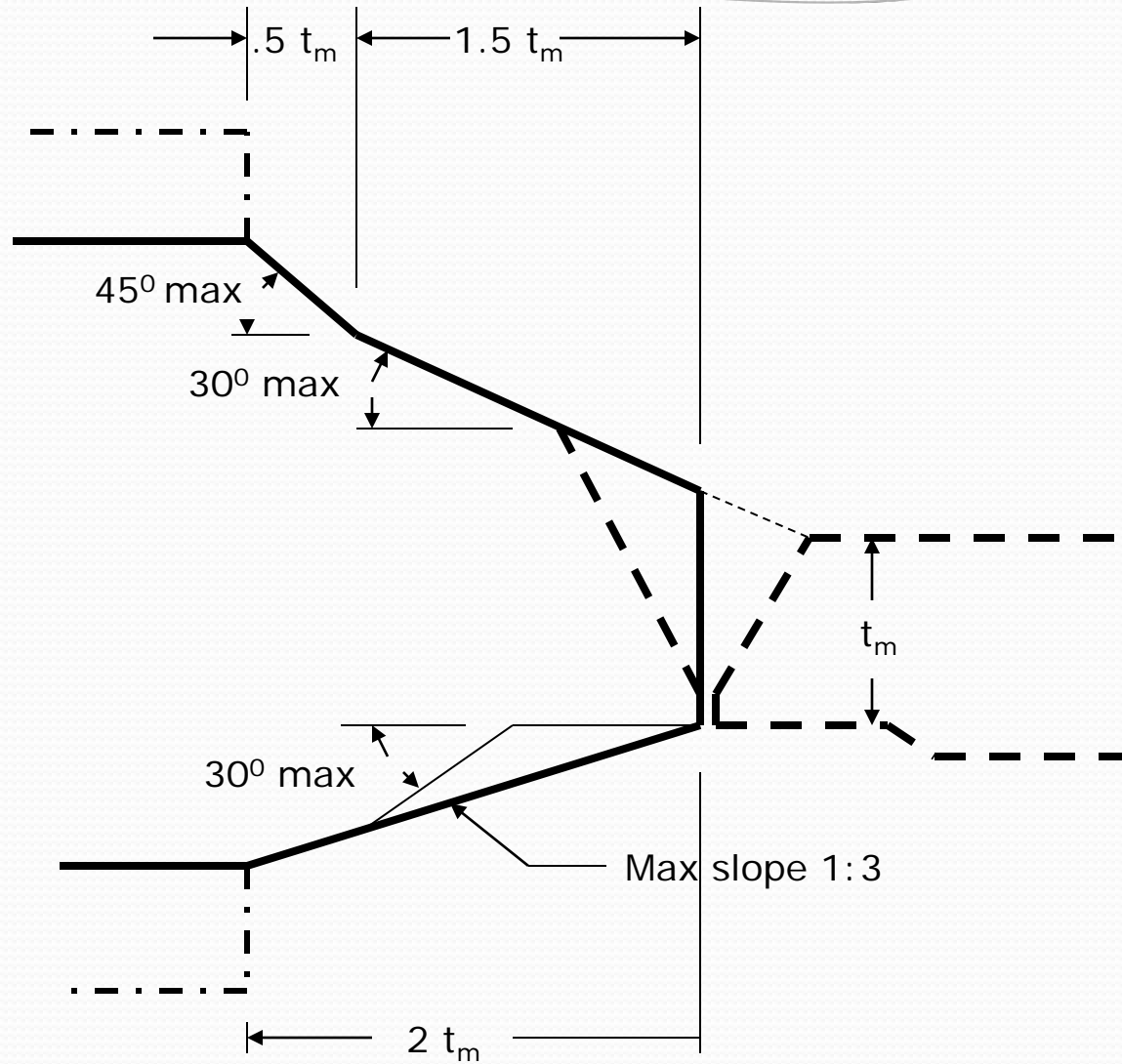
Counter Boring

Taper Turning

Combination of above

# Maximum Envelope for Welding End Transitions

See Fig. 2 of SP75



# Acceptable Design for Unequal Wall Thickness (B31 Codes)

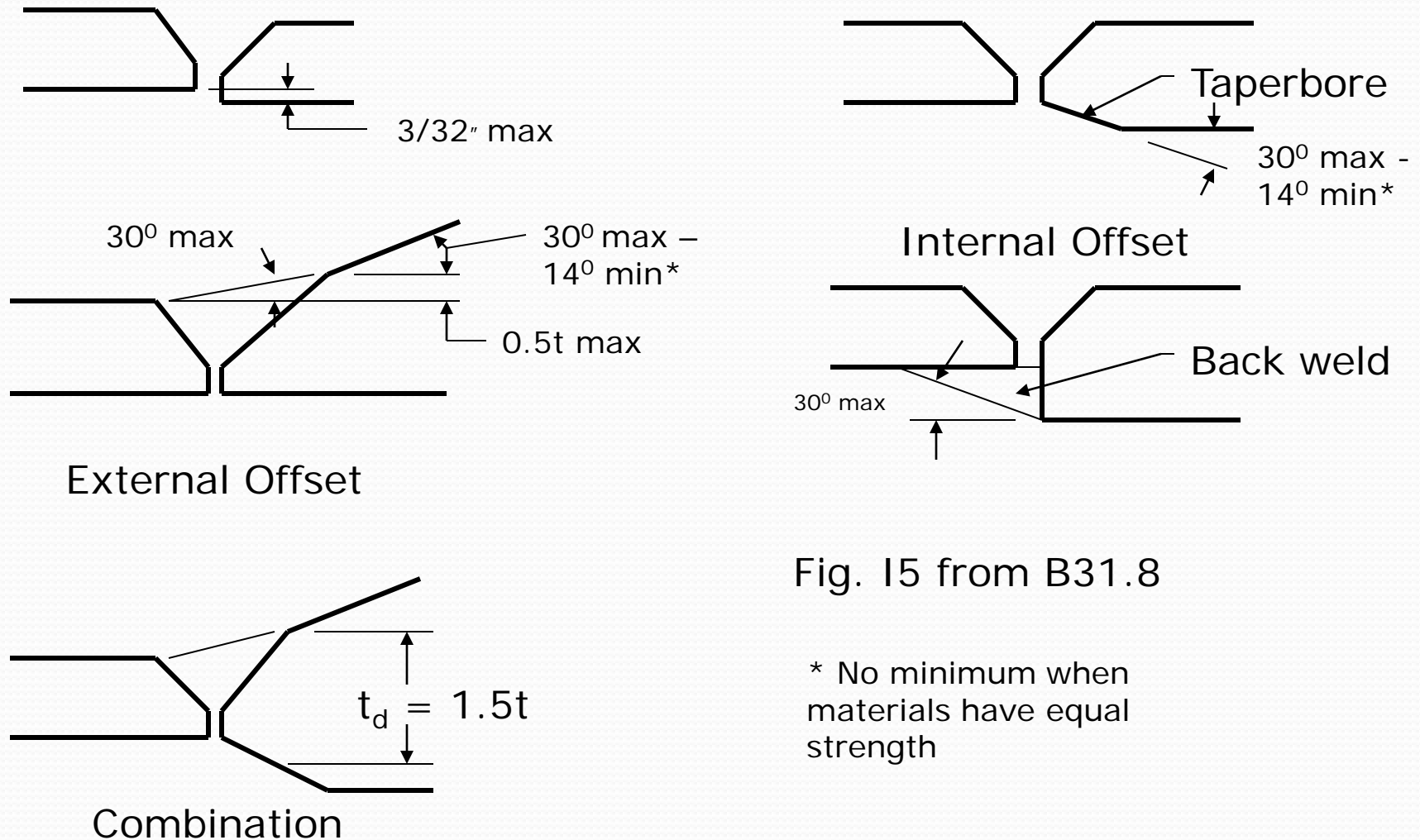


Fig. I5 from B31.8

\* No minimum when materials have equal strength

# Elbow Manufacturing Limitations

Mandrel formed (limited mandrels)	Seamless pipe or R&W cylinders	Wall variation around circumference	Usually round after form – distorts in heat treat	ID controlled unless contour sized
Half – Shells (limited punches)	Plate – two pressed halves	More uniform wall thickness	Usually round w/ some peaks – distorts in heat treat	OD controlled – extra wall to ID
Induction Bends (lot of flexibility)	Line pipe or R&W cylinders	Thickening and thinning	Less control on roundness the tighter the radius	Loses OD – ID and OD do not line up unless special cylinder made

# Elbow Manufacturing Limitations

<b>Mandrel formed (limited mandrels)</b>	<b>Body usually contour sized – can incremental size in body but results in more springing</b>	<b>Control heat treat distortion by shortest cycle, cradles/spiders, or stand on end</b>
Half – Shells (limited punches)	Not all can contour size after heat treat	Control heat treat distortion by shortest cycle, cradles/spiders, or stand on end
Induction Bends	Most cannot body size	Normally don't heat treat after bending – slow speed and tighter heat band used to control distortion



# Heat Treatment Issues

## SP75 heat treatment requirements

- All fittings must be heat treated – N, N&T, Q&T( $\geq Y52$ )
- Properties are derived from heat treatment
  - Tensiles, impacts and hardness
- Test specimens taken from fitting or material heat treated with fittings
- One test per lot – all fittings of same heat, same thickness and heat treated in controlled furnace
- HY materials for fittings not readily available in warehouses – usually bought from mill with controlled chemistries – line pipe often not an option

# Heat Treatment Issues

- Furnace controls required
    - Survey annually
    - Calibrate temperature recording devices quarterly
    - Record cycle (charts)
    - Control time at temperature in austentize cycle
    - Control time to quench tank
    - Control quench tank temperature and agitation
    - Uniform temper cycle
- Alternatively, use of thermocouples per lot attached to a fitting in a load can be used.
- Check of individual fitting properties not required







# Furnace control chart



# Field Segmenting Tips

- If possible, buy cut segment from factory before or during construction
- If not possible, buy elbow segments close to desired angle to avoid waste (some 30, 45, 60 etc.)
- Possibly field bend to make up small differences
- Use transition pieces – results in pipe to pipe weld
- If needed make sure segmentable elbows are ordered and identified for use
- Expect to backweld and transition welds

# Field Segmenting Tips

- Check location prior to cutting
- Be sure to make radial cut
- Make sure pipe is square and round as possible
- Use pipe bevel end and roll if needed
- Control springing – larger diameter, thinner wall, higher yields will tend to spring
- Never cut more than two segments from an elbow
- Prepare cut end first (probably by grinding) and weld to pipe leaving factory end for second weld. Use line-up clamps if needed.



# Pressure Rating

- Same as mating pipe of same material and schedule – proof testing or calculations used to determine shape factor (ie. Lorenz factor). No hydrotest.
- Proof testing does not address local yielding at lower pressures – proof test based on tensile strength
- When field hydrotesting to 100% of SMYS, fittings manufacturers should be notified and special considerations should be taken