

V. Production Welding

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[A. General](#)

[B. Cellulosic Welding Rod Care](#)

[C. Alignment](#)

[D. Use of Line-Up Clamps - Butt Welds](#)

[E. Bevel](#)

[F. Weather Conditions](#)

[G. Clearance](#)

[H. Cleaning](#)

[I. Position Welding](#)

[J. Roll Welding](#)

[K. Identification of Welds](#)

[L. Preheat and Postheat](#)

[M. Recommended Joint Designs for Sections Having Unequal Wall Thicknesses and Unequal Specified Minimum Yield Strengths](#)

[N. Miter Joints](#)

A. General

The welding of piping in accordance with this section shall be performed by qualified welders using qualified procedures. The surfaces to be welded shall be smooth, uniform, and free of fins, laminations, tears, scale, slag, grease, paint, and other deleterious materials that might adversely affect the welding. The joint design and spacing between abutting ends shall be in accordance with the Company welding procedure specification to be used.

B. Cellulosic Welding Rod Care

Cellulosic electrodes (E-XX10) that remain in unopened cans or cartons retain the proper moisture content (3-6%) indefinitely in good storage conditions. If opened cellulosic electrodes are exposed to humid air for extended periods of time, they may pick up enough moisture to effect the weld quality. If moisture appears to be a problem, store electrodes in a preheated rod oven at 100-120deg F or discard. DO NOT use higher temperatures. These electrodes shall remain in a heated state until either used or discarded.

Questionable cellulosic electrodes shall not be used to weld on pipeline facilities.

C. Alignment

The alignment of the abutting ends shall be such as to minimize the offset between surfaces. For pipe of the same nominal wall thickness, the offset shall not exceed 1/8 (0.125)". Any greater offset, provided it is caused by dimensional variations, shall be equally distributed around the circumference of the pipe. Hammering of the pipe to obtain proper lineup should be held to a minimum.

D. Use of Line-Up Clamps - Butt Welds

Line-up clamps shall be used in accordance with the requirements of the procedure specification. When it is permissible to remove the line-up clamp before completion of the root bead, the completed part of this bead shall be in approximately equal segments and these shall be approximately equally spaced around the circumference of the joint; however, when an internal line-up clamp is used and conditions make it difficult to prevent movement of the pipe or if the weld will be unduly stressed, the root bead shall be completed before releasing clamp tension.

Root bead segments used in connection with external clamps shall be uniformly spaced around the circumference of the pipe and shall have an accumulative length of not less than 50% of the pipe circumference before the clamp may be removed.

E. Bevel

1. Mill Bevel

Pipe ends shall be provided with mill bevels conforming to the joint design used in the welding procedure specification.

2. Field Bevel

Pipe ends should be field beveled by machine tool or machine oxygen cutting. Manual oxygen cutting may only be used if so authorized by the Company representative. The beveled ends shall be reasonably smooth and uniform, and dimensions shall be in accordance with the qualified welding procedure.

3. Dressing of Bevel

All bevels shall be filed or ground to a bright surface.

F. Weather Conditions

Welding shall not be done when the quality of the completed weld would be impaired by the prevailing weather conditions, including but not limited to airborne moisture, blowing sands, or high winds estimated to be in excess of 30 mph or as determined that could be detrimental to the weld. Shields or other protective devices may be used when practical. The Company representative, or designee, shall decide if weather conditions are suitable for welding.

G. Clearance

When the pipe is welded above ground, the working clearance around the pipe at the weld should not be less than 16". When the pipe is welded in the trench, the bell hole shall be of sufficient size to provide the welder(s) ready access to the joint.

H. Cleaning

Remove all rust, dirt and other foreign matter before starting a weld. Scale and slag shall be removed from each bead and groove before starting the next

I. Position Welding

1. Welding Procedure

All position welds shall be made with the parts to be joined secured against movement and with adequate clearance around the joint to allow the welder(s) space in which to work.

2. Filler and Finish Beads

The number of beads shall be such that the completed weld shall have a substantially uniform cross section around the entire circumference of the pipe. At no point shall the crown surface be below the outside surface of the pipe, nor should it be raised above the parent metal by more than $1/16$ (.0625)".

Two (2) beads shall not be started at the same location. The face of the completed weld should be approximately $1/8$ (.125)" greater than the width of the original groove. The completed weld shall be thoroughly brushed and cleaned.

J. Roll Welding

1. Maintaining Alignment

At the option of the Company, roll welding will be permitted provided alignment is maintained by use of skids or structural frame work to accommodate two or more lengths of pipe and having an adequate number of roller dollies to prevent sag in the supported length of pipe.

2. Filler and Finish Beads

The number of filler and finish beads shall be such that the completed weld shall have a substantially uniform cross section around the entire circumference of the pipe. At no point shall the crown surface be below the outside surface of the pipe nor should it be raised above the parent metal by more than $1/16$ (.0625)". The face of the completed weld should be approximately $1/8$ (.125)" wider than the width of the original groove. As the welding progresses, the pipe shall be rolled to maintain welding at or near the top of the pipe. The completed weld shall be thoroughly brushed and cleaned.

K. Identification of Welds

When more than one welder is working on any given project and if required by the Company, each welder shall identify those welds that he worked on by placing his initials on the pipe using a marking crayon. If separate welders are used on each welding pass, the welder shall also identify those passes which he performed using the identification of: R for root bead, H for hot pass, F for fillers, and C for cap.

L. Preheat and Postheat

The qualified welding procedures specify the pre- and post-heating practices that are to be followed when materials or weather conditions make either or both of them necessary.

M. Recommended Joint Designs for Sections Having Unequal Wall Thicknesses and Unequal Specified Minimum Yield Strengths

1. General

- a. [Figure 1](#) in Section X illustrates the recommendations in this section.

- b. When the minimum specified yield strengths of the sections to be joined are unequal, the mechanical properties of the filler metal shall be at least equal to those of the section having the higher strength.
- c. The transition between ends of unequal thicknesses may be accomplished by taper, by welding as shown in figure 1, or by the use of a transition ring. A transition ring shall be made out of approved pipe and be at least one and a half times the diameter in length.
- d. Sharp notches or grooves at the edge of the weld where it joins a slanted surface shall be avoided.
- e. Thicknesses shall not vary more than one half of the thickness of the thinner section.

2. Internal Diameters Unequal

- a. For pipelines to be operated at less than 20% SMYS with no more than 1/8" offset, no special treatment is necessary provided adequate penetration and bond is accomplished in welding.
- b. If offset is greater than 1/8", use the recommendations that apply for piping operating at 20% or more SMYS in the next few paragraphs.

3. For pipelines that operate at 20% or more SMYS, the following practices are recommended for unequal internal diameters:

- a. If the nominal wall thicknesses of the adjoining ends do not vary more than 3/32", no special treatment is necessary provided full penetration and bond is accomplished in welding. See (a), [Figure 1](#).
- b. If the nominal internal offset is more than 3/32" and there is no access to the inside of the pipe for welding, the transition must be made by taper cut on the inside end of the thicker section. See (b), [Figure 1](#). The taper angle shall not be steeper than 30° or less than 14°.
- c. Where the nominal internal offset is more than 3/32", but does not exceed ½ the thinner section, and there is access to the inside of the pipe for welding, the transition may be made with a tapered weld as shown in (c), [Figure 1](#). The land on the thicker section must be equal to the offset plus the land on the abutting section.
- d. Where the nominal internal offset is more than ½ the thinner section, and there is access to the inside of the pipe for welding, the transition may be made with a taper cut on the inside end of the thicker section as shown in (b), [Figure 1](#), or by a combination taper weld to ½ the thinner section and a taper cut from that point as in (d), [Figure 1](#).

4. External Diameters Unequal

- a. Where the external offset does not exceed ½ the thinner section, the transition may be made by welding as shown by (e), [Figure 1](#), provided that angle of rise of the weld surface does not exceed 30° and both bevel edges are properly fused.
- b. Where there is an external offset exceeding ½ of the thinner section, that portion of the offset exceeding ½ of the thinner section shall be taper cut as shown in (f), [Figure 1](#).

5. Internal and External Diameters Unequal

Where there is both an internal and an external offset, the joint design shall be a combination of (a) through (f), [Figure 1](#), such as (g), Figure 1. Particular attention must be paid to proper alignment under these conditions.

N. Miter Joints

Pipe shall be joined at an angle using pipe bends and/or approved fittings. These fittings may be cut and prepared for welding to make up angles less than that of the fitting provided the minimum interior arc length remaining is 1".

In rare situations, a miter joint on steel pipe may be made provided:

1. The pipe shall not deflect more than 3°.
2. The distance between miter joints (measured from the crotch of each miter joint) shall be a distance equal to at least one pipe diameter.

Locations and angles of all miter joints shall be recorded on a Main Location Sheets for transmission pipelines and mains or a Service Location Records for service lines.

(UNCONTROLLED IF PRINTED)