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South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Unit 1
Docket No. STN 50-498
Request for Relief from ASME Boiler and Pressure Vessel Code,
Section XI Requirements for the Essential Cooling Water System (ECW Train 1C)
(Relief Request RR-ENG-2-40) (TAC No. MC-5192)

In accordance with the provisions of 10CFR50.55a(g)(5)(iii), the South Texas Project requests relief from IWA-5250 of Section XI of the ASME Boiler and Pressure Vessel Code. Approval will allow deferral of code repair of flaws recently identified in the Essential Cooling Water (ECW) Class 3 piping. Repair of the flaws with a code repair at this time is impractical. In accordance with the guidance provided in Generic Letter 90-05 and subject to Nuclear Regulatory Commission approval, code repairs will be implemented no later than the next refueling outage for the affected unit.

Through-wall indications have been identified on the 30-inch pipe of the Unit 1 "C" train ECW system pipe below ECW valve EW-0101. Several small holes and linear indications were found in the aluminum-bronze pipe; however, there is no external leakage. The flaws are on the ECW pipe inside wall in an area covered by a slip-on flange.

Operability and functionality of the system have been maintained, and deferring code repair of the flaw with application of a temporary non-code repair will not affect the health and safety of the public.

The attached relief request addresses the present condition of the pipe section, and implementation of compensatory and corrective actions in accordance with the guidelines provided in Generic Letter 90-05. A list of commitments in the request is provided.

If there are any questions, please contact either Mr. P. L. Walker at (361) 972-8392 or me at (361) 972-8922.

Kenneth D. House
Acting Manager,
Design Engineering

PLW

Attachment: Request for Relief from ASME Boiler and Pressure Vessel Code, Section XI Requirements for the Essential Cooling Water System (ECW Train 1C) (Relief Request RR-ENG-2-40)

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STI: 31893840

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SOUTH TEXAS PROJECT
REQUEST FOR RELIEF FROM ASME BOILER AND PRESSURE VESSEL CODE, SECTION XI REQUIREMENTS FOR THE ESSENTIAL COOLING WATER SYSTEM (ECW TRAIN 1C) (RELIEF REQUEST RR-ENG-2-40)

1. Component for Which Relief is Requested

(a) Description:

Unit 1 Train C Essential Cooling Water 30-inch piping (Line Number 30" EW 1305-WT3) immediately downstream of valve EW-0101 from component cooling water heat exchanger 1C.

(b) Function:

The Essential Cooling Water (ECW) System is designed to supply cooling water to various safety-related systems for normal plant operation, normal shutdown, and during and after postulated design-basis accidents.

(c) Class:

ASME Code Class 3

(d) Description of the flaw:

Through-wall indications have been identified on the 30-inch pipe of the C train ECW system downstream of ECW valve EW-0101. Damage consists of pitting located immediately downstream of throttle valve EW-0101 on the inside wall of the pipe in an area covered outside the pipe by a slip-on flange. Some pitting has a maximum depth of 0.78 inch with corrosion extending into the flange. The root cause of the pitting was apparent cavitation resulting from required throttling of the upstream valve. While there is some damage to the slip-on flange, the slip-on flange and the attendant welds prevent leakage from the ECW system.

In addition, linear pipe indications were identified in the pipe underneath the flange in two areas.

- The ECW pipe separated from the connecting fillet weld resulting in a gap between the pipe and the flange. The separation extends approximately 20 inches along the pipe circumference.
- The second flaw is a through-wall circumferential crack 6.5" long located 3.5" from the flange face.

The apparent cause of these linear indications is high residual stresses initiated during assembly and exacerbated by high-cycle fatigue.

The condition does not meet ASME code requirements for a Class 3 piping system.

2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition

3. Applicable Code Requirement

ASME Section XI IWA-4310 states:

Defects shall be removed or reduced in size in accordance with this Article. The component shall be acceptable for continued service if the resultant section thickness created by the cavity is equal to or greater than the minimum design thickness. If the resulting section thickness is reduced below the minimum design thickness, the component shall be repaired in accordance with this Article. Alternatively, the component may be evaluated and accepted in accordance with the design rules or either the Construction Code, or Section III, when the Construction Code was not Section III.

Relief is requested so that code repair of the through-wall flaw at this location may be deferred until the next outage of sufficient duration but not later that the next refueling outage provided the conditions of Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping," are met.

4. Flaw Detection During Plant Operation

While performing maintenance on May 23, 2005, aluminum-bronze piping downstream of throttle valve EW-0101 in Unit 1 ECW Train C was found to be damaged. Implementing Code repairs within the allowed outage time for the affected train is not possible, and as a result a plant shutdown would be required to complete the repairs.

5. Impracticality Determination

As stated in Generic Letter 90-05, the staff has determined that an ASME Code repair is required for code Class 1, 2, and 3 piping unless specific written relief has been granted by the NRC. However, the staff has determined that temporary non-code repair of Class 3 piping that cannot be isolated without a plant shutdown is justified in some instances.

A repair is considered to be impractical if:

- The flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated to complete a code repair within the time period permitted by the limiting condition for operation of the affected system as specified in the plant Technical Specifications, and
- Performance of code repair necessitates a plant shutdown.

Performance of code repairs within the allowed outage time for the Essential Cooling Water System at the South Texas Project, as permitted by the limiting condition for operation, is not practical due to the amount of time required to implement the repair, the potential for fit-up problems during repair, and other uncertainties associated with completing the task. Therefore, the South Texas Project requests approval of this relief request on the basis of impracticality.

6. Proposed Alternative and Basis for Use

6.1 Temporary Non-code Repair Method

Contrary to ASME Section XI IWA-4310, defects were not removed prior to returning the affected train to service. The non-code repairs performed on the piping downstream of 1EW0101 consist of the following:

- Area 1 (Pitting/through-wall indications on the pipe near the flange face fillet weld):
  - Apply a seal weld to the pipe wall, or

- Remove the pipe wall where pitting is excessive. The remaining pipe shall be seal welded to the carbon steel slip-on flange, or
- Remove the pipe wall where pitting is excessive. The area from which the pipe is removed may have a replacement pipe segment installed that shall be seal welded on the perimeter to the existing pipe/flange.

Welded areas were visually examined.

- Area 2 (Separation between either side of the inside diameter fillet weld and the pipe wall/flange):
  - Apply seal weld between the pipe wall and flange.

  Welded areas were visually examined.
- Area 3 (Minor pitting of the pipe wall wetted surfaces near the flange):
  - Apply a seal weld to the pipe wall, or
  - Remove the pipe wall where pitting is excessive and seal-weld the remaining pipe to the carbon steel slip-on flange, or
  - Remove the pipe wall where pitting is excessive. The area from which the pipe is removed may have a replacement pipe segment installed that shall be seal welded on the perimeter to the existing pipe/flange.

  Welded areas were visually examined.
- Area 4 (Linear indication in the pipe wall 3.5 inches from the flange face):
  - Apply seal weld to the length of the crack. Build up seal weld to approximately 1/4-inch thickness.

  The weld area was tested with dye penetrant to ensure the crack is fully seal welded.

Voids and imperfections on wetted surfaces downstream of Valve 1-EW0101 were filled with Belzona 1111 to minimize further degradation. The Belzona application is not intended to repair the pressure boundary parts to satisfy the piping minimum wall thickness requirements. Belzona will serve solely as a barrier against erosion and corrosion until code repairs can be implemented.

6.2 Basis for Use

6.2.1 Scope

This relief request applies to damaged areas on the inside diameter of a 30-inch ECW pipe downstream of throttle valve EW-0101 for Component Cooling Water heat exchanger 1C. The damaged areas are covered external to the pipe by a slip-on flange where the pipe joins the throttle valve. The erosion has resulted in pitting of the aluminum-bronze pipe, to the point where the carbon steel material of the slip-on flange has experienced corrosion.

In addition, linear pipe indications were identified in the pipe underneath the flange in two areas.

- The ECW pipe separated from the connecting fillet weld resulting in a gap between the pipe and the flange. The separation extends approximately 20 inches along the pipe circumference.

- The second flaw is a through-wall circumferential crack 6.5" long located 3.5" from the flange face.

The pitting and linear pipe separations are through-wall, but underneath the pipe slip flange; consequently, there was no system leakage.

6.2.2 Specific Considerations

The Essential Cooling Water System is a low-pressure system with normal operating pressures of approximately 50 psig and a design pressure of 120 psig. Therefore, the consequences associated with failure of high-energy lines are not applicable to this relief request.

Consequences of potential system interactions, including flooding, spray on equipment, and loss of flow to the system, have been evaluated and are bounded by Appendix 9A of the South Texas Project Updated Final Safety Analysis Report.

The aluminum-bronze pipe has a nominal diameter of 30 inches and a nominal thickness of 0.25 inch. The pipe material is SB 169 CA-614 rolled and welded plate (6-8 percent aluminum) fabricated to SA-155 tolerances. The slip-on flange material is SA-105 carbon steel. The slip-on flange is welded to the 30-inch aluminum bronze pipe with fillet welds at both ends. The configuration is depicted in the attached figures.

The ECW pumps and the cooling reservoir have adequate design margin and make-up capability to account for postulated small leakage and are therefore fully capable of fulfilling the design basis functions and mission times during a design basis accident (DBA).

Similar pitting of the aluminum-bronze piping at this location is expected to have occurred in the remaining ECW trains. The linear indications are considered to be unique to Unit 1 Train C. However, based on similarity in design between the ECW trains, affected ECW trains are expected to be able to continue to perform their intended design-basis function until code-based repairs can be implemented.

Belzona coatings have been used in various components at the South Texas Project as protective coatings for erosion and corrosion control. Subsequent inspections of these components have demonstrated that Belzona coatings perform well in an immersed ECW environment. The use of Belzona coatings does not pose a threat to the piping, downstream components, or the safety function of the ECW system.

6.2.3 Flaw Evaluation

The structural integrity of the flanged piping was assessed using the "through-wall flaw" evaluation approach in Section C-3a of NRC Generic Letter 90-05. This approach evaluates the flaw stability by linear elastic fracture mechanics (LEFM) methodology. Enclosure 1 to Generic Letter 90-05 details the methodology. Analysis using "Limit Load" methodology was used to determine allowed maximum critical crack size and bending loads.

To summarize the results:

s = stress at the flaw location

s = 5.8 ksi

K = stress intensity factor

K = 57.051

Stresses	Pressure + Dead Weight	Faulted	Thermal
Stress (psi)	4769	3324	1612
Allowable Stress (psi)	18000	43200	27000
Safety Margin	3.77	12.99	16.75

The current flaw size and the bending loads are less than the respective allowed critical crack size and the bending loads determined by the limit load methodology.

Structural integrity analysis shows that at the locations of maximum stress in the piping, very large cracks would be required to cause sudden failure. Through-wall cracks are expected to be detected well before they reach a size sufficient to result in such failure.

6.2.4 Augmented Inspection

The ECW piping is readily accessible; consequently, through-wall system leakage resulting from deterioration of the ECW piping can be detected during weekly VT-2 inspections. Nondestructive examination using ultrasonic or radiographic testing is not feasible due to the configuration and dimensions in the affected area.

6.2.5 Conclusion

The linear indications and areas of significant damage discovered during this inspection of Train C Essential Cooling Water System (ECW) have been repaired using non-code repair methods. Defects were not removed prior to returning the affected train to service. This is acceptable for continued train operation until code-based repairs can be completed because:

- Stress safety margin without complete replacement of the flaws is at least 3.77.
- There is continued protection against system leakage from the flaws at this location because of the welded slip-on flange.
- Visual checks can determine if leaking is in progress.

These temporary repairs of the degraded piping between the two fillet welds provide added assurance that the flange and pipe are acceptable until the next available outage of sufficient duration to perform the code repair as per guidance provided in Generic Letter 90-05.

7. Duration of Proposed Alternative

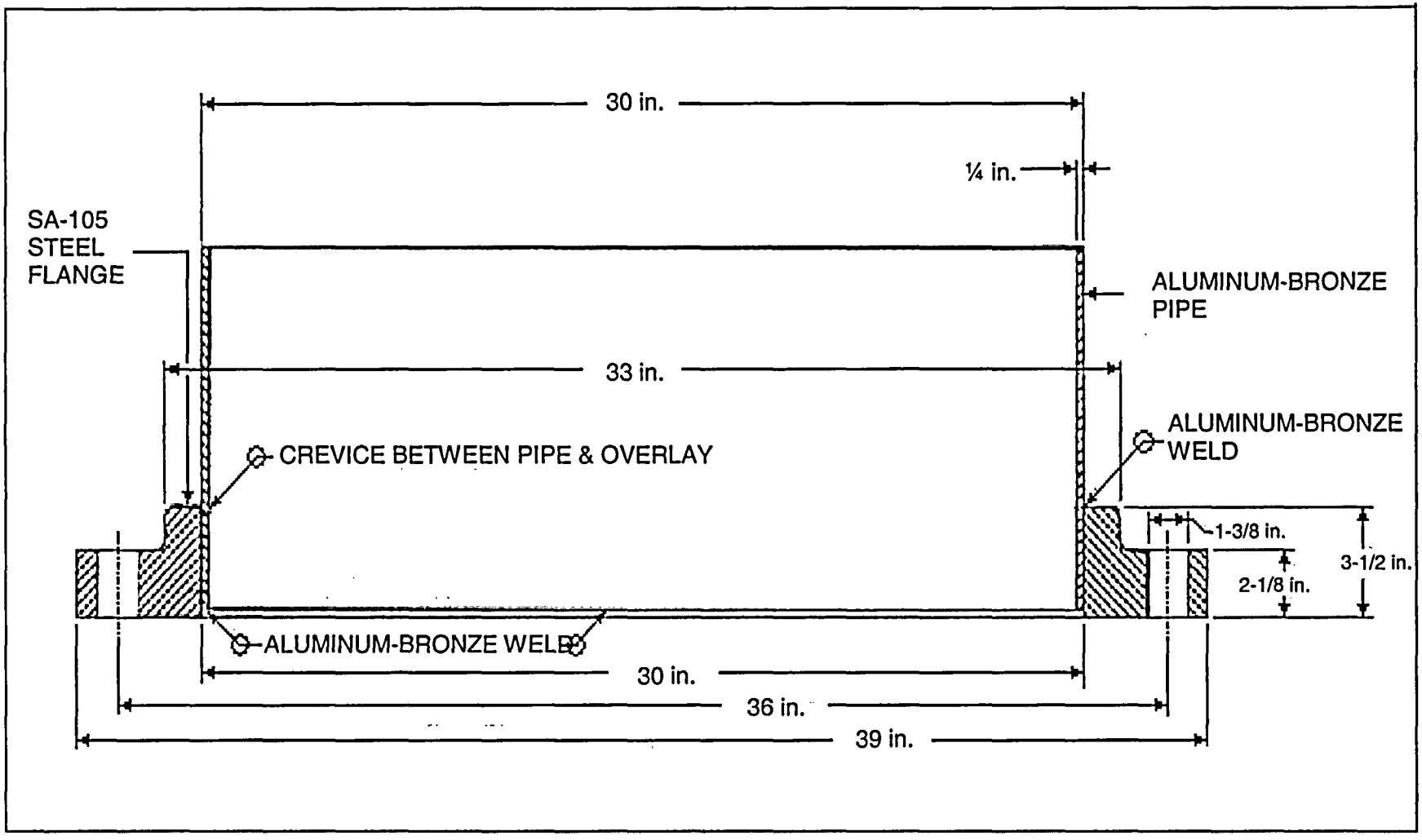
Code repair will be deferred until adequate time is available for the repair. Temporary non-code repair is applicable until the next scheduled outage exceeding 30 days, but no later than the next refueling outage, provided the condition continues to meet the acceptance criteria of Generic Letter 90-05 and is enveloped by the analysis. The next Unit 1 refueling outage is currently scheduled to begin in October 2006.

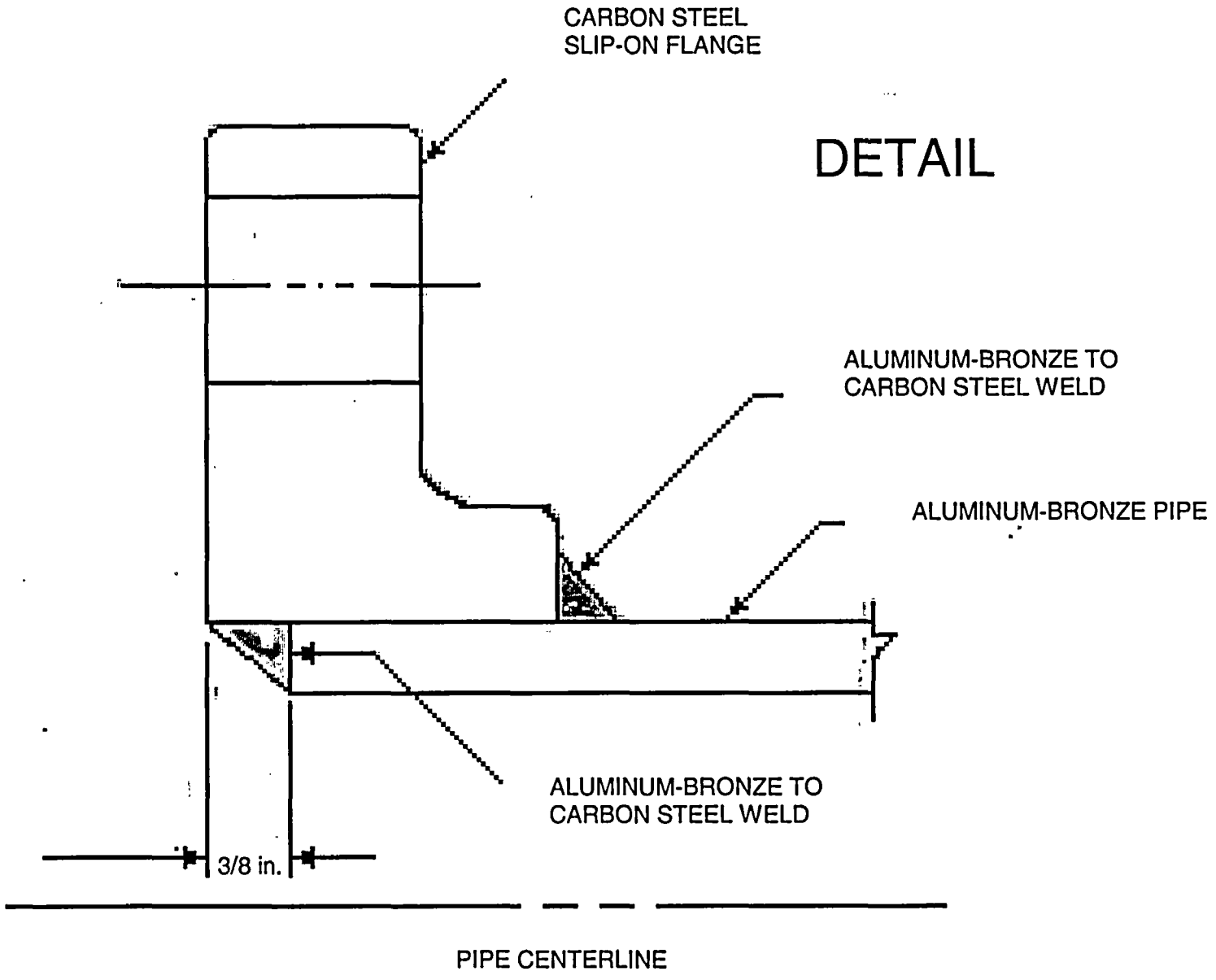
Commitments

Through-wall system leakage resulting from deterioration of the ECW piping can be detected during weekly VT-2 inspections.

Inspections are in progress and are being tracked as condition report action 05-7071-14.

SLIP-ON FLANGE




CARBON STEEL
SLIP-ON FLANGE
DETAIL
ALUMINUM-BRONZE TO
CARBON STEEL WELD
ALUMINUM-BRONZE PIPE
ALUMINUM-BRONZE TO
CARBON STEEL WELD
3/8 in.
PIPE CENTERLINE