

BURNS AND ROE, INC.  
WPPSS  
NUCLEAR PROJECT  
NO. 2

PROJECT  
ENGINEERING  
DIRECTIVE

CODE	PROJECT ENGINEERING DIRECTIVE														
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
DATE	1	0	2	4	7	9	PRIORITY								
	16	17	18	19	20	21	I								

REASON FOR P. E. D.:

Slot welds required per detail D 2038 (\$782) made to top of shims and do not connect ring 3 (Beam type 3) and ring 4 (Beam type 2) as required.

INFORMATION  
COPIES

SHEET 1 OF 15

REFERENCES

SUBJECT: Sac. Shield Wall Welds

LOCATION: El. 541'-5" All A

ENG. SYSTEM: N/A

S/U SYSTEM

QUALITY CLASS

ORIGINATING

DOCUMENTS: NCR 215-5688

DESCRIPTION OF WORK:

Replace slot welds with a partial penetration weld between the upper and lower rings as shown on attached details with FCAW process being used for complete joint welding except for buttering that is required with SMAW E7018.

All welding is to be performed per direction of Burns and Roe Welding Engineers, Addenda System and this PED which includes a work procedure with buttering, peening, grinding, visual inspection, MT inspection and a sequence.

NOTES

1. THIS PED REVISES DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(S): N/A
2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(S): N/A
3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S: N/A
4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF THE FOLLOWING PED'S: N/A

REVISE:

NONE  
DRAWINGS: N/A  
SPECIFICATION: N/A

APPROVALS:

*[Signature]* 3-24-80  
DISCIPLINE ENGINEER DATE  
*[Signature]* 3-25-80  
LEAD DISCIPLINE ENGINEER DATE  
S/U LIAISON ENGINEER DATE  
RESIDENT PROJECT ENGINEER DATE

REPAIR PROCEDURE FOR NCR #05688 AT THE  
541'-5" LEVEL IN REACTOR CONTAINMENT VESSEL

1) PURPOSE

The purpose of this procedure is to establish the requirements for the structural steel repair welding inside the containment. Any deviation from the requirements of this procedure will require specific approval of the Burns and Roe Welding Engineer. Deviation approvals will be granted only after examination of the problem areas and a resolution given by Burns and Roe Welding Engineer by Addendum system.

Welding sequences shall be issued as attachments to this procedure. Any changes or additions to weld sequences or other special instructions shall require approval by the Burns and Roe Welding Engineer.

The Quality Control Manager shall be responsible for assuring compliance with these procedures.

2) DOCUMENTATION

Work packages shall be used for all structural steel work and shall be prepared in accordance with this procedure.

The Structural Steel Weld Record form shall be used for structural steel welding documentation.

Weld repairs, if required, shall be documented on the Structural Steel Weld Repair forms.

The loss of Preheat/Interruption of Weld Sequence form shall be used to document such occurrences. If cracks are discovered, an Inspection Report will also be initiated. Upon completion of the form, a copy will also be immediately given to Burns and Roe Welding Engineer on duty for approval.

Preheat recorder charts shall be identified by weld, iso., or dwg. no., and transmitted, upon completion of work, to the Q.A. vault.

3) MATERIAL

Electrode Control shall be in accordance with the work procedure. Electrodes shall be purchased in hermetically sealed containers and shall be dried for at least one(1) hour at temperatures between 750°F. and 800°F. prior to issuance. Electrodes shall be maintained at a minimum temperature of 250°F. after the high temperature bake until withdrawn for use or temporary storage in portable ovens or a storage oven conveniently placed near the work area. Electrodes shall be removed from portable ovens one at a time and used immediately. Electrodes that have been or are wet shall be bent and discarded in an approved container. (Note: FCAW wire does not require pre-baking).

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	CHECKED BY	DATE	APPROVED: <i>Stallen</i>	DATE: <i>5/27/88</i>	Weld Work Procedure		

#### 4) WELDER QUALIFICATIONS

All welders using this procedure shall be qualified to unlimited thickness and all positions in accordance with approved weld procedures and AWS D1.1.

Welders qualified by groove welds on 8" sched. 120 pipe or larger and on plates 1" or over are qualified for all thicknesses of structural steel

## 5) PROCEDURE

## PREHEAT PROCEDURE AND REQUIREMENTS

The following material shall be on hand prior to preheat and welding operations:

- a) Heating torches
- b) Heating coils or blankets
- c) Heat retaining blankets
- d) Clips for holding coils, blankets, etc., in place.
- e) Temperature control and recording equipment.

## 6) TORCH HEATING

- 1) Torches may be used for applications involving arc-air gouging, attaching strongbacks, heater blanket clips, tacking, backing bars, and minor repairs. Preheat shall be  $200^{\circ}\text{F.} \pm 25^{\circ}\text{F.}$  with a 15 minute soak time.
- 2) Heating torches may be used to locally preheat the structure and weld site in the areas to be tack welded.
- 3) Heating torches shall be used with a neutral flame.
- 4) When preheat is obtained through torch heating for other than temporary tack welds, Q.C. shall frequently monitor the site both prior to and during welding to assure that minimum preheat and maximum interpass temperature requirements are maintained.

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7) RESISTANCE HEATING

All areas to be preheated, except those specifically exempted by the Burns and Roe Welding Engineer, shall be preheated using electric heating elements. The precise locations of the heaters will be designated by the preheating contractor's welding engineer.

Strip chart records of weld joint preheat and cool down are required.

Only magnetic holders shall be used to hold heaters and blankets to the Sacrificial Wall and to structures on the 541' level.

The preheat and maximum interpass temperature shall be held from the center line of the joint outward to at least 3" on each side of the joint. More than 3" from the joint the temperature range may be less than the minimum specified but shall not be more than the maximum specified. Thermocouples shall be located no more than 3" from the weld center line and their placement requires approval by the Burns and Roe Welding Engineers.

Inspectors shall check preheat with a contact pyrometer at fit-up before allowing welding to begin. During welding, inspection shall monitor minimum preheat and maximum interpass temperatures in the joint using a contact pyrometer.

After reaching preheat temperature, soak the joint at temperature for 1½ hours before beginning welding. Maintain the temperature range until all welding has been completed and then soak for another three (3) hours before starting cool-down.

Heat retaining blankets shall be used as necessary to control cool-down rate. The cool-down rate shall not exceed 50°F. per hour. Blankets may be removed when ambient temperature has been reached.

The heat retaining blankets, which must be maintained throughout preheat, all welding inspection, and cool-down, may be adjusted to permit welding. For instance, a heater and blanket may be placed directly over the joint for preheat and soak, then removed during welding.

When the preheat drops below the specified minimum, a Loss of Preheat form shall be prepared. The temperature shall be restored as soon as possible after the low temperature is detected.

8) TEMPERATURE REQUIREMENTS

The preheat requirement for local torch heating for attaching strongbacks, heater blanket clips, backing bars, and for tacking shall

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be: 150°F. to 200°F. for at least 2" in each direction from the weld site, with a 15 minute soak time at temperature prior to beginning work.

Welders and/or operators shall be provided temperature indicating crayons or contact pyrometers to assure that preheat requirements are being met.

9) PREHEAT MAXIMUM INTERPASS TEMPERATURE

Welds to Sacrificial Shield Wall and within 24" of the Sacrificial Shield Wall.	200 ± 25°F	250°F.
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The minimum preheat and maximum interpass temperature for all welding shall be as noted above.

#### 10) FIT-UP AND TACKING

The joint gap for structural and partial penetration welds shall not exceed 3/16" for material thicknesses less than 3". The joint gap shall not exceed 5/16" for material thicknesses 3" and above. Such joints shall incorporate adequate backing against which to weld.

The root opening for single bevel grooves against backing bars shall be as follows.

1/4" min. to 9/16" max. backing bar removed after welding.  
3/8" min. to 9/16" max. backing bar left on.

Tack welds shall be subject to the same quality requirements as the final welds except that discontinuities such as undercut and unfilled craters need not be removed before the final arc weld.

Preheat is mandatory for single pass tack welds which are remelted and incorporated into continuous arc welds (final welds).

Tack welds must be large enough to prevent shifting or cracking during subsequent welding. They must be clean, contain no cracks, lack of fusion, or slag and should be designed to become part of the final weld.

Tack welds which are incorporated into the final welds shall be made with electrodes meeting the requirements of the final welds and shall be cleaned thoroughly.

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11) All welding shall be performed using approved welding procedure according to AWS D1.1 and Specification Section 2808-215-17D. A stringer bead technique shall be used to the greatest extent possible. In any case, the width of bead shall not exceed three (3) core diameters of the electrode (except for dual shield flux cored wire which shall not exceed 3/8" in width.

The minimum size of a root pass shall be sufficient to prevent cracking and the maximum thickness of layers subsequent to root pass shall be 1/8" for welds made in the flat position and 3/16" for welds made in any other position.

Each weld pass of deposited weld metal shall be thoroughly cleaned using slagging picks, wire brushes, or by grinding.

Any cracks, blow holes, or other defects that appear on the surface of weld beads shall be removed by chipping or grinding before the next covering weld bead is deposited.

All weld beads, except those in the root and final layers, shall be peened immediately after removal of slag. However, any visible defects such as porosity, cracks, or slag pockets must be removed by grinding prior to peening. Peening shall be done using an air hammer with a round nose tool of a minimum diameter of one quarter inch ( $\frac{1}{4}$ "). Peening shall be done in a straight and continuous line. Care shall be exercised to prevent scaling or flaking of weld base metal from over-peening. Peening shall be used in all cases, except where specifically prohibited by a note on the weld sequence sheet. Air operated "needle" slagging guns shall not be used for peening purposes. Peen per sketch attached.

No downhill welding will be permitted.

Heat input range shall not exceed the following:

35kj/in. heat input shall be maximum for welding.

Buttering may be done horizontally, vertically (up); or any combination of the two. Requirements for buttering, if any, are shown on weld sequence sheet. Buttering does not require peening.

All groove welds and all fillet welds against the Sac. Wall require that the Sac Wall be buttered, and the I.D. of all weld joints shall be buttered prior to welding.

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Every effort should be made to provide continuous welding until the joint is complete. As a minimum, for base material thickness up through 2½", ¾" throat thickness shall be obtained without an interruption. For material thicker than 2½", 1½" throat thickness should be completed without interruptions. "Interruptions" shall be defined as welding which is discontinued for more than 1 hour but less than 2 hours. All "interruptions" shall be recorded. Any weld which is discontinued for more than 1 hour must be dispositioned and approved by the Burns and Roe Welding Engineer. Any weld which exceeds the 2 hour interruption limit shall require documentation on an IR/NCR if deemed necessary by the Burns and Roe Welding Engineer. For all interruptions, the following action shall be taken:

- 1) The last weld layer shall be peened before the weld is left.
- 2) The weld shall be covered with insulation blankets and the required preheat maintained. Q.C. shall verify this.
- 3) The weld shall be visual inspected prior to resuming welding. The visual inspection report noting the interruption shall be included in the work package. If a crack is discovered, an IR shall be prepared.
- 4) Each weld shall be peened and inspected, per attached sketch.

## 12) INSPECTION

Prior to any welding, the area to be welded shall be visual inspected in accordance with AWS D1.1, and after any arc-gouging, cutting or grinding. All welding shall be MT inspected at 100% completion at preheat temperature. All welding shall be MT inspected 72 hours after cool down.

When the finished weld will be inaccessible for the 72 hour magnetic particle inspection because another weld or member will have covered it, acceptance will be based on a hot MT made when the weld is complete and visual and 72 hour MT of any remaining exposed areas. This exception is only allowed when it eliminates heat cycling a weld zone, and it shall be approved by the Burns & Roe Welding Engineers.

B & R Welding Engineer shall evaluate all rejectable indications revealed by visual or MT inspection prior to any rework.

## 13) REPAIR SEQUENCE

Remove the indication revealed by visual inspection to sound metal beyond each end of the discontinuity by grinding or chipping. If the defect extends one half inch (½") arc-gouging may be used. The required preheat shall be specified. Arc-gouging is to be used sparingly to minimize the possibility of crack propagation.

Excavation shall be reinspected to assure that the defect has been removed.

Reweld excavated area following appropriate paragraphs in this procedure.

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			10/1/88	11/1/88	

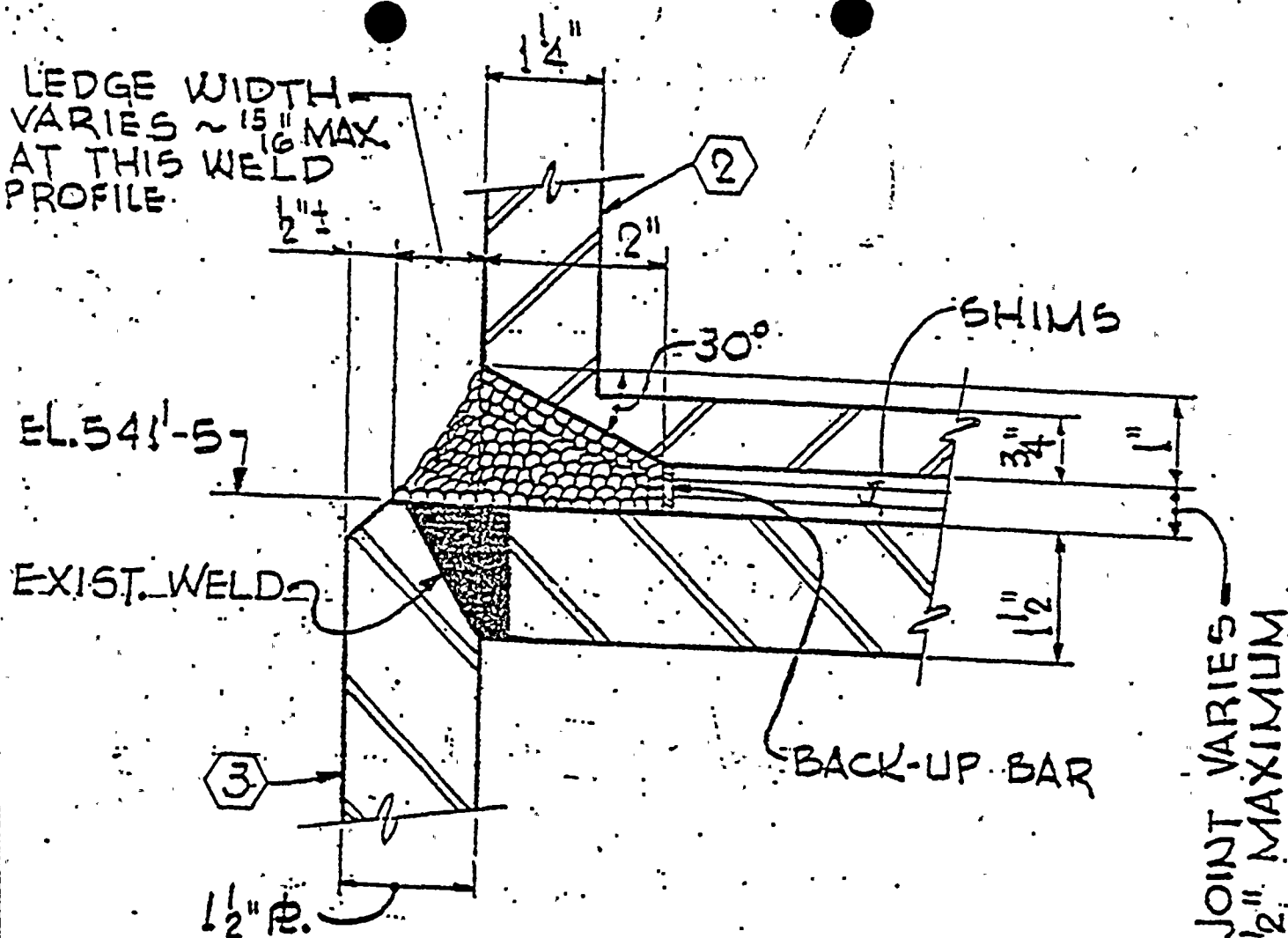
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N.T.S.	CHKD BY: <i>[Signature]</i>	DATE: 3-24-80	APPROV'D: <i>[Signature]</i>	DATE: 7/2/80	PHASE I



- \*Except cover pass.

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			<i>PHASE I</i>		

LEDGE WIDTH  
VARIES ~ 15" MAX.  
AT THIS WELD  
PROFILE.

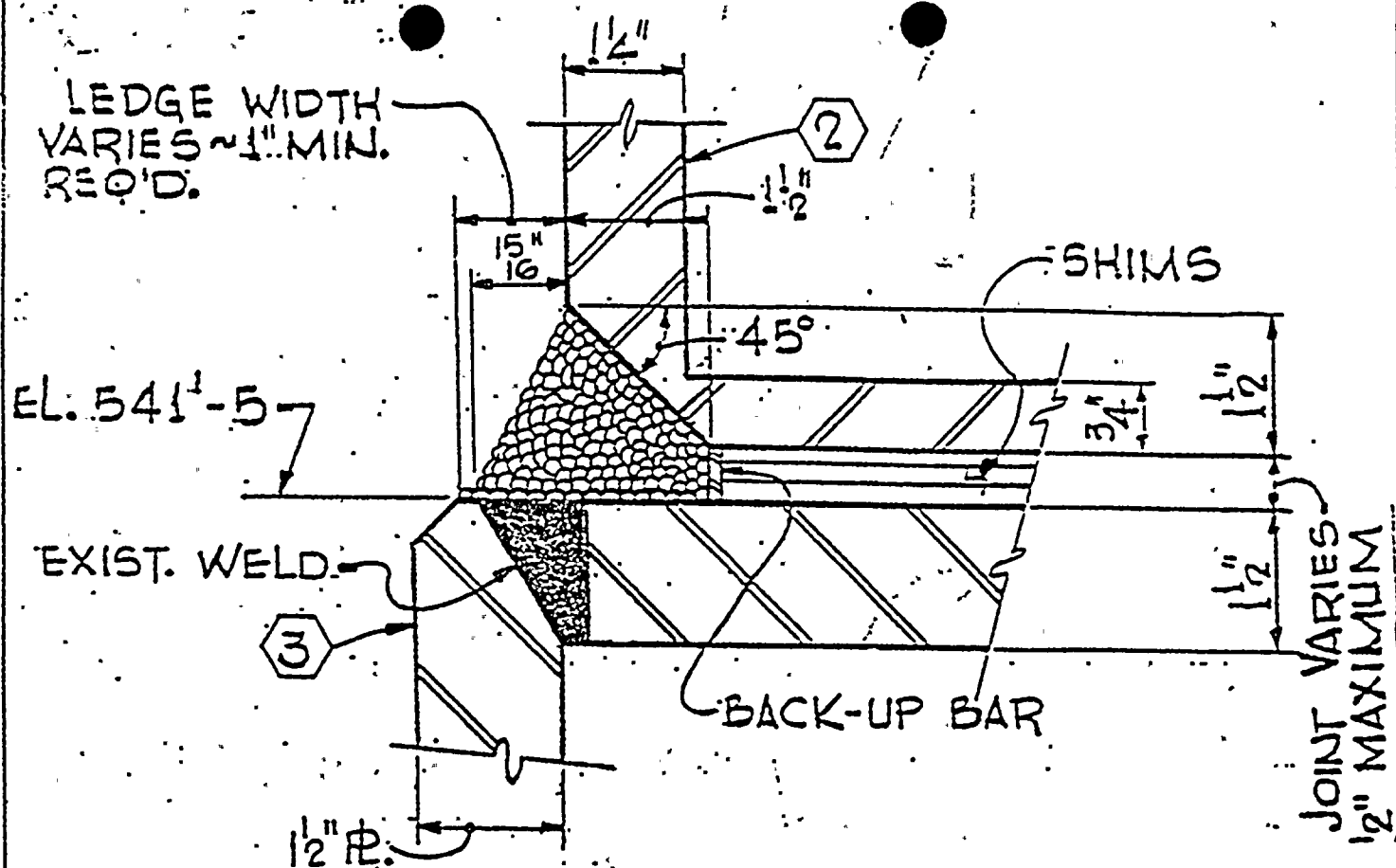


TYPICAL PHASE II WELD DEPOSIT  
WHERE LEDGE IS LESS THAN 1" WIDE &  
SIDE  $\phi$  / BUILT-UP MEMBER (3) IS 1 1/2"

- 1) After root passes have been applied all remaining passes shall be peened. \*
- 2) M.P.T. final weld at preheat temp. and 72 hrs. after complete cool down.

\*Except cover pass.

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SCALE:	DRAWN BY:	DATE:	TITLE: WELD DEPOSIT PHASE II		
N.T.S.	CHKD BY: <i>YMB</i>	DATE: <i>2/2/80</i>	APPROV: <i>Itaker</i> DATE: <i>2/2/80</i>		

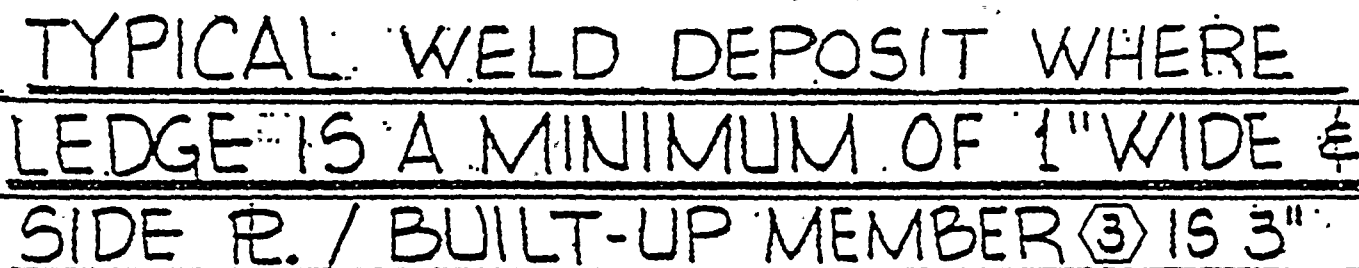


TYPICAL PHASE II WELD DEPOSIT  
WHERE LEDGE IS A MINIMUM OF 1" WIDE &  
SIDE R./BUILT-UP MEMBER (3) IS 1 1/2"

- 1) After root passes have been applied all remaining passes shall be peened. \*
- 2) M.P.T. final weld at preheat temp. and 72 hrs. after complete cool down.

\*Except cover pass.

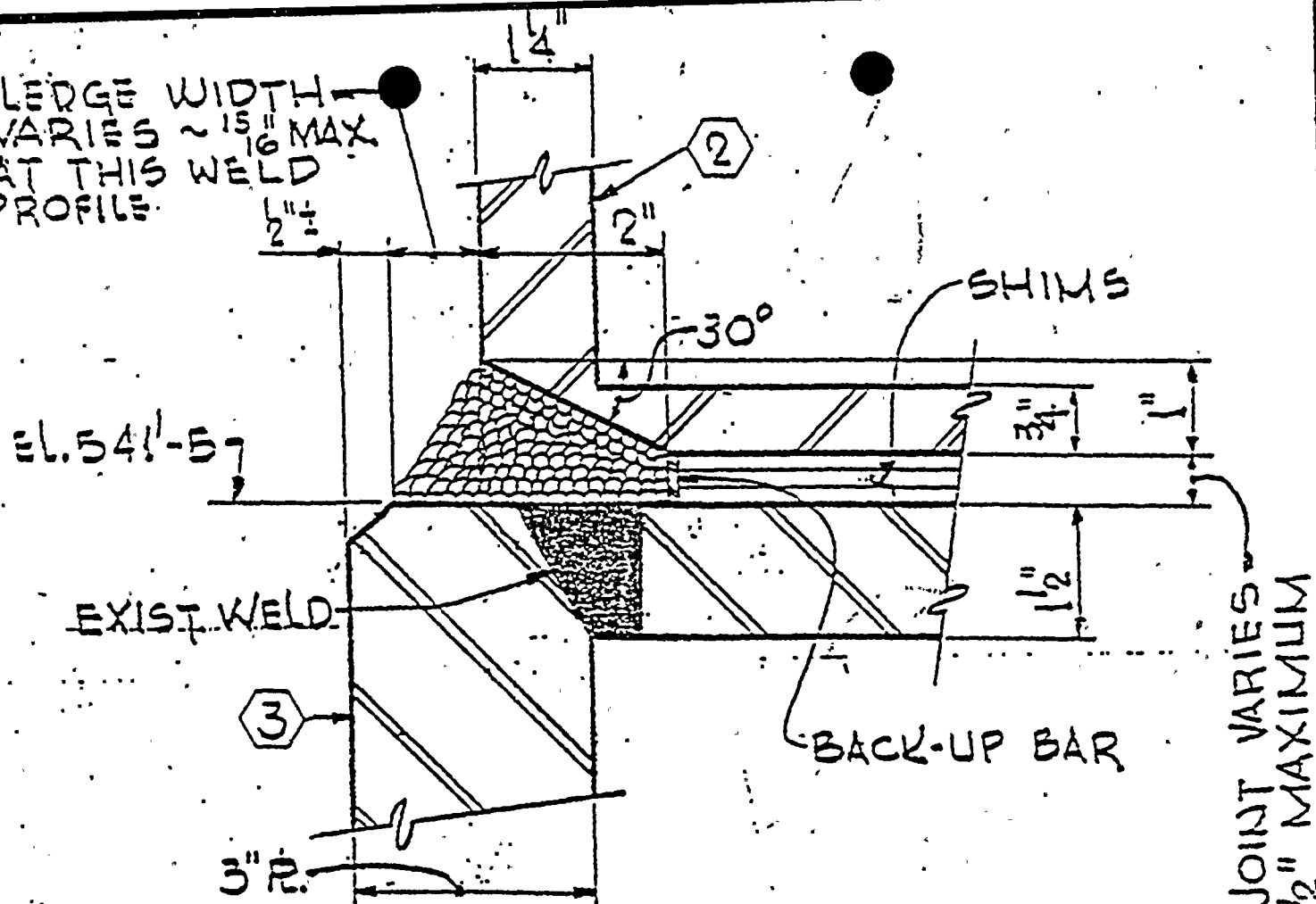
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N.T.S.	UMM	DATE: 2/24/80	APPROVED: J. Allen DATE: 2/25/80		



\*Except cover pass.

WELD DEPOSIT

LEDGE WIDTH  
VARIES ~ 15" MAX  
AT THIS WELD  
PROFILE.



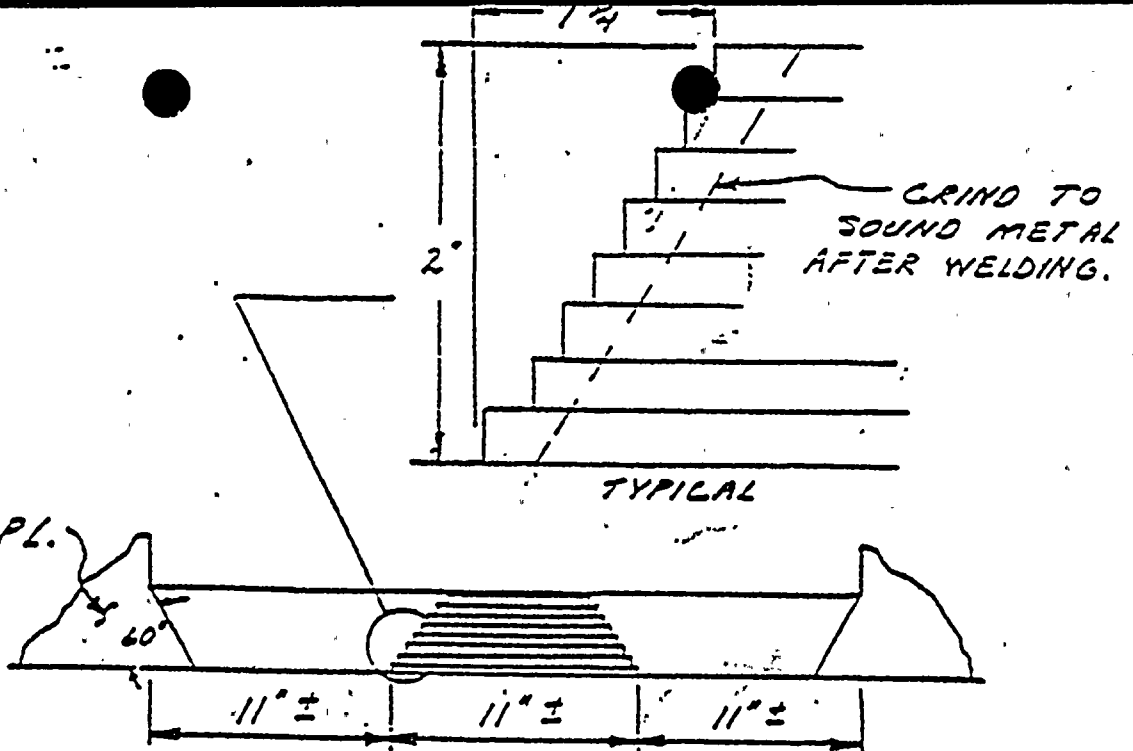
# TYPICAL WELD DEPOSIT WHERE LEDGE IS LESS THAN 1" WIDE & SIDE R. / BUILT-UP MEMBER (3) IS 3"

- 1) After root passes have been applied all remaining passes shall be peened. \*
- 2) M.P.T. final weld at preheat temp. and 72 hrs. after complete cool down.

\*Except cover pass.

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N.T.S.	W. M. M.	DATE: 1/1/88	WELD DEPOSIT		

COL. SPLICE PL.  
(TYP.)



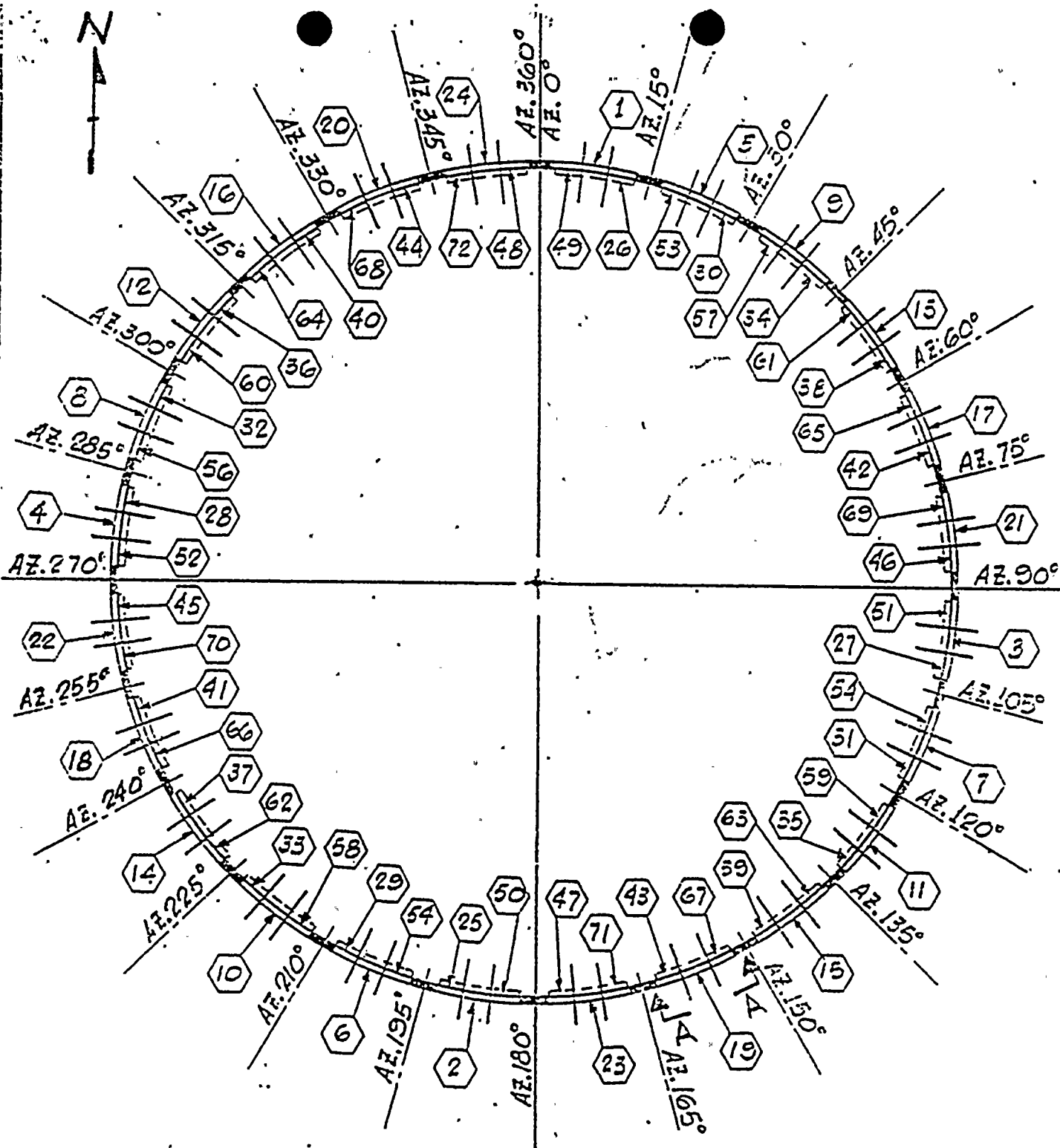
SECTION A-A  
TYPICAL CASCADE WELD DETAIL

NOTES: --A) 4'-11" cascade area's shall be made first, to assure that there is no movement to the wall, also to establish the stability for the remaining welding.

B) All remaining welding may be completed in a different sequence if so designated by B & R Welding Engineer.

- 1) Four (4) welders to weld simultaneously throughout sequence.
- 2) First sequence to start at AZ. 7°-30'.
- 3) Second sequence to start at AZ 191°-30'.
- 4) Third sequence to start at AZ. 103°-30'.
- 5) No welder shall proceed ahead of any other welder in a sequence.
- 6) Each sequence number consists of approximately 11".

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## PLAN ~ WELD SEQUENCE

INDICATES WELD SEQUENCE NUMBER

WORK THIS SHEET WITH SHEET 8th of 15

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SCALE: N.T.S.	DESIGNED BY: KERNER DATE: 12/23/77 CHECKED BY: <i>[Signature]</i> DATE: 3/24/78	TITLE: WELD SEQUENCE PLAN APPROVED BY: <i>[Signature]</i> DATE: 7/2/78			