



G.L. Tiley & Associates Ltd.
CONSULTING ENGINEERS

Technical Specification
Ross Shaft- Strip & Re-equip.

ROSS SHAFT FIELD
WELD INSPECTION

Revision

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Document No.

UGI-H9-2S005D

CLIENT: SDSTA

PROJECT: ROSS SHAFT STRIP & RE-EQUIP

SIGNATURE

DATE

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ISSUE/REVISION INDEX

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RR	B	WE	XJ	PS	2017/10/13	Released for Review & Comments
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Issue Codes: RC = Released for Construction, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RQ = Released for Quotation, RR = Released for Review and Comments.



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SECTION 1 GENERAL

The following specification was prepared to guide the process of inspecting field-welded structural steel completed as part of the installation of new set steel within the Ross Shaft.

The Ross Shaft was previously used as a production mineshaft for the Homestake Mine. As part of SDSTA's conversion of the mine into a scientific research facility, the existing shaft infrastructure in the Ross Shaft is being removed and replaced with new set steel. Wherever possible, connections for the new steel infrastructure were shop-welded or bolted. However, in some areas, field welding was required.

The field welding was performed during installation of the new Ross Shaft set steel. For G.L. Tiley & Associates Ltd. to accept the field welding performed and certify the shaft as complete and suitable for use, the field-welded components must be inspected by an independent certified weld inspector.

Areas where field welding must be inspected are listed in section 2. Field welds should be inspected based on the requirements listed in section 3. Specific areas where non-destructive testing is required are identified in Section 3.4. The inspection must be performed by personnel meeting the requirements of Section 4.

SECTION 2 ITEMS TO INSPECT

SECTION 2.1 BEARING BRACKETS

The most common field-welded item to inspect in the Ross Shaft rehabilitation work are structural plate washers used in the set steel bearing brackets. An example bracket is shown in Figure 1. There are approximately 200 of these brackets installed in the Ross Shaft. Several different types of brackets have been installed based on the shape of the shaft wall. The brackets are detailed on drawings UGI-H4-236, 242, 243, 244, 323, and 324. It is understood that some of these field-welded components have since been painted.



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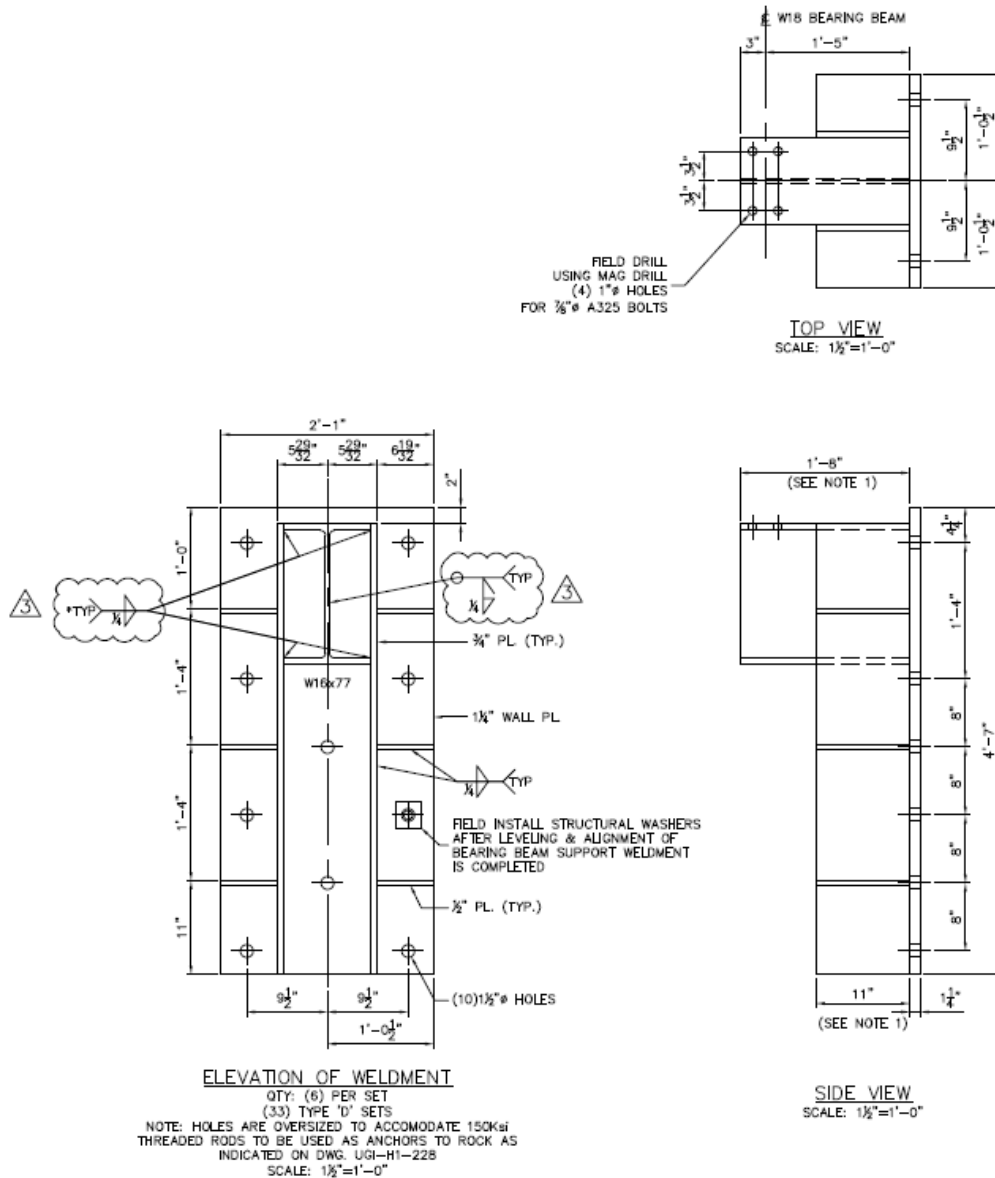


Figure 1: Standard Bearing Bracket

Above the 3650 level, the majority of bearing sets have six brackets, arranged as shown in the Figure 2.



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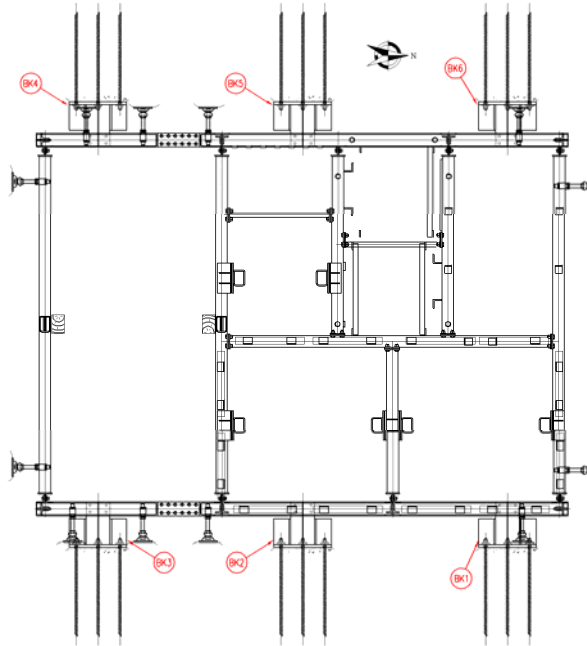


Figure 2: Typical bearing bracket arrangement above the 3650 level of the shaft

Below the 3650 level, the majority of the bearing sets have seven brackets, arranged as shown in Figure 3.

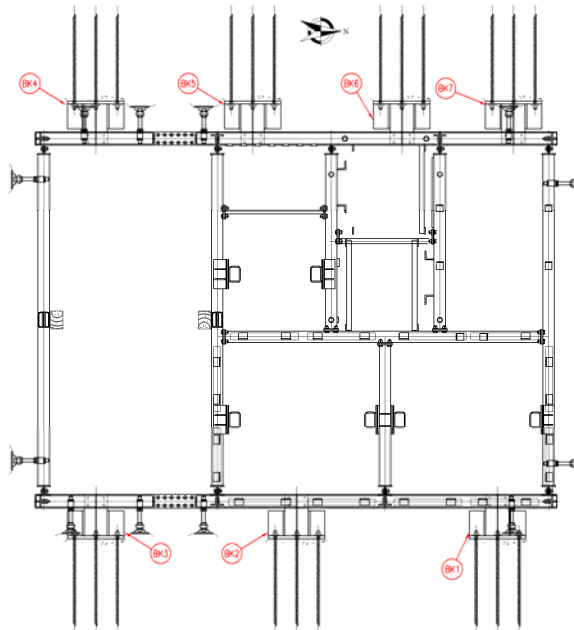


Figure 3: Typical bearing bracket arrangement below the 3650 level of the shaft



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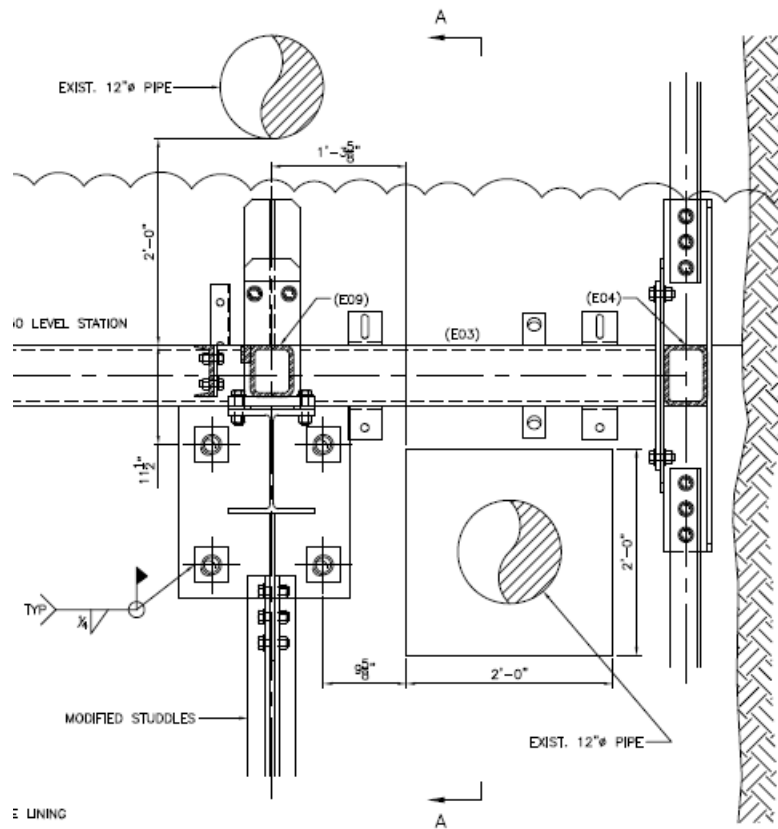
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When referring to specific brackets, the set number and the bracket number should be referenced.

SECTION 2.2 2450 LEVEL

At the 2450L, there are several items that were customized to avoid an existing pipe in the shaft (shown in the figure below). The field welds shown on UGI-H1-235 and UGI-H4-247 need to be inspected.



ELEVATION OF 2450 STATION LEVEL
(LOOKING WEST)

Figure 4: Additional bracket at the 2450 level. Excerpt from UGI-H1-235.



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SECTION 2.3 4850 LEVEL ANCHOR BLOCKING

Near the 4850 and 5000 levels, a modified blocking arrangement was required to provide horizontal support for the set steel. In this arrangement, structural steel tubing was anchored to the shaft wall and connected to the set steel as shown in Figure 5, with fabrication details as shown in Figure 6.

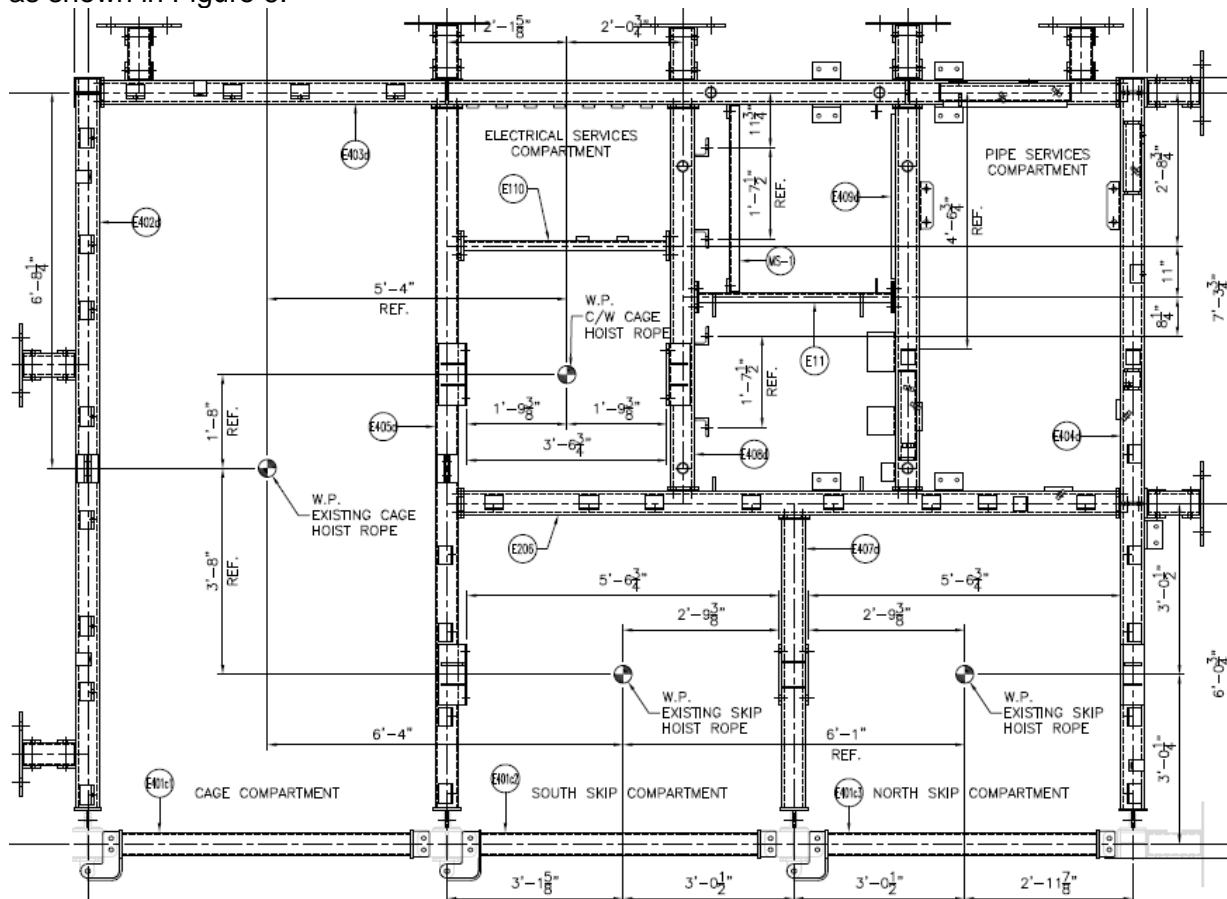


Figure 5: Anchor blocking arrangement near the 4850 level. Excerpt from UGI-H4-402



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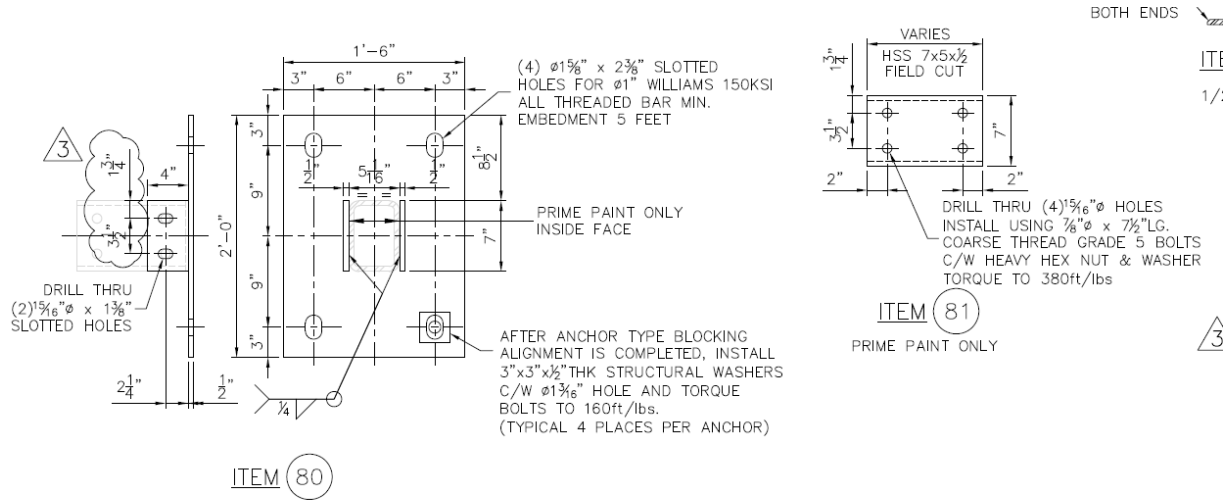


Figure 6: Fabrication details for 4850 level anchor blocking

At these locations, several items that were normally shop welded needed to be field welded in place to provide room to install the blocking. Two examples of this that would need to be inspected are shown in Figure 7 and Figure 8.

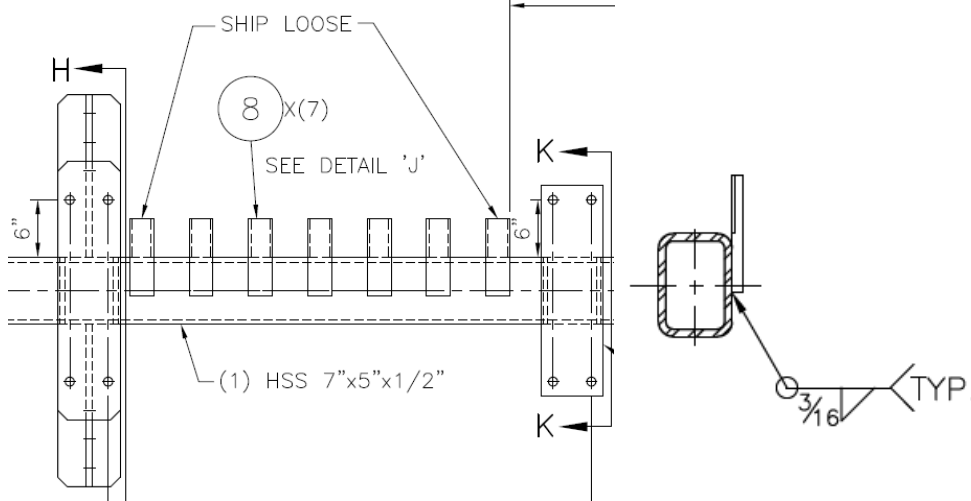


Figure 7: Field-welded cable support tabs along west wall of electrical compartment. Field welding of the outer tabs was required wherever anchor-type blocking was used.



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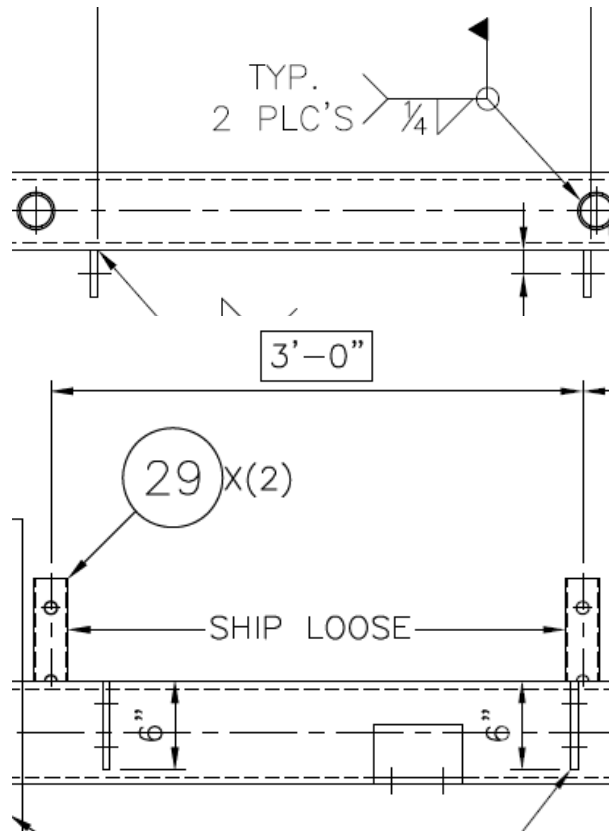


Figure 8: Field-welded handrail post supports along west wall of manway compartment. Field welding of these handrail supports was required wherever anchor-type blocking was used.

SECTION 3 INSPECTION PROCEDURE

SECTION 3.1 CODES AND STANDARDS

Where applicable, the following standards are considered suitable to be used to guide inspection of the welds:

ASTM E164 STANDARD PRACTICE FOR CONTACT ULTRASONIC TESTING OF WELDMENTS


OR

ASTM E165 STANDARD TEST METHOD FOR LIQUID PENETRANT EXAMINATION

OR

ASTM E709 STANDARD GUIDE FOR MAGNETIC PARTICLE TESTING

AWS D1.1 STRUCTURAL WELDING CODE – STEEL

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SECTION 3.2 ACCESS

Many of the field-welded connections are in areas that are no longer easily accessible, requiring the installation of scaffolding or swing stages for close inspection. As such, a full inspection of all field-welded connections would involve significant downtime. This inspection is intended as a high-level assessment with minimal downtime to identify if further investigation is required.

The following methods of access are available without significant preparatory work by SDSTA. Please note that appropriate working-at-heights training and equipment is required for work from the shaft conveyances.

- A work deck in the cage compartment allows access to brackets 3 and 4.
- A work deck in the north skip compartment allows access to bracket 1.
- The top of the skip in the south skip compartment allows access to bracket 2.
- Installation of manway ladders and platforms is partially complete. Where the manway has been installed, brackets 5, 6, and 7 will be visible, but will likely not be accessible for close inspection. The additional field-welded connections at the 2450, 4850, and 5000 levels (refer to Sections 2.2 and 2.3) may also be accessible from the manway.

In certain specific areas of interest (refer to Section 3.4), SDSTA shall provide temporary access to bracket 6 suitable for a close visual inspection and non-destructive testing.

SECTION 3.3 VISUAL INSPECTION

A visual inspection shall be performed on a sample of the items identified in Section 2. The sampling method shall be determined by the inspector in coordination with SDSTA. However, the following requirements shall be met:

- A minimum of 10% of the set steel bearing brackets shall be visually inspected.
- The areas selected for inspection shall be randomly distributed, with the intention of forming a representative sample of all field-welded connections in the shaft.
- The sampling method shall consider the access concerns discussed in Section 3.2.
- The visual inspection shall include the brackets identified for non-destructive testing in Section 3.4.

SECTION 3.4 NON-DESTRUCTIVE TESTING

At minimum, non-destructive testing is required at the following brackets:

- Set 35, Bracket 6
- Set 53, Bracket 6
- Set 85, Bracket 6
- Set 128, Bracket 6
- Set 149, Bracket 6
- Set 185, Bracket 6
- Set 201, Bracket 6



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Figure 9 and Figure 10 below provide guidance on where non-destructive testing is required on the brackets to be tested. Non-destructive testing shall be performed on the full perimeter of all welds in "Weld Group 2". Non-destructive testing should be performed on the welds in "Weld Group 1" if the visual inspection raises any concerns about the condition of the weld.

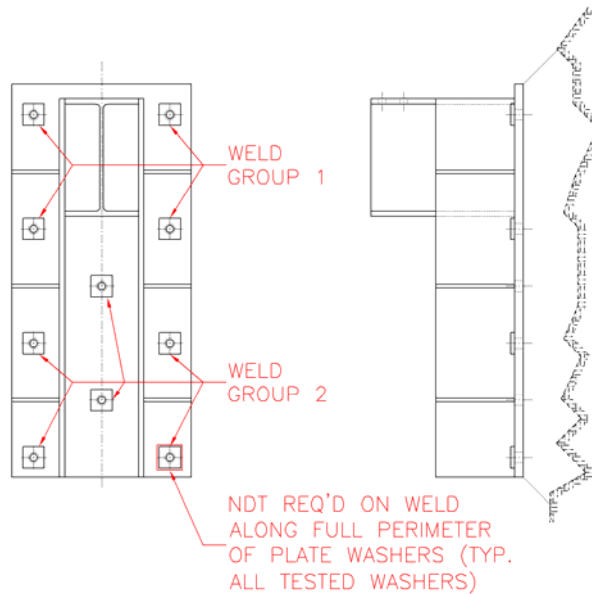


Figure 9: NDT requirements when testing typical bearing bracket

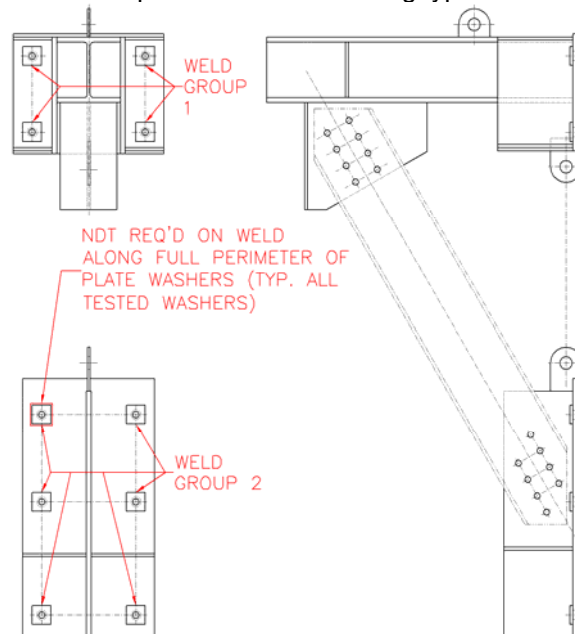



Figure 10: NDT requirements when testing Type 1 bearing bracket

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The visual inspection see (Section 3.3) may identify other areas where non-destructive testing is required to assess whether a weld is satisfactory. Where practical, this additional non-destructive testing should be performed during the inspection. The inspection report should indicate any areas where further investigation is recommended.

The selection of the appropriate non-destructive testing method is left to the discretion of the inspector. If there are other test methods not listed in section 3.1 that are to be included please detail these methods in the proposal being tendered.

SECTION 4 INSPECTOR REQUIREMENTS

The inspection must be performed by a Certified Welding Inspector (CWI) with the American Welding Society (AWS).

SECTION 5 APPENDIX

The following drawings are provided for reference and information to allow for an understanding of what is to be expected as part of the inspection:

UGI-H1-235	2450 STATION LEVEL STUDDLE MODIFICATIONS
UGI-H4-236	DETAIL OF BEARING BEAM SUPPORT WELDMENT
UGI-H4-242	DETAIL OF ALTERNATE SUPPORT WELDMENT – TYPE ‘1’
UGI-H4-243	DETAIL OF ALTERNATE SUPPORT WELDMENT – TYPE ‘2’
UGI-H4-244	DETAIL OF ALTERNATE SUPPORT WELDMENT – TYPE ‘3’
UGI-H4-247	DETAIL OF MODIFIED ‘E’ SET AT 2450 LEVEL STATION
UGI-H4-323	DETAIL OF STUDDLE BRACKET 7a
UGI-H4-324	DETAIL OF STUDDLE BRACKET 8a
UGI-H4-408	SET TYPE ‘E04’ DETAILS – SHEET 4
UGI-H4-412	SET TYPE ‘E04’ DETAILS – SHEET 8
UGI-H4-413	SET TYPE ‘E04’ DETAILS – SHEET 9

UGI-H9-2S005A STRUCTURAL STEEL FABRICATION SPECIFICATION

--END OF SPECIFICATION--