


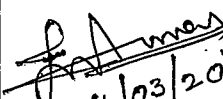
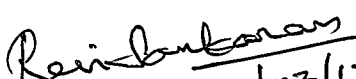


BHARAT HEAVY ELECTRICALS LIMITED  
TIRUCHIRAPALLI 620 014  
QUALITY ASSURANCE

SIP: NP: 06/02

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PROCEDURE FOR VISUAL INSPECTION OF NON PRESSURE PARTS

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01	28/03/04	-Sd- A Francis	-Sd- G S N Murthy	-Sd- C R Raju
02	11/03/2017	 11/03/2017 K.Nagarajan, Sr.Engineer/QA	 11/03/2017 J.V.V.Aruna Kumar, DGM/QA	 11/03/17 U.Revisankaran, AGM/QA&BE

Record of Revisions

Revision No.	Clause No.	Details of revision
00		PR:QE:021/02renumbered as SIP:NP:06
		Editorial corrections for clarity
		Clause 3.1 modified
01	3.1	Code related change
	3.2	For better clarity
	3.2.1	For better clarity
	3.2.3	Code related change
	3.2.5	For better clarity
	4.4	Code related change
02	3.2.2,3.2.4, 4.4 (3),4.4 (5)	<i>Clauses modified based on AWS D 1.1 /D1.1M:2015 Standard.</i>

## 1.0 SCOPE

This procedure details out the visual inspection of all base metal surfaces and weld joints of Non Pressure Parts.

## 2.0 REFERENCE DOCUMENTS

AWS D 1.1 /D1.1M:2015 & relevant drawings.

## 3.0 VISUAL INSPECTION OF GAS CUT EDGES

### 3.1 Limits on acceptability and repair of mill induced laminar discontinuities in cut surfaces

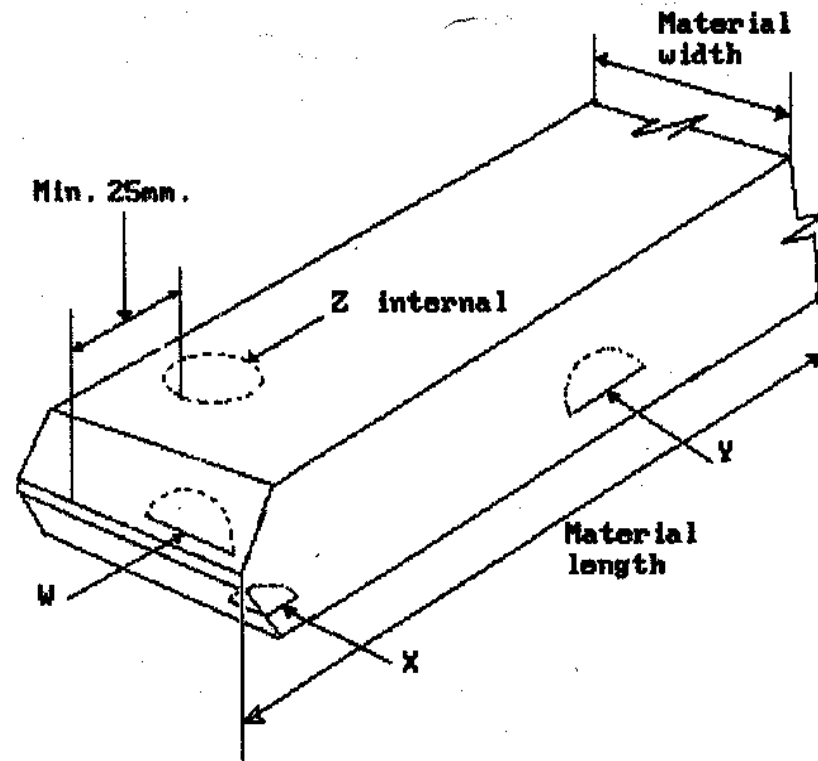
Description of Discontinuity	Repair Required
Any discontinuity 25mm in length or less	No repair required
Any discontinuity over 25mm in length and 3mm max. depth (after grinding & confirmation of depth on 10% of total such locations)	No repair required
Any discontinuity over 25mm in length with depth over 3mm but not greater than 6mm	Remove by grinding and weld.
Any discontinuity over 25mm in length with depth over 6mm but not greater than 25mm	Completely remove and weld.
Any discontinuity over 25mm in length with depth greater than 25mm.	Refer Clause 3.2

### 3.2 For discontinuities over 25mm in length with depth greater than 25mm, discovered by visual inspection (and subsequent grinding for depth assessment) of plate cut edges/ bevel edges before welding or during examination of welded joints by radiography or ultrasonic inspection, following procedure shall be followed:

#### 3.2.1 Where discontinuities such as W, X or Y in Fig.1 are observed prior to completing the joint, the size, shape and area of the discontinuity shall be determined by UT.

#### 3.2.2 The repair of the discontinuity by welding shall be allowed in case area of discontinuity does not exceed 4% of the cut area with the following exceptions: if the *length* of the discontinuity or the aggregate width of discontinuities on any transverse section, as measured perpendicular to the plate length, exceeds 20% of the plate width, the limit of 4% area shall be reduced by percentage amount of the width exceeding 20% (e.g., if the discontinuity is 30% of plate width, the area of discontinuity cannot exceed 3.6% of the plate area). The discontinuity on the cut edge of the plate shall be gouged out to a depth of 25mm beyond its intersection of the surface by chipping, or carbon arc gouging, or grinding and blocked off by welding with manual shielded metal arc process in layers not exceeding 3mm in thickness.

Fig.1

**EDGE DISCONTINUITIES IN CUT PLATE**

- 3.2.3 If discontinuity (Z) not exceeding the allowable area in Clause 3.2.2, is discovered after the joint has been completed and is determined to be 25mm or more away from the face of the weld, as measured on the plate surface, no repair of discontinuity is required. If the discontinuity (Z) is less than 25mm away from the weld, it shall be removed to a distance of 25mm from the fusion zone of the weld by chipping, air carbon arc gouging or grinding. It shall then be blocked off by welding with low hydrogen SMAW process in layers not exceeding 3mm in thickness for at least four layers. Submerged arc or other welding process may be used for remaining layers.
- 3.2.4 If the area of discontinuity (W), (X), (Y) or (Z) exceeds the allowable limits of Clause 3.2.2, the plate or sub-component shall be rejected and *replaced*.
- 3.2.5 The aggregate length of weld repair shall not exceed 20% of length of plate surface being repaired.

#### 4.0 VISUAL INSPECTION OF WELDS

- 4.1 Visual examination of welds shall be performed after completion of welding and subsequent cooling to room temperature. However for ASTM A514 and A517 steels (*whenever used*), visual examination of welds shall be performed only after 48 hours of completion of welding.

4.2 All welds shall be cleaned to remove slag, spatter etc. and visually examined for defects like crack, undercut, porosity, lack of fusion etc.

4.3 The welds shall also be examined for size, shape and reinforcement.

4.4 **ACCEPTANCE CRITERIA AND DISPOSITION DETAILS ARE AS FOLLOWS:**

Sl.No.	Nature of defects	Acceptance norms	Disposition
1.	Crack, Lack of fusion, Overlap	Not accepted	Confirm by LPI/MPI, repair and retest.
2.	Crater (Except at the ends of stitch welds outside the required length)	Not accepted	Fill by weld deposit.
3.	<u>Under cut:</u> For T < 25 mm  For T $\Rightarrow$ 25 mm	Up to 1.0 mm accepted. (Up to 2.0 mm if within 50mm for any 300 mm weld Length.)  Up to 2.0 mm accepted.	To be ground and merged/welded.  >2.0mm to be ground and merged/welded.
4.	<u>Porosity:</u> Transverse Butt welds  Porosity for other Groove/Fillet welds	Piping porosity not permitted.  One pore of $\leq 2.5$ mm for each 100 mm of Weld length is permitted (*). *sum of diameters of piping porosity in fillet welds in web to stiffener: 10mm for 25 mm weld & 20mm for 300mm weld is however acceptable.	
5.	<u>Weld profile:</u> (i) Face of fillet  (ii) Size (Minimum)  (iii) Reinforcement (groove)	Flat or concave (meeting the throat) accepted. convexity is acceptable as below: 2mm for weld width $\leq 8$ mm 3mm for weld width $> 8$ mm < 25 mm 5mm for weld width $\geq 25$ mm  As per drawing. Under size permitted as below(#) 2mm for nominal size < 5mm 2.5mm for nominal size 6mm 3mm for nominal size $> 8$ mm #In all case, undersized weld length shall not exceed 10% of the total weld length.  <i>3mm (max.) for <math>t \leq 25</math>mm ; 5mm(max.) for <math>t &gt; 25</math>mm</i> <i>t= thickness of thicker plate for CJP; t= weld size for PJP</i>	