PALLKKI NDT EXCELLENCE CENTER
BANGALORE

VISUAL EXAMINATION PROCEDURE

DOCUMENT NO: -VT-001

0	30.04.13			-
Rev	**Date**	**NDE Level III**	**HPQA**	**NDE Level III.**
		Prepared & Approved by	**Accepted by**	**Reviewed by**

1.SCOPE

1.1 This procedure covers the visual examination of welding in pressure vessel components – plate, pipe, nozzles etc...By using Visual and Optical aids and Gauges.

1.2 The welding Visual Examination shall be performed before, during and after welding.

2.REFERENCES :

2.1 ASME Section V article 9. Latest edition

2.2 ASME Section VIII Div. 1.Latest edition

2.3 ASME B 31.1 Latest edition

3.PERSONNEL QUALIFICATION:

3.1 The visual examination, interpretation and evaluation shall be carried out by either by NDT Level II (Visual Testing) or NDT Level III (Visual Testing) certified persons.

3.2 Certified NDT Level I (Visual Testing) personnel can perform visual examination under supervision of certified NDT Level II (Visual Testing) person or NDT Level III (Visual Testing) person only.

3.3 Personnel qualification shall be as per recommended guidelines of ASNT-SNT-TC-1A-2006 edition.

3.4 The qualified persons as per recommended Practice number of above must be able to read Jaeger font and size ‘J1” with natural or corrected eyes on Jaeger chart. This examination shall be conducted at the maximum interval of one year.

4.TEST PARAMETERS:

4.1 **Lighting Conditions:**

4.1.1 Visual examination shall be performed in well lit condition having minimum light intensity of 1000 Lux at the examination surface.

4.1.2 Lighting used may be natural light or 100 Watt electric bulb.

4.2 **Surface roughness:**

4.2.1 The surface to be examined shall be free from all dirt, grease, lint, oil, scale or slag.

4.2.2 The surface roughness values shall be as per the drawing requirements.

4.2.3 Weld surface irregularities can be removed by grinding.

4.2.4 While doing grinding for removal of weld surface irregularities or excessive reinforcement, the ground surface shall be smooth curvature without leaving any sharp corner.

4.3 **Position of the examiner with respect to the job condition:**

4.3.1 Direct visual examination shall be carried out at locations where sufficient access is available with maximum distance between the test surface and the eyes are 600 mm.

4.3.2 The angle between the eyes and the test surface must be greater than 30 degrees from the test surface.

4.3.3 Magnifying lens can be used for identification of the type of discontinuities but not for the acceptance of the discontinuity.

5.CALIBRATION REQUIREMENTS:

5.1 Date of valid calibration for all the measuring instruments used shall not be later than 12 months from the date of examination.

5.2 All the measuring instruments shall undergo calibration immediate after repair or servicing.

6. VISUAL EXAMINATION DURING VARIOUS STAGES OF PRESSURE VESSEL FABRICATION:

6.1 Ensure that only qualified welder perform welding as per parameters specified in applicable Welding Procedure Qualification.

6.2 Applicable qualified welding procedure specification shall be available in the location of the welder at the time of welding. Welder qualification record shall be available with designated Welding Engineer.

6.3 If welding is to be performed with baked electrodes which are placed in portable welding oven, the lid of the portable holding oven must be in closed condition. If the welder is found welding by keeping the portable holding oven lid open, then entire length of welding which he has performed under this condition shall be subjected to investigation by Welding Engineer.

6.4 Visual examination of final welding shall meet the below Table-6

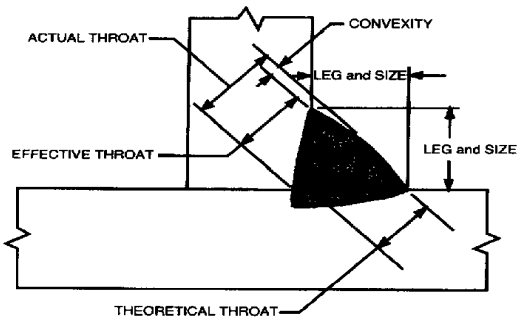
6.5 Examination Report as a consolidation of all three stages of welding may be used as per Annexure-1 format.

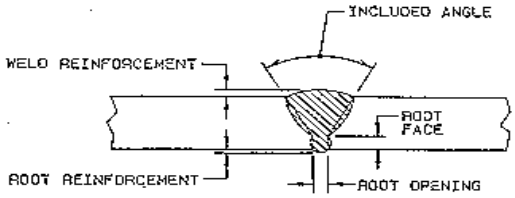
6.6 However separate Examination sheet shall be maintained after final welding examination for minimum requirements as mentioned below

(a) The date of the examination
(b) Procedure identification and revision used
(c) Technique used
(d) Results of the examination
(e) Examination personnel identity, and, when required by the referencing Code Section, qualification level
(f) Identification of the part or component examined

TABLE-6

Sr. No.	Parameter	Tolerance
1	External Porosity, external inclusion, cracking, incomplete penetration, lack of fusion, crack like indications	**Are not allowed regardless of the size.**
2	Out of roundness of shells and heads of pressure vessels	A. Out of roundness is the difference between maximum and minimum ID. B. Maximum permissible out of roundness is 1.2 % of nominal diameter.
3	Bevel angle	± 2.5 degree.
4	Root face	-0.5 mm, + 1.2 mm
5	Root gap at the time of welding.	-0.5 mm, + 1.0 mm
6	Mismatch between members to be welded	A.1.5 mm maximum for nominal thickness up to 6.0 mm. B.2.5 mm maximum for nominal thickness more than 6.0 mm and up to 12.0 mm. C.3.0 mm maximum for nominal thickness more than 12 mm.
7	Variation in welding member thickness	A.Both members must be in same plane at inner surface. B.The higher thickness member must be tampered with suitable process on such that for each 1 mm reduction in thickness, the slope shall be up to 3 mm distance perpendicular to the thickness.
8	Spatters	A.No spatter is allowed.
9	Arc strike	A.No arc strike is allowed. B.Arc strike can be repaired.
10	Under cut	A.0.5 mm depth maximum.
11	Reinforcement	A.1.5 mm maximum for nominal thickness up to 6.0 mm. B.2.5 mm maximum for nominal thickness more than 6.0 mm and up to 10.0 mm. C.3.4 mm maximum for nominal thickness more than 10 mm and up to 20 mm. D.If reinforcement value exceeds, required tolerance then it can be ground and bring to the required level. Grinding is to be carried out in smooth curvature and shall not produce sharp corner.
12	Fillet weld (Concave)	The size of an equal leg fillet weld is the leg length of the largest inscribed right isosceles triangle. Theoretical Throat = 0.7 X Size
13	Fillet weld (convex)	The Leg and size shall be same (max + 0.75 mm reinforcement allowed)


ACTUAL THROAT
CONVEXITY
LEG and SIZE
EFFECTIVE THROAT
LEG and SIZE
THEORETICAL THROAT


INCLUDED ANGLE
WELD REINFORCEMENT
ROOT FACE
ROOT REINFORCEMENT
ROOT OPENING

Annexure-1Visual Examination Report format for Visual Welding examination

Pallakki NDT Excellence Center., BANGALORE					
VISUAL EXAMINATION REPORT					
Name of Object	:	Object ID no.	:	Date of test	:
Procedure no.	:	Material	:	Report no.	:
Material Thk.	:	Type of joint	:	Welding Process	:
Visual aids used	:	Illumination	:	Drawing no.	:
Extent of examination	:	Acceptance standard	:	Process Annexure	:

SR. No.	BEFORE WELDING CHECK POINT(STAGE-1)	RESULT	REMARKS
01	Shape and dimensions of the weld preparation		
02	Fusion face and adjacent surface		
03	Joint are in fixed relation to each other i.e. weld fit up		
SR. No.	DURING WELDING CHECK POINT(STAGE-2)	RESULT	REMARKS
01	weld metal is cleaned before further run		
02	Visible imperfections		
03	Shape of the runs and b/w the weld and parent metal		
SR. No.	AFTER WELDING CHECK POINT(STAGE-3)	RESULT	REMARKS
01	Cleaning and dressing		
02	Profile and dimensions		
03	Weld root and surfaces		
04	Requirement of ASME/ASTM		

Examined By: **Witnessed By:**

Exhibit VT-1 Revision: 0 Date: 30-04-13