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| J\|S\|S\|L | **PROCEDURE FOR DYE PENETRANT EXAMINATION** | DOC. NO: - JSSL/DPT/008-02<br>REV NO:02<br>Total Pages: - 1 to 8 |


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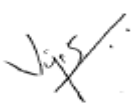
| | | |  |  | | |
| JSSL/DPT/008-02 | 22.07.2025 | Approval/03 | Vipin | Megha Desai | | |
| PROC.NO | DATE | ISSUED FOR/ REV.NO. | PREP'D BY JSSL | APP'D BY JSSL | APP'D BY CLIENT | APP'D BY TPI |

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# DYE PENETRANT EXAMINATION PROCEDURE

## 1. Scope:

This procedure specifies the minimum requirements for liquid penetrant inspection of steel materials and weldments of structural steel works carried out in JSSL Bellary.

## 2. Reference:

- AWS D1.1. 2020
- ASME Sec. V. Article 6. 2019
- ASTM E-165.2018

## 3. Personnel:

**i.** Personnel undertaking liquid penetrant inspection shall be qualified to minimum of ISNT/ASNT Level-II, AS per SNT-TC-1A.

**ii.** Personnel employed in liquid penetrant examination shall be aware of the substances used with regard to flammability and possible breathing and/ or skin irritation and shall familiarize themselves with manufacturer's instructions before use.

## 4. Method:

The Liquid Penetrant Examination shall be conducted by Visible Contrast dye Penetrant Solvent removal method. Temperature limits between $10^0$ C and $52^0$ C.

**I. Materials:**

a) Solvent Cleaner.

b) Visible dye Penetrant.

c) Non-Aqueous Developer.

d) Lint Free Cloth or Equivalent.

Materials shall be in a cool dry place. Magnaflux or similar brands shall be used. Intermixing of different brands for same testing is not permitted.

**5. Surface Preparation:**

i. All parts or areas of part to be examined must be clean and dry before the penetrant is applied.

ii. If welded and heat affected zone is to be examined, all contaminants shall be removed from the area being examined.

iii. Surface must be free of scale, rust, weld spatter, grease, paint, oily films, dirt and etc…

iv. The surface to be examined shall be ground in case of surface irregularities that mask the indication of defects.

**6. Pre cleaning:**

The surface shall be cleaned with lint free cloth dampened with cleaner. After cleaning the surface to be tested can be accomplished for drying process by normal evaporation for volatile solvents. (Test part shall be exposed to ambient temperature 10 minutes.)

7. **Penetrant Application:**

**i.** The temperature of the surface to be examined shall be ambient temperature of natural working condition and not exceeding $52^0$C.

ii. The penetrant shall be applied on the prior cleaned surface to be tested by means of spraying.

iii. The part or area of part to be examined is to be covered completely with penetrant.

**8. Penetrant dwell time:**

The length of the time the penetrant must remain on the part to allow proper penetration. Penetrant dwell time shall be 5 to 10 minutes.

**9. Excess penetrant removal:**

**i.** Clean with lint free dry cloth repeat the operation most traces of the penetrant have been removed.

**ii.** Clean with the lint free cloth wettened with solvent remover the traces are gently wiped from one direction to avoid removing penetrant from discontinuities.

**iii.** Repeat the first operation and let the area to dry in the ambient temperature/working condition.

**iv.** Test part shall be exposed to ambient temperature 10 min. for drying.

**10. Developer application:**

**i.** The developer shall be applied to the test surface after the excess penetrant removal process is completed. The developer is to be shaken well before application to ensure that particles in suspension are dispersed. The developer shall be applied by spraying in such a manner as to ensure complete part coverage with a thin even film and the developer must be allowed to completely dry.

**ii.** Developing time shall not be less than 10 minutes. As stated in article 24, table 2 of ASME section V.

**11. Examination:**

Final examination shall be done within 10 to 60 minutes after developer application. All indications shall be considered as discontinuities until investigated; upon investigation such indications shall be recognised as relevant and/or non relevant, therefore subject to interpretation in accordance with AWS D1.1-2020 table 8.1 acceptance/rejection criteria.

**i.** **Illumination:** A minimum of 1000 lux (100 foot candles) light intensity shall be provided during examination & evaluation.

**ii.** **Evaluation of indication:**

**Non relevant** indications are caused by geometrical irregularities, machining or grinding marks. Those indications shall be re-examined by the same methods of by other methods for conformance of the same.

**Relevant indications** are indications which results from imperfection. Only indications with major dimension greater then 1.6mm shall be considered relevant.

**Linear indications** are those indications for which the length is three times or more than the width.

**Round indications** are those which are circular or **ell**iptical with the length are less than three times of the width.

**iii. Acceptance criteria:**

The indications shall be acceptable if the criteria of table 8.1 of AWS D1.1-2020 are satisfied.

**12. Report:**

Upon completion of test a report shall be prepared as per the format attached with this procedure.

**13. Post cleaning:**

After completion of testing, penetrant of any and developer materials shall be removed by any suitable means.

**Table 8.1**
**Visual Inspection Acceptance Criteria (see 8.9)**

| Discontinuity Category and Inspection Criteria | Statically Loaded Nontubular Connections | Cyclically Loaded Nontubular Connections |
|---|---|---|
| **(1) Crack Prohibition**<br>Any crack shall be unacceptable, regardless of size or location. | X | X |
| **(2) Weld/Base Metal Fusion**<br>Complete fusion shall exist between adjacent layers of weld metal and between weld metal and base metal. | X | X |
| **(3) Crater Cross Section**<br>All craters shall be filled to provide the specified weld size, except for the ends of intermittent fillet welds outside of their effective length. | X | X |
| **(4) Weld Profiles**<br>Weld profiles shall be in conformance with 7.23. | X | X |
| **(5) Time of Inspection**<br>Visual inspection of welds in all steels may begin immediately after the completed welds have cooled to ambient temperature. Acceptance criteria for ASTM A514, A517, and A709 Grade HPS 100W [HPS 690W] steels shall be based on visual inspection performed not less than 48 hours after completion of the weld. | X | X |
| **(6) Undersized Welds**<br>The size of a fillet weld in any continuous weld may be less than the specified nominal size (L) without correction by the following amounts (U):<br>L, specified nominal weld size, in [mm] — U, allowable decrease from L, in [mm]<br>≤ 3/16 [5] — ≤ 1/16 [2]<br>1/4 [6] — ≤ 3/32 [2.5]<br>≥ 5/16 [8] — ≤ 1/8 [3]<br>In all cases, the undersize portion of the weld shall not exceed 10% of the weld length. On web-to-flange welds on girders, underrun shall be prohibited at the ends for a length equal to twice the width of the flange. | X | X |
| **(7) Undercut**<br>(A) For material less than 1 in [25 mm] thick, undercut shall not exceed 1/32 in [1 mm], with the following exception: undercut shall not exceed 1/16 in [2 mm] for any accumulated length up to 2 in [50 mm] in any 12 in [300 mm]. For material equal to or greater than 1 in [25 mm] thick, undercut shall not exceed 1/16 in [2 mm] for any length of weld. | X | |
| (B) In primary members, undercut shall be no more than 0.01 in [0.25 mm] deep when the weld is transverse to tensile stress under any design loading condition. Undercut shall be no more than 1/32 in [1 mm] deep for all other cases. | | X |
| **(8) Porosity**<br>(A) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no visible piping porosity. For all other groove welds and for fillet welds, the sum of the visible piping porosity 1/32 in [1 mm] or greater in diameter shall not exceed 3/8 in [10 mm] in any linear inch of weld and shall not exceed 3/4 in [20 mm] in any 12 in [300 mm] length of weld. | X | |
| (B) The frequency of piping porosity in fillet welds shall not exceed one in each 4 in [100 mm] of weld length and the maximum diameter shall not exceed 3/32 in [2.5 mm]. Exception: for fillet welds connecting stiffeners to web, the sum of the diameters of piping porosity shall not exceed 3/8 in [10 mm] in any linear inch of weld and shall not exceed 3/4 in [20 mm] in any 12 in [300 mm] length of weld. | | X |
| (C) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no piping porosity. For all other groove welds, the frequency of piping porosity shall not exceed one in 4 in [100 mm] of length and the maximum diameter shall not exceed 3/32 in [2.5 mm]. | | X |

Note: An "X" indicates applicability for the connection type; a shaded area indicates non-applicability.

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| J\|S\|S\|L JSW | LIQUID PENETRANT TESTING REPORT | L.P.No.:<br>Date: |

| | | | |
|---|---|---|---|
| Customer Name | | Job No. | |
| QAP No. | | Location | TORANGALLU |
| Procedure Reference no: JSSL/DPT/08-2 REV.2. | | | |
| Details of Testing: | | | |
| MARK NO | | | |

| | | | |
|---|---|---|---|
| Method | Solvent Removable Method | Acceptance Criteria | AWS D1.1 |
| Type of LPT | VISIBLE CONTRAST | Pre-Cleaning | Solvent cleaning |
| Dwell Time | 10 min | Development Time | 10 min |
| Test Temperature | Ambient | Post Cleaning | Solvent cleaning |

**Details of LPT Chemicals used:**

| Sl. No. | Description | Make | Batch no | Expiry Date |
|---|---|---|---|---|
| 1 | Penetrant | | | |
| 2 | Cleaner | | | |
| 3 | Developer | | | |

| Joint Number | Observations | Interpretation | Result | Remarks |
|---|---|---|---|---|
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We, the undersigned, certify that the statements in this record are correct and that the test welds were prepared and tested in conformance with the requirements of AWS D 1.1: 2020 Structural Welding Code - Steel.

Witnessed By_____

Date _____

Examined By_____

(NDT Level II) _____

Date _____

JSSL-QA-05 Rev.0