

<b>State Energy Inspection Services</b>  <b>Standard Operating Procedure</b> Liquid Penetrant	<b>Instruction #</b>	<b>Manual</b>
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## 1.0 Scope

Liquid Penetrant (LP) examination is performed to provide the inspection and testing coverage necessary on the end portions of tubulars not covered during Ultrasonic testing on Non-Ferrous material. The coverage for this examination is 18 inches from each end including pin and coupling threads. Liquid Penetrant examination may consist of the following inspection and testing methods.

- a) Visual thread inspection
- b) White light inspection
- c) Liquid Penetrant testing of the external and internal surfaces utilizing the visible-water washable method.

- 1.1 For visual thread evaluation performed during Liquid Penetrant, reference State Energy's SOP 11.0.
- 1.2 For evaluation of tube imperfections found during Liquid Penetrant, reference State Energy's SOP 2.0.

## 2.0 Personnel Qualifications

- 2.1 Personnel performing this procedure shall be classified as a minimum, Level I.
- 2.2 Level I inspectors shall be under the supervision of an on-site Level II or Level III supervisor.
- 2.3 Personnel performing SEA inspection must be able to distinguish J1 letters at 12 inches on a Jaeger eye chart and have no color vision impairment.

## 3.0 Reference Documents

- 3.1 The following documents are referenced in preparation of this procedure and should be available on the job site location.
  - ✓ API RP5A5
  - ✓ API 5CT
  - ✓ API 5L
  - ✓ API 5D
  - ✓ ASTM E165
  - ✓ Customer Specification, as applicable

## 4.0 Definitions

- 4.1 Reference ASTM E165 for definitions of wording used in this procedure.

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## 5.0 Equipment

- 5.1 Equipment required to perform Liquid Penetrant inspection as applicable, is as follows:
- a) Acetone cleaner
  - b) Penetrant and Developer of the same manufacture
  - c) Steam cleaner and low pressure water spray
  - d) Test block-cracked
  - e) Lint free cloth
  - f) Tools for imperfection evaluation

## 6.0 Surface Preparations of the Pipe Ends

**NOTE:** Liquid Penetrant inspection is not to be performed on material that has been bead, grit or sugar blasted nor the presents of any coatings or paint, as these will mask indications.

- 6.1 Thread protectors, if applicable, shall be removed and set aside for cleaning before re-application.
- 6.2 All inspection surface areas, including threads shall be cleaned to insure removal of dirt, grease, thread lubricants, scale, paint, coating or other contaminates which could interfere with the capillary action used in the inspection. Final cleaning is to be performed by one of these methods.
- a) Acetone using a lint free cloth
  - b) Steam cleaning using hi-pressure water
- 6.3 All seal rings must be removed before cleaning the threaded area of modified couplings.
- 6.4 Once protectors are removed form connections, care shall be exercised when handling for protection of the exposed threads.

## 7.0 Penetrant Application And Rinse

- 7.1 Different types or manufactures of penetrant materials should not be mixed.
- 7.2 The surface temperature of the piece to be inspected must between 60° and 120° F

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- 7.3 Penetrant shall be applied by brushing or spraying evenly over the area to be tested.
- 7.4 If applicable, use the test block, (prepared and application) in the same manor as the pipe.
- 7.5 Dwell time should be referenced from the following table:

Surface Temperature	Dwell Time (minutes)	
	Minimum	Maximum
F°		
60	20	30
80	15	25
100	12	20
120	10	15

**Note:** *Tightly closed discontinues requirement longer dwell times, use maximum times listed for best sensitivity.*

- 7.6 Remove penetrant with low velocity water spray no warmer than 110 degrees. Check for complete removal with a lint free absorbent cloth.
- 7.7 Because of the time and temperature sensitivity of this method, penetrant application and developing should be done on a limited number of areas at a time.

## 8.0 Developing

- 8.1 Spray a uniform coat of developer over the surface to be inspected.
- 8.2 Apply the developer within 7 minutes after the post rinse drying.
- 8.3 Developing time should be between 10 to 30 minutes or as indicated using the test block.

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## 9.0 Examination Procedure

- 9.1 Apply a sequential number near the coupling end of each length.
- 9.2 Examination should be done in ambient lighting or a minimum light intensity at the surface being inspected in 50 foot candles.
- 9.3 Slowly roll each joint a minimum of 1 revolution for examination of east surface to be inspected.
- 9.4 All relevant indications shall be marked and investigated as per State Energy's SOP 2.0.

## 10.0 Post Inspection

- 10.1 Remove all visible penetrant and developer from the tube and thread areas.
- 10.2 Using hi pressure air, dry all threaded areas.
- 10.3 Apply the proper thread compound as noted on the Work Order instructions of all exposed threads. Coverage must be complete over the entire threaded area. Do not thin any pipe thread compound. In cold weather, it may be easier if warmed before applied.
- 10.4 Clean thread protectors are to be applied wrench tight and fully engaged.

## 11.0 Inspection Records

- 11.1 Confirm the final count, tallies, rejects, good joints, and total joints are correctly reflected in the record.
- 11.2 Confirm all joints have been banded and stenciled properly.
- 11.3 Records of Thread Gage are to be kept for a minimum of 5 years.