



CAN-PT-14P001 REVISION 06

LIQUID PENETRANT EXAMINATION



ASME V, ARTICLE 6 AND 24; ASME SE-165 (ASTM E165)

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Notes: This document was renamed from AGI PT 01 to CAN-PT-14P001 and may also be used when AGI PT 01 is referenced.

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Revision Summary		
Revision No.	Date	Description
00	---	First revision.
01	December 01, 2011	Inspection - replaced with examination throughout. References - Added ASME Section V 2010 w 2011a. 7.5.8a) - modified statement.
02	February 01, 2012	Scope – Added statement on size and shape of objects to be examined. 7.5.2 – Added minimum to title. 7.5.3a) – Changed PSI to kPa for consistency in units. 7.5.4 – Revised last sentence. 7.5.6 – Increased time to 15 minutes. 7.5.6b) – Inserted paragraph for wet developer – aqueous. 10.0 – Added Procedure Qualification. Technique 2 – Revised as per 7.5.4. Technique 3 – Revised as per 7.5.4. Appendix 4 – Added qualification of White Light Source.
03	July 01, 2012	Document and references renamed. Modified 3.1.
04	June 10, 2013	Updated document format. Modified 5.13, 7.5.7a).
05	July 24, 2013	Replaced missing text from Appendix D.
06	November 15, 2013	Updated for ASME V 2013. Revised 1.0, 2.0, 5.2, 7.1, and 7.5.7a).



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1.0 SCOPE

- 1.1 This procedure provides instruction to technicians performing liquid penetrant examination in accordance with ASME Section V, Article 6 and 24 (ASME SE-165 / ASTM E165). It is to be applied when those standards are referenced and may also be used when no examination protocol is specified.
- 1.2 The size and shape of items to be examined and the extent of that examination are unrestricted provided that the elements of this procedure can be met.
- 1.3 The requirements of the procedure are detailed in techniques included in the Appendix for each of the penetrant processes.

2.0 REFERENCES

- 2.1 Acuren Safety Management System
- 2.2 ASME Section V, Article 6 and 24 (2013)
- 2.3 ASTM E165
- 2.4 CAN-CP-02P001 Acuren Canada SNT-TC-1A Written Practice

3.0 PERSONNEL QUALIFICATION AND RESPONSIBILITIES

- 3.1 Examination shall be carried out by technicians certified to the requirements of the Acuren procedure CAN-CP-02P001. Note: Certain codes or standards may require the use of additional or alternate certification schemes (e.g. CAN/CGSB-48.9712).
- 3.2 A Level I technician may perform examination when under the direct supervision of a Level II or Level III technician.
- 3.3 A Level II or III technician shall carry out final interpretation and sign the report.
- 3.4 A Level III technician shall approve this procedure.

4.0 SAFETY

- 4.1 Personnel shall;
 - 4.1.1 comply with the requirements of the Acuren Safety Management System.
 - 4.1.2 follow all Client and project specific safety requirements.
- 4.2 Aerosol cans must be stored away from heat sources.

5.0 EQUIPMENT AND MATERIALS

- 5.1 Applicators (brush, sprayer, handheld puffer for dry developer, etc.)
- 5.2 Cleaners may be any suitable solvent subject to the restrictions of clause 7.1.3.
- 5.3 Documentation – must be available at worksite: Code acceptance extracts, and this procedure

- 5.4 Light Meter (UV) – calibrated within previous twelve (12) months per CAN-CAL-02P002
- 5.5 Light Meter (White Light) – calibrated within previous twelve (12) months per CAN-CAL-02P002
- 5.6 Lint-free cloths or absorbent paper
- 5.7 Penetrant Materials – any industrial penetrant materials purchased meeting the requirements of ASTM. Intermixing of products from different manufacturers or from different families within the manufacturer's product line is prohibited. Common use materials are identified in the techniques.
- 5.8 Pressure Gauge – capable of measuring 205 to 485 kPa.
- 5.9 Procedure – a current copy of this procedure shall be available to the technician at the workplace
- 5.10 Thermometer – capable of measuring 0 to 100° C.
- 5.11 Timer – wrist watch or equivalent
- 5.12 Ultraviolet Light – with output verified per clause 7.5.7b)iv)
- 5.13 White Light Source – minimum light intensity of 100 foot candles (1076 lux). A 100 watt bulb at 30 cm or less is qualified (see Appendix D). Other light sources may be used if qualified per Appendix A or verified with a white light meter at the time of examination.

6.0 TECHNICAL LIMITATIONS

- 6.1 Penetrant materials must be from the same manufacturer and in the same family group. Mixing of materials from different product families or manufacturers is not allowed.
- 6.2 Penetrant materials used on nickel based alloys, austenitic or duplex stainless steels and titanium must meet the contamination control requirements of ASME V, Article 6, Mandatory Appendix II. Acuren purchases penetrant materials that meet these requirements.
- 6.3 Visible dye method shall not be used prior to fluorescent.

7.0 EXAMINATION

Client information and specific examination requirements including acceptance criteria shall be provided to the technician in the form of a Work Order (Call Sheet) prior to the start of examination. On projects where work orders are not issued, the supervisor shall provide detailed instructions, preferably written, to the technician. There are no restrictions to the size and shapes of the items to be examined. Geometry or access may limit examination. Such limitations shall be recorded in the examination report.

7.1 Surface Preparation

- 7.1.1 Satisfactory results may be obtained when the examination surface is in the as-welded, as-rolled, as-cast or as-forged condition. Where substantial surface irregularities could mask indications the technician shall request that the client

prepare the surface by grinding, machining or other means while ensuring that potential discontinuities will not be masked by the process.

7.1.2 The surface to be examined and adjacent areas within 25 mm shall be clean, dry and free of extraneous matter that could interfere with examination.

7.1.3 Solvents used to prepare the examination area may include typical cleaning agents such as detergents, organic solvents, de-scaling solutions and paint removers. These solvents are subject to the restrictions of clause 6.2.

7.2 Drying

After cleaning, the surfaces to be examined shall be dry prior to application of penetrant. Forced air may be used to expedite the process. A minimum drying time of five (5) minutes is required.

7.3 Technique Classification

The dye may be fluorescent or visible (colour contrast) used with one (1) of the three (3) penetrant processes. Refer to Appendix B for liquid penetrant techniques.

FLUORESCENT	VISIBLE (COLOUR CONTRAST)
Water Washable	Water Washable
Solvent Removable	Solvent Removable
Post Emulsifiable *	Post Emulsifiable*

* Only hydrophilic emulsifier is used in this procedure.

7.4 Temperature

The temperature of the penetrant and surface of the part shall be 5°C to 52°C (40° - 125°F) throughout the examination process. Local heating or cooling is permitted in order to keep within this range.

Processing outside these temperatures is permissible when qualified as per Appendix C of this procedure.

7.5 Examination

7.5.1 Penetrant Application

Penetrant may be applied by any suitable means including brushing, dipping, spraying or wiping.

7.5.2 Penetrant Dwell Time

TEMPERATURE	DWELL (MINIMUM)
10°C - 52°C	10 minutes
5°C - 10°C	20 minutes

7.5.3 Excess Penetrant Removal

Remove penetrant as per the method described taking care to minimize removal of penetrant from discontinuities.

a) Water Washable Penetrants

Remove with a water spray at maximum pressure of 350 kPa and maximum temperature of 43°C. A hose with standard city supplied water or a manually operated sprayer should not exceed these requirements. If alternate water supplies are used, a pressure gauge and thermometer must be placed in the line to confirm that the limits are not exceeded.

b) Post Emulsifiable Penetrant with Hydrophilic Remover

Pre-rinse the examination area for a maximum of one (1) minute using the method described in 7.5.3a) as per water washable penetrants.

Mix emulsifier as per manufacturers recommendations. It is intended that fresh emulsifier be used for each examination. Apply emulsifier by immersion or spraying. Allow to dwell for a maximum of two (2) minutes. After emulsification, remove the mixture by rinsing as per 7.5.3a).

7.5.4 Solvent Removable Penetrants

Remove excess penetrant by wiping with a lint-free cloth or absorbent paper. Remaining traces are then removed by repeating the process with the cloth or paper moistened with solvent. Avoid the use of excess solvent. Flushing the surface with solvent, following application of the penetrant and prior to developing is prohibited.

7.5.5 Drying After Excess Penetrant Removal

a) Water Washable or Post Emulsifiable

Blot with clean lint-free cloths or use circulating air. Surface temperature of the part shall not exceed 52°C.

b) Solvent Removable

Blotting, wiping, evaporation or forced air may be used.

7.5.6 Developing

Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes.

a) Dry Developer

Apply in a light dusting over the entire dry surface using a brush or hand powder bulb. Dry developer shall not be used with colour contrast penetrants.

b) Wet Developer – Aqueous

Aqueous developer may be applied to either a wet or dry surface by dipping, brushing, spraying or other means, provided a thin coating is

obtained over the entire surface being examined. Drying time may be decreased by using warm air, provided the surface temperature of the part is not raised above 5°C to 52°C (40° - 125°F). Blotting is not permitted.

c) Wet Developer – Non-Aqueous

For water-washable or post-emulsifiable penetrants, the developer must be applied to a dry surface by spraying. For solvent removable penetrants, apply as soon as practical after excess penetrant removal. Allow to dry by normal evaporation.

d) Developing Time

Developing time is measured from the point immediately after application of dry developer or as soon as wet developer dries.

7.5.7 Interpretation

Final interpretation shall be made ten (10) to sixty (60) minutes after dry developer application or completion of wet developer drying time. If the surface is large and cannot be inspected within sixty (60) minutes, perform the examination in increments. The time may be extended if bleed-out does not alter examination results.

Note that if the penetrant diffuses excessively into the developer; observe the formation of indication(s) during the application of the developer to assist in characterizing and determining their extent.

a) Colour Contrast Penetrants

White light intensity at the examination surface must be a minimum of 100 foot candles or 1076 lux. Light intensity must be measured prior to examination or a light source as verified per Appendix A shall be used. A 100 watt bulb is qualified. Refer to Appendix D.

b) Fluorescent Penetrants

Examination for fluorescent penetrant examination requires the following:

- i) Shall be performed in a darkened area.
- ii) Inspectors shall allow five (5) minutes of eye adaptation in the darkened area prior to examination.
- iii) Photosensitive or permanently tinted lenses shall not be worn.
- iv) Black light intensity shall be a minimum of 1000 $\mu\text{W}/\text{cm}^2$ at the examination surface. Intensity is required to be measured; prior to use, whenever the power source is interrupted and at the completion of the examination. If intensity has decreased below 1000 $\mu\text{W}/\text{cm}^2$, replace the light and reinspect.

7.5.8 Evaluation

- a) Indications shall be evaluated as acceptable or rejectable as per the client provided acceptance standard. Technicians are provided with, or have access to, the applicable acceptance requirements of the relevant standards in the Acuren Code Extract Manual.
- b) Non-rejectable indications shall be recorded as per the acceptance standard.
- c) Rejectable indications shall be recorded. At a minimum the type of indications (linear or rounded), location and extent (length or diameter or aligned) shall be recorded.
- d) When the acceptance standard is stated as Client's Information all indications shall be recorded. This shall include, at minimum, the type of indications (linear or rounded), location and extent (length or diameter or aligned) including their location without accepting or rejecting. Where possible mark the indications on the part.
- e) In all cases recordable indications shall be photographed, mapped or described in detail sufficient to locate them.
- f) Broad areas of fluorescence or pigmentation which may mask indications are unacceptable. These areas shall be cleaned and re-examined.

8.0 POST CLEANING

Parts will be post cleaned only at the request of the client.

9.0 REPORTS

- 9.1 Complete all fields of the Acuren supplied liquid penetrant report in either electronic or hardcopy format.
 - 9.1.1 Report results as determined by the requirements of Clause 7.5.8 Evaluation
- 9.2 Report Fields. Report shall contain the following fields at a minimum. Where the item is not applicable to the examination the field shall be completed as N/A.
 - 9.2.1 Client Information
 - 9.2.2 Description of items tested
 - 9.2.3 Date
 - 9.2.4 Acuren Job Number
 - 9.2.5 Work Location
 - 9.2.6 Acceptance Standard including revision status
 - 9.2.7 Acuren Procedure Number including revision status

- 9.2.8 Technique Number
 - 9.2.9 Material
 - 9.2.10 Thickness
 - 9.2.11 Scope of Examination
 - 9.2.12 Type of Examination, e.g., Visible or Fluorescent
 - 9.2.13 Method of Examination, e.g., Water Wash, Solvent Removable
 - 9.2.14 Material identification:
 - a) Family Brand
 - b) Number or letter designation of each penetrant, remover, emulsifier and developer used including developer type.
- Note: When examining materials identified in 6.2, include batch numbers for the penetrant materials used.
- 9.2.15 Blacklight output verification
 - 9.2.16 White light type and output verification
 - 9.2.17 Light meter serial number and calibration due date
 - 9.2.18 Surface condition
 - 9.2.19 Surface temperature
 - 9.2.20 Results including map, detailed description or photographs of indications
 - 9.2.21 Technician name, signature and certification
 - 9.2.22 Client Signature (when possible)

10.0 PROCEDURE QUALIFICATION

When procedure qualification is specified by the referencing Code Section a change of a requirement of **ASME Section V, Article 6, Table T-621** (see below) identified as an essential variable shall require requalification of the written procedure by demonstration. A change of a requirement identified as a nonessential variable does not require requalification of the written procedure. All changes of essential or nonessential variable form those specified within the written procedure shall require revision of, or an addendum to, the written procedure.

Table T-621
Requirements of a Liquid Penetrant Examination Procedure

Requirement	Essential Variable	Nonessential Variable
Identification of and any change in type of family group of penetrant materials including developers, emulsifiers, etc.	X	
Surface preparation (finishing and cleaning, including type of cleaning solvent)	X	
Method of applying penetrant	X	
Method of removing excess surface penetrant	X	
Hydrophilic or lipophilic emulsifier concentration and dwell time in dip tanks and agitation time for hydrophilic emulsifiers	X	
Hydrophilic emulsifier concentration in spray applications	X	
Method of applying developer	X	
Minimum and maximum time periods between steps and drying aids	X	
Decrease in penetrant dwell time	X	
Increase in developer dwell time (Interpretation Time)	X	
Minimum light intensity	X	
Surface temperature outside 5°C to 52°C or as previously qualified	X	
Performance demonstration, when required	X	
Personnel qualification requirements		X
Materials, shape or sizes to be examined and the extent of examination		X
Post-examination cleaning technique		X



APPENDIX A: QUALIFICATION OF WHITE LIGHT SOURCE

Examination of visible (colour contrast) penetrant or magnetic particle indications must be carried out where light at the examination surface is at a minimum intensity of 100 foot-candles. The light may be measured with a white light meter at the time of examination. Alternatively, a source may be qualified as per the following method.

EQUIPMENT

White Light: Light Source (describe): _____

Light Meter: Serial Number: _____ Calibration Due Date: _____

1. Set the meter in a stationary location.
2. Place the light in front of the light meter sensor and retract while observing the light output on the meter.
3. Stop retraction when the meter reads 100 foot candles. Record the distance. The light is qualified examination use at a maximum distance as noted.

White Light Source is qualified for use at a maximum distance of _____ cm.

Technician (Signature)

Date

Technician (Print Name)

The Regional Quality Representative is responsible for retaining this document on file per local practice.

APPENDIX B: TECHNIQUES

TECHNIQUE 1: VISIBLE WATER WASH

Equipment	Applicators, lint-free cloths, light source (qualified) or alternate confirmed with light meter, thermometer, timer, water supply.		
Materials	Manufacturer	Magnaflux	Ardrox
	Penetrant	SKL-WP, SKL WP2	P6R, 906
	Developer – Non-Aqueous	SKD-S2	9D1B
Surface Preparation	If substantial surface irregularities exist that could mask indications request client to remove them. Clean examination surface and adjacent area within 25 mm.		
Drying After Cleaning	Allow a minimum drying time of five (5) minutes. Ensure surface is dry prior to penetrant application.		
Penetrant Application	Apply by brushing, dipping or spraying.		
Penetrant Dwell	Penetrant dwell is dependent upon temperature range of the part and penetrant materials as listed below:		
	Temperature	Dwell	
	10°C - 52°C	10 minutes	
	5°C - 10°C	20 minutes	
Penetrant Removal	Water spray at maximum pressure of 350 kPa and maximum temperature of 43°C.		
Drying	Blot with lint-free cloths or allow to dry with ambient air.		
Developing	Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes. Non-Aqueous – Observing that the surface is dry, spray a thin even coating. Aqueous – Examination surface may be wet when using aqueous developer. Apply by dipping, brushing or spraying.		
Interpretation	Inspect ten (10) minutes to sixty (60) minutes after developer has dried. Additional time is permissible if bleed out does not affect results.		
Post Cleaning	Post clean if required by client.		

TECHNIQUE 2: VISIBLE SOLVENT REMOVABLE

Equipment

Applicators, lint-free cloths, light source (qualified) or alternate confirmed with light meter, thermometer and timer.

Materials

Manufacturer	Magnaflux	Ardrox
Penetrant	SKL-SP1, SKL-SP2	P6R, 906, 996
Remover	SKC-S	9PR50, PR1
Developer – Dry	Not allowed	Not allowed
Developer – Non-Aqueous	SKD-S2	9D1B, NQ1

Surface Preparation

If substantial surface irregularities exist that could mask indications request client to remove them. Clean examination surface and adjacent area within 25 mm.

Drying After Cleaning

Allow a minimum drying time of five (5) minutes. Ensure surface is dry prior to penetrant application.

Penetrant Application

Apply by brushing, dipping or spraying.

Penetrant Dwell

Penetrant dwell is dependent upon temperature range of the part and penetrant materials as listed below:

Temperature	Dwell
10°C - 52°C	10 minutes
5°C - 10°C	20 minutes

Penetrant Removal

Wipe excess penetrant with a dry absorbent cloth. Repeat until most traces have been removed. Remove remaining penetrant with a cloth moistened with remover and continue lightly wiping. Avoid use of excess penetrant. Flushing the surface with solvent following application of the penetrant and prior to developing is prohibited.

Drying

Blot with lint-free cloths or allow to dry with ambient air.

Developing

Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes.

Non-Aqueous – Observing that the surface is dry, spray a thin even coating.

Aqueous – Examination surface may be wet when using aqueous developer. Apply by dipping, brushing or spraying.

Interpretation

Inspect ten (10) minutes to sixty (60) minutes after developer has dried. Additional time is permissible if bleed out does not affect results.

Post Cleaning

Post clean if required by client.

TECHNIQUE 3: FLUORESCENT WATER WASHABLE

Equipment Applicators, lint-free cloths, ultraviolet light and meter, thermometer, timer and water supply.

Materials	Manufacturer	Magnaflux	Ardrox
	Penetrant	ZL-15B, ZL-19, ZL-60D, ZL-67, ZL-56	P131E, P133D, P134E, P136E, 970P25E, 970P22, 970P24
	Developer – Non-Aqueous	ZP-9F	9D1B, NQ1
	Developer – Dry	ZP-4B	9D4A

Note that sensitivity level 1 (lowest) is sufficient for most field applications. Use of higher sensitivity than required will result in excess background fluorescence and non-relevant indications.

Surface Preparation If substantial surface irregularities exist that could mask indications request client to remove them. Clean examination surface and adjacent area within 25 mm.

Drying After Cleaning Allow a minimum drying time of five (5) minutes. Ensure surface is dry prior to penetrant application.

Penetrant Application Apply by brushing, dipping or spraying.

Penetrant Dwell Dwell is dependent upon temperature range of the part and materials as listed below:

Temperature	Dwell
10°C - 52°C	10 minutes
5°C - 10°C	20 minutes

Penetrant Removal Water spray at maximum pressure of 350 kPa and maximum temperature of 43°C for a maximum of one (1) minute. Monitor removal with a blacklight to ensure adequate penetrant removal.

Drying Blot with lint-free cloths or allow to dry with ambient air.

Developing Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes.
Dry – Apply in a light dusting over the entire dry surface using a brush or hand powder bulb.
Non-Aqueous – Observing that the surface is dry, spray a thin even coating.
Aqueous – Examination surface may be wet when using aqueous developer. Apply by dipping, brushing or spraying.



TECHNIQUE 3: FLUORESCENT WATER WASHABLE

Interpretation

Examination is to take place in a darkened area. White light intensity less than two (2) foot-candles is preferred. Allow eye adaptation for five (5) minutes prior to making final interpretation. Inspect ten (10) minutes to sixty (60) minutes after developer has dried. Longer time is permissible if bleed out does not affect results.

Measure ultraviolet light intensity at the examination surface prior to and at the completion of examination.

Post Cleaning

Post clean if required by client.

TECHNIQUE 4: FLUORESCENT SOLVENT REMOVABLE

Equipment Applicators, lint-free cloths, ultraviolet light, light meter, thermometer and timer.

Materials	Manufacturer	Magnaflux	Ardrox
Penetrant (Sensitivity level low to high)		ZL-2C, ZL-27A, ZL-37	9812, 9813, 9814, P131E, P133D, P134E, P136E, 970P22, 970P24, 970P25E, 985P14, P7F3
Remover		SKC-S	9PR50, PR1
Developer – Non-Aqueous		ZP-9F	9D1B, NQ1
Developer – Dry		ZP-4B	9D4A

Note that sensitivity level 1 (lowest) is sufficient for most field applications. Use of higher sensitivity than required will result in excess background fluorescence and non-relevant indications.

Surface Preparation If substantial surface irregularities exist that could mask indications request client to remove them. Clean examination surface and adjacent area within 25 mm.

Drying After Cleaning Allow a minimum drying time of five (5) minutes. Ensure surface is dry prior to penetrant application.

Penetrant Application Apply by brushing, dipping or spraying.

Penetrant Dwell Penetrant dwell is dependent upon temperature range of the part and materials as listed below:

Temperature	Dwell
10°C - 52°C	10 minutes
5°C - 10°C	20 minutes

Penetrant Removal Wipe excess penetrant with a dry absorbent cloth. Repeat until most traces have been removed. Remove remaining penetrant with a cloth moistened with remover and continue lightly wiping. Avoid use of excess penetrant. Flushing the surface with solvent, following application of the penetrant and prior to developing is prohibited.

Drying Blot with lint-free cloths or allow to dry with ambient air.

Developing Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes.
Dry – Apply in a light dusting over the entire dry surface using a brush or hand powder bulb.
Non-Aqueous – Observing that the surface is dry, spray a thin even coating.
Aqueous – Examination surface may be wet when using aqueous developer. Apply by dipping, brushing or spraying.



TECHNIQUE 4: FLUORESCENT SOLVENT REMOVABLE

Interpretation

Examination is to take place in a darkened area. White light intensity less than two (2) foot-candles is preferred. Allow eye adaptation for five (5) minutes prior to making final interpretation. Inspect ten (10) minutes to sixty (60) minutes after developer has dried. Longer time is permissible if bleed out does not affect results. Measure ultraviolet light intensity at the examination surface prior to and at the completion of examination.

Post Cleaning

Post clean if required by client.

TECHNIQUE 5: FLUORESCENT POST EMULSIFIABLE
Equipment

Applicators, ultraviolet light, light meter and timer.

Materials

Manufacturer	Magnaflux	Ardrox
Penetrant	ZL-2C, ZL-27A, ZL-37	9812, 9813, 9814, P7F3
Emulsifier	ZR-10B	9881, E1
Developer – Dry	ZP-4B	9D4A
Developer – Non-Aqueous	ZP-9F	9D1B, NQ1

Note that sensitivity level 1 (lowest) is sufficient for most field applications. Use of higher sensitivity than required will result in excess background fluorescence and non-relevant indications.

Surface Preparation

If substantial surface irregularities exist that could mask indications request client to remove them. Clean examination surface and adjacent area within 25 mm.

Drying After Cleaning

Allow a minimum drying time of five (5) minutes. Ensure surface is dry prior to penetrant application.

Penetrant Application

Apply by brushing, dipping or spraying.

Penetrant Dwell

Penetrant dwell is dependent upon temperature range of the part and penetrant materials as listed below:

Temperature	Dwell
10°C - 52°C	10 minutes
5°C - 10°C	20 minutes

Penetrant Removal

Water spray at maximum pressure of 50 psi and maximum temperature of 43°C. Apply emulsifier. Allow no longer than two (2) minutes dwell. Rinse.

Drying

Blot with lint-free cloths or allow to dry in ambient air.

Developing

Apply developer as soon as possible after penetrant removal and within fifteen (15) minutes.

Dry – Apply in a light dusting over the entire dry surface using a brush or hand powder bulb.

Non-Aqueous – Observing that the surface is dry, spray a thin even coating.

Aqueous – Examination surface may be wet when using aqueous developer. Apply by dipping, brushing or spraying.

Interpretation

Examination is to take place in a darkened area. White light intensity less than two (2) foot-candles is preferred. Allow eye adaptation for five (5) minutes prior to making final interpretation. Inspect ten (10) minutes to sixty (60) minutes after developer has dried. Longer time is permissible if bleed out does not affect results. Measure ultraviolet light intensity at the examination surface prior to and at the completion of examination.

Post Cleaning

Post clean if required by client.

APPENDIX C: TECHNIQUE FOR NONSTANDARD TEMPERATURE

Examination outside the standard temperature range of 5°C to 52° C (40° - 125°F) is permissible but the technique must be qualified. In most cases, the examination will be based upon Technique 1 of this procedure but the same process may be applied to others.

A Level III must review the results and approve the revised technique by signing the report for the revised method.

1. In addition to the equipment and materials identified in the basic technique a cracked, aluminum comparator block as described in ASME Section V, Article 6 Appendix III-630 is required.
2. Cut the block in half along the seam and identify one (1) section A and one (1) section B by stamping or etching.

3. For Temperatures Lower than 5°C

- 3.1 Process Part A as per the standard temperature technique.
- 3.2 Process Part B using the same technique ensuring the block and materials are held at the qualifying temperature throughout the examination process.
- 3.3 Upon completion compare the crack indications on the two (2) blocks. If the indications are essentially the same, the technique shall be considered qualified for use.
- 3.4 Temperature Range Qualified: (Low) examination temperature, through to (High) 5°C.

4. For Temperatures Higher than 52°C

Examination at higher than 52°C requires qualification at both the upper and lower temperature limits. Therefore, the block B must be processed twice.

- 4.1 Process Part A as per the standard temperature technique.
 - 4.2 Process Part B using the same technique ensuring the block and materials are held at the elevated but lower limit of the qualifying temperature throughout the examination process.
 - 4.3 Upon completion compare the crack indications on blocks A and B. If the indications are essentially the same, the technique shall be considered qualified at the lower limit.
 - 4.4 Clean the block and process at the higher limit. Upon completion compare the crack indications on blocks A and B. If the indications are essentially the same, the technique shall be considered qualified at the higher limit.
 - 4.5 Temperature Range Qualified: From temperatures that range from the lower to higher qualifying limits.
5. A Level III must witness the final examination and sign the report for this examination. Ensure the temperature ranges are included. The Regional Quality Representative shall retain a copy of this report and a copy is to be placed in the client job file.

**APPENDIX D: QUALIFICATION OF WHITE LIGHT SOURCE (100 WATT BULB)**

Examination of visible (colour contrast) penetrant or magnetic particle indications must be carried out where light at the examination surface is at a minimum intensity of 100 foot-candles. This document qualifies a 100 watt bulb at 30 cm.

EQUIPMENT

White Light: Light Source (describe): Trouble Light with 100 watt bulb and 100 foot extension cord

Light Meter: Serial Number: 0500305 Calibration Due Date: June 20, 2012

1. Set the meter in a stationary location.
2. Place the light in front of the light meter sensor and retract while observing the light output on the meter.
3. Stop retraction when the meter reads 100 foot candles. Record the distance. The light is qualified examination use at a maximum distance as noted.

White Light Source is qualified for use at a maximum distance of 30 cm.

A handwritten signature in black ink, appearing to read "Gary Isaac", written over a horizontal line.

Technician (Signature)

January 26, 2012

Date

Gary Isaac

Technician (Print Name)