



QUALITY CONTROL AND TECHNICAL OPERATIONS PROCEDURE

TITLE: VISUAL INSPECTION (GENERAL) PROCEDURE
WELDS AND WELDING

PROCEDURE NO. QC-TOP-VIP-2 **REV.** 00

PREPARED BY: Ron Richard **DATE:** January 20, 2004
LEVEL 3 W178.1 (Reg. No.605)

APPROVED BY: TOM BOUDREAU, OPERATIONS MANAGER **DATE:** January 21, 2004
AWS QC1-96 (Reg. No. 97100027)
LEVEL 2 W178.1 (Reg. No.2516)

APPROVED BY: RON RICHARD, PRESIDENT/GENERAL MANAGER **DATE:** January 22, 2004
LEVEL 3 W178.1 (Reg. No.605)

APPROVED BY: KEITH FOLKINS, P.Eng., Q.A. MANAGER **DATE:** January 26, 2004
LEVEL 2 W178.1 (Reg. No.2779)



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Procedure Manual**

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1.0 SCOPE

1.1 This procedure has been developed to provide the basis for reliable Visual Inspection of welds and welding associated with the following product categories;

- (1) Buildings, Bridges
- (2) Industrial Structures, Machinery, Cranes, Rail & Road Vehicles.
- (3) Storage Tanks
- (4) Pipelines
- (5) Industrial Pipe
- (6) Pressure Vessels, Heat Exchangers, Boilers
- (7) Ships and Floating Marine Structures

2.0 INTRODUCTION

The visual examination method is an effective means for evaluating materials, processes and workmanship in a variety of welding applications.

Visual examination is utilized to monitor and expedite compliance with various standards and contract specifications.

Visual examination can function effectively only when adequate and reasonable access to the welding activity is provided. This access and subsequent coverage will be specified by customer specifications but should, as a minimum, allow examination to be conducted on an on-going basis and at important project milestones.



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3.0 REFERENCES

ASME Section V:

Article 1 General Requirements

Article 9 Visual Examination

4.0 PERSONNEL

Inspection personnel performing visual welding examination in accordance with this procedure shall be certified as required by AWS QC1-96 and/or SNT-TC1A, 1996 & 1998 Addenda.

- 4.1 Personnel shall be examined annually to determine satisfactory vision in accordance with the following requirements;
- (a) Distant vision shall equal 20/30 or better in at least one eye, either uncorrected or corrected.
 - (b) Near vision shall permit reading J-1 letters on a standard Jaeger-type test chart for near vision or equivalent test type, in at least one eye, either uncorrected or corrected.
- 4.1.1 Vision examinations shall be performed by an Ophthalmologist, Optometrist or other Professionally recognized person.
- 4.1.2 Records of the vision examination shall be retained on file and will be made available, upon request, to comply with code or contract requirements.

5.0 INSPECTION REQUIREMENTS

5.1 Surface Requirements

- 5.1.1 As-welded surfaces are acceptable for visual inspection provided all welding slag has been removed and that surface conditions are such that surface welding defects of a size not permissible by the welding specifications are not likely to be hidden or masked.
- 5.1.2 Preparation of surfaces to meet requirements for inspection may consist of wire brushing, light grinding, sandblast or any other method that does not damage the welded components or further mask possible surface welding defects.
- 5.1.3 In order to conduct proper visual welding examination surfaces should be inspected prior to the application of paint or coatings.

5.2 Illumination Requirements

- 5.2.1 Illumination shall be such that surface welding defects of a size not permissible by the welding specifications are not likely to be hidden or masked.
- 5.2.2 Normal shop, room or daytime lighting is acceptable provided the requirements of 5.2.1 are met and surfaces are not obscured by shadows, unlit corners or darkened areas.



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- 5.2.3 Additional lighting for inspection may consist of flashlight, trouble light, extension light or any other means provided that the surface lighting requirements are attained over a reasonable area.

Any supplemental lighting should be sufficient to attain the recommended minimums of 15 fc (footcandles) for general examination and 50 fc (footcandles) for the detection or study of small anomalies.

5.3 Viewing Requirements

- 5.3.1 Viewing shall be such tha

t surface welding defects of a size not permissible by the welding specifications are not likely to be hidden or masked.

- 5.3.2 Normal viewing conditions of approximately 300 mm to 1500 mm (12" to 60") eye-to-surface distance are acceptable.

- 5.3.3 Should normal viewing conditions not be possible then additional measures such as mirrors, magnifying lenses, telescopes, borescopes, fibre optics, cameras, or other suitable instruments or remote devices can be used provided that all other inspection requirements are met and that any such system shall have a resolution capability at least equivalent to that obtainable by direct visual observation.

6.0 INSPECTION PROCEDURE

6.1 Introduction

This section outlines those items of interest which should be inspected to provide a thorough and consistent visual examination. It is understood that all of the following items may not be investigated for every weld made; however, a random sampling to an extent that overall quality can be projected shall be obtained.

6.2 Required Before Welding Commences

- 6.2.1 Review all drawings and weld procedures to be employed ensuring that they have received the necessary approval, qualifications and correct weld detailing.
- 6.2.2 Review mill test certificates of base materials for conformance with the applicable specification. Obtain necessary test results for missing data before accepting material. If material specifications are not met, reject the material.
- 6.2.3 Examine base material for surface defects which are outside of the specification tolerances. Reject material that does not meet the project requirements.



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6.3 Inspection Immediately Prior To Welding

- 6.3.1 Ensure that the specified and approved filler metal, flux, gas, etc. is being used.
- 6.3.2 Ensure that welding consumables are being properly stored and handled.
- 6.3.3 Ensure that the joint fit up, joint preparation and joint type meets the requirements of the specification.
- 6.3.4 Ensure that the face of the joint is free from grease, dirt, scale and other items detrimental to good welds.
- 6.3.5 Verify the qualification of the operator and ensure that the qualification has not lapsed.
- 6.3.6 Ensure proper measures have been taken to protect weld during inclement weather.

6.4 Inspection During Welding

- 6.4.1 Ensure that the 'essential variables' of the welding procedure are being followed.
- 6.4.2 Ensure proper preheat and interpass temperatures are achieved and maintained. Use temperature sensitive crayons or contact thermometers to measure this.
- 6.4.3 Check that proper cleaning is being done between each weld pass and that no visible defects are present.
- 6.4.4 Where backgouging is required, ensure that backgouging to sound metal has been done and that all defects have been removed and that the groove has a proper shape for rewelding.
- 6.4.5 Should the fabrication and welding sequence be such that features of interest may become enclosed or otherwise hidden with subsequent operations conduct inspections accordingly.
- 6.4.6 Ensure that welding sequence, when required by procedure, is being followed.

6.5 Inspection After Welding

- 6.5.1 Visual inspection of welded joints subject to high restraint and/or joints of quenched and tempered steel shall be delayed as long as practical and preferably by not less than 48 hours after completion of the welds.
- 6.5.2 Ensure that slag is removed.
- 6.5.3 Verify that weld size, weld type and weld length are in agreement with the applicable drawing, specification and/or procedure.
- 6.5.4 Verify final appearance and dimensional requirements are in agreement with the applicable drawing, specification, and/or procedure and that no distortion has occurred.



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6.6 Repairs

6.6.1 Ensure that a qualified procedure is employed.

Verify that the final appearance and size of the weld are in agreement with the applicable drawing and/or specification and that no distortion has occurred.

7.0 EVALUATION OF INDICATIONS

7.1 Indications found during visual inspection shall be categorized as follows:

- 1) Linear indications - length is more than three times the width.
- 2) Rounded indications - circular or elliptical in shape with length less than three times the width.
- 3) Aligned indications - group of three or more indications which may be connected by a straight line between any two of the indications.

7.2 With customer approval, indications may be removed or reduced by sanding, filing, gouging or grinding in order to determine the depth and extent of the indication. After the metal removal, the area shall be cleaned and re-inspected. The re-inspection shall be at least as sensitive as the original inspection.

7.3 For evaluating indications, the acceptance criteria shall be in accordance with the applicable referencing code or project specification.

8.0 REPORTS

8.1 Reports shall be submitted by the inspector and shall contain as much of the following information as applicable.

- a) name of inspector
- b) date of test
- c) referencing documents
- d) inspection coverage
- e) inspection equipment (if utilized)
- f) results of inspection

8.1.1 Documentation shall include all observation and dimensional checks as specified by the applicable Referencing Code or Specification.

8.2 When request by the customer, inspection results shall be marked on or adjacent to the weld to indicate those areas requiring repair or to indicate acceptance of the weld.

8.3 As standard policy the customer/client shall receive the original of any report and a copy of that report retained on file by Technico.

8.4 Inspection report forms have been approved for use and are included in Appendix "A".



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APPENDIX A

FORMS



INSPECTION REPORT

590 Grandview Avenue · Saint John · New Brunswick · Canada · E2J · 4M9 · Phone: (506) 633-1300 · Fax: (506) 633-1274 · e-mail: technico@nbnet.nb.ca

CUSTOMER:		DATE OF INSPECTION	D	M	Y
ATTENTION:		REPORT No.			
PROJECT:		PAGE		OF	
COMPONENT INSPECTED:		JOB No.			
AREA OF INTEREST:		P.O. No.			
COMPONENT LOCATION:		INSPECTION EQUIPMENT			
CUSTOMER WORK ORDER No.:	PART No.:	TYPE:			
MATERIAL:	HEAT No.:				
COMPONENT SURFACE CONDITION:		EQUIPMENT No.:			

EXAMINATION DATA

PROJECT CODE/SPEC.	
PROCEDURE No.	TECHNIQUE No.

REMARKS:

ADDITIONAL INFORMATION - SEE ATTACHED: SKETCH(ES) SUPPLEMENTARY SHEET(S) NDT REPORTS VIDEO

SIGNATURES	CERTIFICATION		DATE		
	LEVEL	D	M	Y	
INSPECTOR					
SUPERVISOR					
AUTHORIZED INSPECTOR					
CUSTOMER REPRESENTATIVE					