SEMMPF321

Analysing and interpreting the results of radiographic tests on castings

Overview

This standard identifies the competencies you need to analyse and interpret radiograph images generated from radiographic testing of castings, in accordance with approved procedures and techniques. This will require you to obtain all the relevant information about the test areas of the castings, the acceptance criteria and the radiographic technique to be followed to ensure a valid outcome. You must ensure that image viewing conditions are correct. You will be expected to check the image quality and to interpret the radiographic images against the background of the information obtained. You will identify the type of defects/flaws present, their location and relevant dimensions. You will need to compare your findings with the acceptance criteria and draw appropriate conclusions as to the condition of the castings. The term radiography is used in this standard and can include real time radiography or computed tomography (CT scanning) methods. Also the term radiographic testing can be using either photographic film or digital detectors.

Your responsibilities will require you to comply with organisational policy and procedures for the radiographic analysis and interpretation activities undertaken and to report any problems with the equipment in use, or the activities, that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to the inspection of castings using radiographic testing techniques. You will have a sound understanding of radiographic principles, techniques and the nature and characteristics of ionising radiation. Also your knowledge will include the use of digital and computer radiography methods. Image formation on radiographic film/detectors and the effect of casting geometry, radiographic practice and image processing on a range of image media and quality will be key issues.

You will understand the principles and practice of the interpretation process, in particular the appearance of defects/flaws on the image. You will also know the safe storage/archiving requirements of the radiography images in use. You will understand the casting process, especially aspects relating to the incidence of defects/flaws in the manufacture of the castings. You will know the acceptance criteria for the castings, the

influence of the defects/flaws on the castings in service and the consequences of failure resulting from the defects/flaws.

As you may be required to work in controlled areas, an understanding of radiographic practice will be a key feature, with special reference to hazards and safe working practice. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. follow relevant job instructions and specifications
3. ensure that you have the test data needed to conduct the analysis
4. resolve promptly any inconsistencies in the data
5. analyse the data using approved methods and procedures
6. check that the data analysis is accurate and thorough and takes account of the test conditions
7. compare the analysis against the product or asset specification and identify any faults or variations from specification
8. deal promptly and effectively with problems within your control and report those that cannot be solved
9. ensure that work records are completed, stored securely and available to others, as per organisational requirements
10. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
the personal protective equipment and clothing (PPE) to be worn during the activities
4. the set-up and requirements of a controlled test area (such as the identification and marking of boundary exclusions, the erection of physical barriers, warning lights and visual signs to restrict unauthorised entrance, the sighting of radiation survey meters, the positioning of appropriate radiation screens)
5. the principles of radiographic testing (including the use of X-ray and gamma radiation as a penetrating agent; shadow effect and projection, and the capture of the image; developing, accruement, fixing, storing and the equipment used to view the images)
6. the sources of radiation used in radiographic testing activities (to include the X-ray tube generator and the use of radioactive isotopes)
7. the principles of real time radiography, computed tomography and digital processing of X-rays
8. image formation (including rectilinear propagation; the geometry of shadow projection, inverse square law, focal spot, formation of penumbra and image quality indicators (IQIs))
9. the types and selection of radiographic films or digital detectors and the image processing/manipulation systems
10. processing faults, characteristic curves and the effect of developing conditions on the finished image quality
11. the storage/archiving facilities for the radiograph images both photographic and digital
12. radiographic image quality (to include sensitivity, density, contrast and definition and the effect of scattered radiation on the image)

13. the response of casting defects/flaws to penetrative radiation and the resulting image density
14. the types of casting defect/flaws that are detectable using radiographic testing methods (shrinkage porosity, gas porosity, inclusions and blowholes)
15. how to interpret the images and the appearance of various defects/flaws; spurious discontinuities, their cause and effect; assessment of defect/flaw size and location
16. the conditions in which the images should be viewed (to include ambient conditions, use of appropriate light box or digital projection)
17. acceptance criteria to be used for the castings and the level of defects/flaws that are acceptable in the castings
18. the influence of defects/flaw on service and performance; the risks and consequences of casting failure
19. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
20. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1.

Ensure the necessary information and data required for the analysis and interpretation is available, to include all of the following:

- 1.1 relevant casting information
- 1.2 image capture technique used
- 1.3 acceptance criteria to be used
- 1.4 area of the casting being examined (geometries and thickness)
- 1.5 radiographic parameters and testing conditions
- 1.6 type of Image Quality Indicator (IQI) to be used
- 1.7 film/detector type
- 1.8 processing conditions

2.

Ensure the conditions of the viewing area include all of the following:

- 2.1 correct ambient conditions
- 2.2 appropriate subdued internal lighting
- 2.3 suitable light box for viewing or digital projectors

3.

Ensure the radiographic image quality meets specified Image Quality Indicator requirements, to include all of the following:

- 3.1 image quality
- 3.2 sensitivity
- 3.3 contrast
- 3.4 density

4.

Check castings for three of the following defect/flaws:

- 4.1 shrinkage porosity
- 4.2 gas porosity
- 4.3 inclusions
- 4.4 blowholes
- 4.5 other defects/flaws (specify)

5.

Interpret the images to identify both of the following (where defects/flaws exist):

- 5.1 location
- 5.2 dimensional size

6.

Compare findings with the acceptance criteria, and record all of the following in the NDT report:

- 6.1 geometry and thickness of the test area
- 6.2 test area indications (where indications are found)

6.3 equipment parameters used
6.4 film/detector processing system
6.5 defects/flaws identified
6.6 comparisons with acceptance criteria
6.7 conclusions reached
6.8 personal data

7.

Complete the inspection activities, carrying out all of the following activities:

7.1 marking up defective/flawed castings with all relevant information
7.2 recording all the required details of the inspection in the appropriate format
7.3 handing over the castings and inspection details to the appropriate people

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