

Inspecting fabricated components and structures

Overview

This standard identifies the competences you need to carry out the dimensional and visual inspection of fabricated components and structures, in accordance with approved procedures. You will be required to select the appropriate inspection equipment, based on the features to be checked and the accuracy to be measured. This will involve checking that the appropriate equipment is within current test dates and, where necessary, setting up and calibrating the equipment ready for the inspection operations to be performed. In carrying out the inspection activities, you will be expected to check the components for both dimensional and geometrical accuracy, and this may be required to be undertaken at various stages of manufacture, such as pre-assembly, intermediate and final assembly. Components to be inspected could include fabricated frames, tanks, pipe sections, modular components, fabricated tubular components and fabricated structures.

Your responsibilities will require you to comply with organisational policy and procedures for the inspection activities, seeking out relevant information for the activities undertaken, and to report any problems with the inspection equipment or activities that you cannot personally resolve, or are outside your personal authority, to the relevant people. You will be expected to work with a minimum of supervision taking personal responsibility for your own 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 applying inspection procedures to fabricated components and structures. You will understand the inspection process and its application, and will know about the equipment and inspection techniques, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when working with fabricated components, and the safeguards necessary for undertaking the activities safely and correctly. You will be required to demonstrate safe working practices and procedures throughout and will understand the responsibility you owe to yourself and others in the workplace.

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Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. follow the correct specification for the product or equipment being inspected
3. use the correct equipment to carry out the inspection
4. identify and confirm the inspection checks to be made and acceptance criteria to be used
5. carry out all required inspections as specified
6. identify any defects or variations from the specification
7. record the results, and complete inspection documentation in the appropriate format
8. deal promptly and effectively with problems within your control and report those that cannot be solved

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Knowledge and understanding

You need to know and understand:

1. the specific health and safety precautions to be taken when inspecting fabricated components (specific legislation or regulations governing the activities or work area, safe working practices and procedures to be adopted, general workshop safety practice)
2. the hazards associated with inspecting fabricated products (such as working at height, handling fabricated structures, slips, trips and falls), and how they can be minimised
3. how and where to obtain the required drawings and related specifications, and how to check that they are current and complete
4. how to extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards), in relation to work undertaken
5. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
6. the use of relevant standards in determining if components and products are fit for purpose
7. the general principles of quality assurance systems and procedures
8. preparations to be undertaken before the product is inspected
9. the visual and dimensional inspection methods and techniques that are used for fabrications
10. the need to select and use set datum faces, and the effects of taking readings from different datums (such as accumulation of limits leading to errors)
11. the effects that the environment may have on the measurements taken (such as where precision measurements are concerned)
12. the equipment that is used to carry out the various inspection checks (such as rules and tapes, precision vernier instruments, levels and plumb lines, laser equipment and theodolite)
13. the importance of ensuring that tools and equipment are set up correctly and are in a safe and useable condition
14. the need to check that the equipment is approved for the inspection activities undertaken (including calibration checks and current certification dates)
15. the techniques used to check for alignments, verticality and roundness/ovality
16. the need to carry out the checks and to record the results on the appropriate documentation
17. the calculations used to adjust survey results for temperature differences
18. how to calculate and predict erection positions from the data given
19. how to calculate allowances for weld gaps and weld shrinkage, in

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- order to attain overall global tolerances
- 20. the typical defects and variations that can be found on the fabrications, and how to identify them
- 21. why sampling is used, and when it is an effective means of quality assurance
- 22. the procedure to be followed when inspected products are out of specification
- 23. the importance of completing inspection documentation, what needs to be recorded and where records are kept
- 24. the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve

Scope/range

1. Carry out all of the following activities during the inspection process:

1. observe all the required safety procedures for the work area/activity
2. obtain and use the correct issue of drawings, job instructions and specifications
3. obtain and check the condition and calibration dates of tools, measuring instruments and equipment used
4. place and coordinate temporary survey stations, where required (where applicable)
5. perform the dimensional survey and determine out-of-tolerance values
6. apply adjustment of survey results for temperature correction (where applicable)
7. produce recommendations for control of final global dimensions, using intermediate data (where applicable)
8. report and investigate the possibility of gaining a concession for out-of-specification products
9. leave the work area in a safe and tidy condition on completion of the activities

2. Carry out the inspection of two of the following types of fabrications:

1. fabricated frames
2. pipe sections
3. transformers
4. structures
5. cylindrical components
6. reduction pieces
7. square/rectangular tanks
8. conical components
9. segmented bends
10. curved/profiled structures
11. tubular structures
12. modular components
13. trunking/ducting systems
14. panels
15. other specific fabrication

3. Carry out twelve of the following checks:

1. dimensional accuracy
2. straightness
3. security of joints

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4. squareness
 5. position/location
 6. weld size and profile
 7. angle
 8. freedom from distortion/damage
 9. computation of best-fit centres
 10. alignment
 11. completeness
 12. prediction of erection positions
 13. circularity or ovality
 14. flatness
 15. development of cut lines
 16. visual appearance
 17. orientation
 18. computation of allowances for weld gap tolerances and weld shrinkage for attainment of global tolerances
 19. practical allowances for expansion and contraction
4. Use six of the following types of inspection equipment:
 1. rules and tapes
 2. protractors
 3. rafter squares
 4. squares
 5. plumb lines
 6. templates and jigs
 7. spirit levels
 8. callipers
 9. theodolites
 10. dividers
 11. vernier instruments
 12. laser equipment
 13. gauges
 14. torque instruments
 15. total station (electronic theodolite)
 16. automatic levelling equipment
5. Carry out the inspection checks to one of the following quality and accuracy standards:
 1. approved construction drawings
 2. applicable national and international standards
 3. client specifications/detail drawings
6. Complete inspection documentation, to include one from the following, and pass to the appropriate people:
 1. inspection report
 2. customer specific documentation

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- 3. job card
- 4. concession report

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