

ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10306:2002 Issue:01 | Date of Issue: 20/02/2018



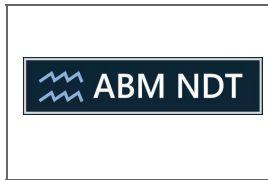
**Procedure For The Ultrasonic Testing
Of Steel H Beams With Parallel Flanges
and IPE Beams**

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CONTENTS

1. Scope
 2. Application
 3. References
 4. Definitions & Abbreviations
 5. Personnel Qualification
 6. Surface Finish
 7. Equipment
 8. Probes
 9. Equipment and performance checks
 10. Couplant
 11. General
 12. Calibration & Sensitivity
 13. Assessment of Ultrasonic Indications
 14. Non-conformance
 15. Reporting
- Appendix A** – BS EN 10306 - Figure 1
- Appendix B** – BS EN 10306 - Table 1
- Appendix C** – BS EN 10306 - Table 2
- Appendix D** – Procedure revision history



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1. Scope

This procedure covers the manual ultrasonic testing of steel H beams with parallel flanges and IPE beams using the reflection method of ultrasonic testing for the detection of the presence of internal discontinuities.

This method is based on the reflection of longitudinal ultrasonic waves, the direction of which are approximately perpendicular to the surface of the product.

The examination consists of:

- A. location and evaluation of the discontinuities by comparing the amplitude of the discontinuity echo with the amplitude of a 5mm FBH located at the same depth as the discontinuity. Note: Only those discontinuities giving a echo amplitude equal or greater than 5mm FBH shall be considered.
- B. determining the area of the discontinuity using the -6dB beam width technique, with the length being parallel to the rolling direction and the width being perpendicular to the rolling direction.

2. Application

The examination shall take place at stages defined in the purchasing specification, drawings, Inspection/test plans, etc. under normal conditions this will be in the delivery condition.

All beams tested in accordance with this procedure shall be examined using longitudinal waves and the manual pulse-echo contact scanning technique. Equipment shall utilise an A scan presentation.

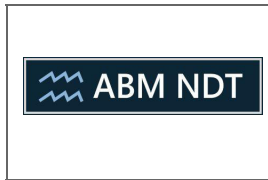
All flanges and webs of the beam shall be tested from one side only. In the case of flanges, the testing shall be conducted on the opposite side from the web i.e. the outside face of the flange.

3. References

This procedure makes reference to the following documents:-

BS EN ISO 9712:2012 Non-destructive Testing. Qualification and certification of NDT personnel.

BS EN 10306:2002 Iron and steel – Ultrasonic testing of H beams with parallel flanges and IPE beams.



ULTRASONIC INSPECTION PROCEDURE

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BS EN ISO 2400:2012 Non-destructive testing. Specification for calibration block No. 1

BS EN 12668-1:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt. 1 Instruments

BS EN 12668-2:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt 2. Probes

BS EN 12668-3:2013 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Combined equipment.

4. Definitions & Abbreviations

Internal discontinuity - Any imperfection lying within the thickness of the flat product, e.g. planar or laminar imperfection, single plane or multi-plane inclusion bands or clusters.

Defect - Unacceptable internal discontinuity i.e. one exceeding the specified maximum size or population density limits.

Population density - The number of individual internal discontinuities of a size greater than a specified minimum size and less than a specified maximum size, per specified area of body or length or edge zone.

Manual or assisted manual testing - Testing by an operator applying an ultrasonic probe, or probes, to the flat surface, manually executing the appropriate scanning pattern on the flat product surface and visually assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or built-in signal amplitude alarm devices.

FBH - Flat bottom hole

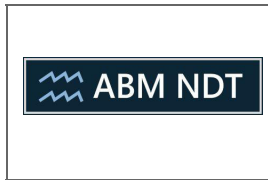
DAC - Distance amplitude correction curve

5. Personnel Qualifications

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with ISO 9712, in the ultrasonic testing of wrought products. e.g. PCN Level 2

All personnel shall also hold a valid eyesight certificate (meeting the requirements of ISO 9712 Section 7.4) obtained within the last 12 months.

All personnel documentation shall be kept on file and made available to the customer, end-user or client upon request.



ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10306:2002 Issue:01 | Date of Issue: 20/02/2018

6. Surface Finish

In the as rolled stage, beams shall normally be examined without any special surface preparation. Scanning surfaces shall be free from paint, non-adhering scale, dry couplant, surface irregularities or any other substance which could reduce coupling efficiency, hinder free movement of the probe or cause errors of interpretation.

The surface condition shall be considered acceptable providing the specified quality class can be achieved.

7. Equipment

The ultrasonic flaw detector shall have an A-scan presentation and comply with the requirements of BS EN 12668-1 and have a current calibration certificate.

Calibration blocks shall comply with BS EN ISO 2400

5mm FBH reference blocks made from material having similar acoustic properties and surface condition as the product under examination. The reference block shall have at least three reflectors covering the depth range under examination.

8. Probes

Only combined double crystal 0 degree compression wave probes shall be used and shall have the following characteristics : 9-25mm diameter and of nominal frequencies of 2-5 MHz.

Probes used shall conform to the requirements of BS EN 12668-2.

9. Equipment and Performance Checks

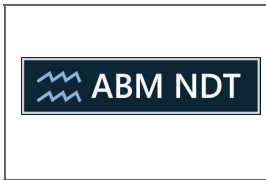
All functional and calibration checks of equipment shall be performed in accordance with BS EN 12668-3

Daily checks to include:-

- Physical state and external aspects.

Weekly checks to include:-

- Timebase linearity
- Amplification linearity
- Probe signal to noise ratio
- Pulse duration



ULTRASONIC INSPECTION PROCEDURE

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All equipment checks shall be recorded by the operator and shall be made available upon future request.

10. Couplant

The couplant used shall be appropriate to the application. Generally, either water or standard commercial couplant e.g. Surtest UCA-7 shall be used.

Couplant used shall not be harmful to the material being tested.

The same couplant shall be used for calibration, setting sensitivity, scanning and the evaluation of discontinuities.

Post testing all couplant shall be removed from the item under test and any measures specified by the customer to protect the steel shall be taken.

11. General

Prior to ultrasonic inspection the operator shall be provided with the following information: material/alloy/grade type, steel beam dimensions and cast/stock number.

5mm FBH reference block used for the DAC construction shall be manufactured from a piece of defect free material of a similar composition.

When using combined double probes, the orientation of the barrier separating the two transducers shall be perpendicular to the scanning direction.

Scanning shall be carried out in accordance to one (or more) of the following plans.

- Plan A: Testing the ends of the web.
- Plan B: Testing the ends of the flanges.
- Plan C: Testing the complete web.
- Plan D: Testing the complete flange.

See appendix A for detailed scan plans.

When using scanning plans A or B the ends shall be completely tested over a length of 75mm with a 10% probe overlap between scans.

When using scanning plans C or D, scanning may be conducted in a sinusoidal or zig-zag pattern over the complete width of the flange or web. The half wavelength or scan distance shall be adapted to suit the chosen quality class and shall not be greater than 100mm.