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CONTRACT 88/116 : REPORT ON ULTRASONIC TESTING TRAINING COURSE FOR ZISCO STEEL,
REDCLIFF, ZIMBABWE : 9-27 JANUARY 1989.

The training course was held in the training centre of ZISCO Steel for nine members of the Materials and Metallurgy Department. The intention was to train the attendees to inspect butt welds in ferrous steel plates for flaws by the Ultrasonic Non-Destructive Testing method. A syllabus of the course is attached as Annex A.

Facilities at the training centre were excellent. The assistance and whole-hearted co-operation of the staff was very much appreciated.

More than 50% of the training time was devoted to practical testing using equipment and test specimens, which had to be flown out from the United Kingdom. Even though this equipment was sent three weeks before commencement it had not been released from bond four days after the course started, in spite of persistent queries from the Lecturer. On the fifth day the Lecturer drove to Harare and personally supervised the issue of the equipment release documentation, via UNIDO, Zimbabwe Government, UNIDO shipping agents and customs.


After this and by dint of working extra hours, the course ran smoothly. However, the equipment took from the end of January to the end of May to get back to the United Kingdom and then the crate was damaged.

The course was well received by the students who were certainly most diligent. It is hoped that they can practice the method regularly, for without this practice they will lose dexterity. Some students had problems retaining theoretical information but this is probably due to youth and inexperience. Certainly the Head of Metallurgy, Mr D Damon left the Lecturer with the impression that he was well pleased with the content and presentation.

In the future it is recommended that practice and experience is emphasised. A further revision and updating course may prove useful in 1991.

It is understood that the U.N. is setting up a centre of engineering excellence in Harare in the near future and this will cater for the countries in central and southern Africa. The Welding Institute and particularly the School of Applied Non-Destructive Testing would be delighted to co-operate and help in any way, to assure the success of this venture.

ANNEX A : Training Syllabus
ANNEX B : Individual Student Reports.

V G TRULUCK 
Principal Lecturer

1/24

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The School of Applied Non-Destructive Testing (SANDT) is a co-operative service of The British Institute of Non-Destructive Testing and The Welding Institute.

COMPREHENSIVE PRACTICAL ULTRASONIC WELD EXAMINATION FOR

ZISCOSTEEL, REDCLIFF, ZIMBABWE

P R O G R A M M E

DAY 1

Registration

Outline of Course objectives

SESSION 1

Basic Principles of sound.
Nature of Ultrasound.
Behaviour of ultrasonic waves.
Relationship of wavelength, velocity & frequency.
Modes of wave motion.

Demonstrations of velocity in materials and nature of reflection.
Modes of particle displacement.
Demonstrations.
Propagation using wave machine.

Break

SESSION 2

Basic Principles contd.
How energy is used in testing.
'A' Scope.
Transmission.
Reflection.
Resonance.
Acoustic impedance.

Introductory history leading to the design, transmission, reflection and resonance.
Instruments.
'A' Scan presentation.
Practical application impedance mismatch.

Lunch

SESSION 3

Transducers.
Compression Probes.
Crystal Probes.

Factors affecting output of probes.
Frequency control.

Break

SESSION 4

The Flaw Detector.
A-Scan Presentation
Basic circuitry.
Dead Zone.
Decibel.

Nature & Purpose of circuit components.
Derivation of Decibels.

Distribution of revision test paper no.1.

DAY 2

SESSION 5 The Flaw Detector
 contd.
 Practical - Setting up
 procedure.

Practical exercises
in calibration.

Coffee

SESSION 6 Thickness measurement.
 Velocity measurements.

Practical exercises.

Lunch

SESSION 7 Distribution of sound energy.
 Near and Far fields.
 Beam Spread.

Tea

SESSION 8 Sensitivity

 Distribution of revision
 test paper no.2.

Methods of setting
sensitivity.

DAY 3

SESSION 9 Attenuation, absorption
 and scatter.

Demonstration of
attenuation.
Practical calculation.

Coffee

SESSION 10 Plate testing
 Code of practice.

Thickness gauging
Lamination testing.

Lunch

SESSION 11 Practical plate
 testing.

Location & size
estimation of artificial
defects in plate.

Tea

SESSION 12 Practical plate testing

DAY 4

SESSION 13 Refraction Law.
 critical angles.

Design & application for
angle probes.

Break

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SESSION 14 Calibration of angle probes & equipment. Essential checks, emission point, angle divergence etc.

Lunch

SESSION 15 Calibration blocks familiarisation. Practical, IIW & A4/W2 blocks.

Break

SESSION 16 Beam profile plots (20dB drop) Demonstration

Distribution of revision test paper no.3.

DAY 5

SESSION 17 Vertical & horizontal beam plots. Practical, establishing and proofs, near zone calculation.

Break

SESSION 18 Vertical & horizontal beam plots. Mirror image plot.

Lunch

SESSION 19 Vertical & horizontal beam plots.

Break

SESSION 20 Vertical & horizontal beam plots.

DAY 6

SESSION 19 Revision of week one work

Break

SESSION 20 Inspection of butt-welds.

Procedures and
recommendations.

Lunch

SESSION 21 Weld inspection
procedure.

Explanation of method

Break

SESSION 22 " " continued.

DAY 7

SESSION 23 Weld inspection

Demonstration of butt-
welds testing.

Break

SESSION 24 Weld inspection

Reporting procedure

Lunch

SESSION 25 Testing of butt-welds.

Practical

Break

SESSION 26 Testing of butt-welds contd.

Practical

Distribution of revision
test paper no.4.

DAY 8

SESSION 27 Defect echo recognition Standard probing patterns.

Break

SESSION 28 Testing of butt-welds. Practical

Lunch

SESSION 29 Testing of butt-welds contd.

Break

SESSION 30 Testing of butt-welds contd.

Distribution of revision test paper no.5.

DAY 9

SESSION 31 Testing of welds, fillet and nozzle. Lecture

Break

SESSION 32 Testing of butt-welds. Practical

Lunch

SESSION 33 Testing of butt-welds contd.

Break

SESSION 34 Revision and question session.

DAYS 10-14

Supervised Practical work

DAY 15 End of Course Practical examination.

COURSE CONCLUDES