Materials and Qualification Procedures for Ships

Book N

Procedure 17-1

Approval for Thickness Measurement of Hull Structure of Ships and Offshore Units

Revision 9, 01 August 2017

Notes: this revision incorporates the LR Offshore Rules requirements (and IACS UR Z15) that firms engaging in TM surveys of Offshore Units are required to be approved, as per IACS UR Z17.
Approval for Thickness Measurement of Hull Structure of Ships and Offshore Units

1 General Information

1.1 It is a requirement of the Lloyd's Register Rules and Regulations for the Classification of Ships, and Rules and Regulations for the Classification of Offshore Units, that firms supplying services on behalf of ship owners or offshore unit owners for thickness measurement of structural material be approved in accordance with this procedure. This document describes the requirements of Lloyd's Register for such approval and incorporate the criteria for approval identified by IACS (Unified Requirement Z17).

1.2 For the guidance of surveyors, ship owners, and other interested parties, LR document entitled Thickness Measurement and Close-Up Survey Guidance has been developed to complement the Regulations, providing in tabular form and diagrammatically the special survey requirements for thickness measurement and close-up survey.

For the guidance of surveyors, and offshore unit owners, and other interested parties, refer to LR Rules and Regulations for the Classification of Offshore Units, Part 1, Chapter 3.

1.3 Lloyd's Register Thickness Measurement software has been developed to provide a uniform reporting format for the results of thickness measurement surveys undertaken on ships. The software is available to service suppliers approved by LR and should be used for all thickness measurement work carried out under LR survey. Reporting should be in compliance to latest: TM & Close up Survey Guide, Pt 1, 1.7 Reporting.

1.4 The work of firms approved in accordance with this procedure will be subject to surveillance checking by the surveyor.

1.5 The scope of this approval for Thickness Measurement firms approved by LR covers:

(i) All ship types except: non-ESP ships less than 500 gross tonnage, and all fishing vessels; (see LR Rules and Regulations for Classification of Ships Part 1 Ch 2 Sect 2.3)

(ii) All Offshore Units as defined in LR Rules and Regulations for the Classification of Offshore Units Part 1, Chapter 2, Section 2)
1.6 The documents must be submitted in English language.

1.7 The TM Firm shall request approval to the appropriate category, as listed in section 4.4.2 of this procedure.

2 Related standards and Rules

Lloyd’s Register Rules and Regulations for the Classification of Ships, Part 1, Chapters 2 and 3, and Part 4 (Latest edition)

Lloyd’s Register Rules and Regulations for the Classification of Offshore Units Part 1, Chapters 2 and 3 (Latest edition).


IACS Unified Requirements Z17 – Procedural Requirements for Service Suppliers – (Latest edition)

SNT – TC-1A – Recommended Practice - Personnel qualification and Certification in Non - Destructive Testing.

ISO 9712: - Non-destructive testing - Qualification and certification of personnel.

IACS Procedure Requirement PR 23 – Procedure for Reporting Information on the Approval of Thickness Measurement Firms – (Latest edition)
3 Procedure for Approval

3.1 General Procedure

3.1.2 Application for approval on Form 2584, Request for Approval.

3.1.3 The documents referred in section 4 are to be prepared and submitted.

3.1.4 An audit of the firm will be undertaken as section 4 and results reported. (note, all additional service stations/offices owned by the company, and wishing to be LR approved, shall be assessed. In some cases, this may involve liaising with a different LR local office as appropriate).

3.1.5 Review of documents and audit results by Materials and NDE (MNDE) department, United Kingdom.

3.1.6 Issue of certification by MNDE department, United Kingdom.

3.1.7 Updating of LR thickness measurement service supplier database.

3.2 Requirements for approval

3.2.1 Suppliers with the experience and capability necessary to carry out a thickness survey will be considered for approval if they comply with the following:

3.2.2 Training of Personnel

A documented training programme for thickness measurement personnel shall be in place. Where it is not possible to perform this internally, a programme of external training may be accepted.

3.2.3 Operator and supervisor grades shall be qualified in accordance with a recognised national / international industrial standard such as SNT-TC-1A, ISO 9712, or equivalent. Operators shall be certified to a minimum of level I, supervisors to a minimum of level II. (Note: Where SNT-TC-1A scheme is used, the company shall have a Written Practice in place for their usage of this scheme)

3.2.4 Operators shall have had a minimum of one year experience on board ship or Offshore Unit, as applicable, and have enough knowledge of ship or Offshore Units structures to be able to select a representative position for each measurement.

3.2.5 Supervisors shall have had a minimum of two years’ experience as operator, technician or inspector involved with the thickness measurement of ship or Offshore Unit structural material.
3.2.6 Supervision

The supplier shall provide supervision for all services supplied. For a supplier consisting of one person, that person shall meet the requirements of a supervisor.

3.2.7 Training Programmes

There is to be a structured training programme in place which shall address the principles and techniques of ultrasonic testing, with the emphasis on thickness measurement, together with a basic instruction in relevant hull and other structures, susceptible to corrosion.

The training programme shall cover the selection and identification of test locations (which will be subject to the agreement of the owners representative and the classification surveyor) based on LR document 'Thickness Measurement and Close-Up Guidance', or the appropriate Rule section for Offshore Units. The training shall also include knowledge and nomenclature of appropriate structures.

Practical training and examinations shall cover calibration of ultrasonic equipment and should include thickness measurement on samples which include the following conditions;

(a) Corrosion on both accessible and remote surfaces

(b) Protective coatings of various types on the accessible surface.

The training programme shall also include the requirements for reporting. For ships, training in the latest version of LR Thickness Measurement software shall be included. The software package is available, free of charge, from http://www.lr.org/en/services/software/argonaut.aspx

3.2.8 Personnel Records

A list of qualified personnel including details of formal education, training and experience must be maintained up to date and be available for scrutiny by the attending surveyor.

Supervisors and operators are to carry ID cards (with photographs) showing NDE qualifications and authorisation to work on thickness measurement surveys and shall include a photograph of sufficient size and detail as to identify the operator. The names of all authorised supervisors and operators will (additionally) be listed on the LR issued TM certificate.
3.2.9 Equipment

Suppliers must possess equipment that is capable of giving accurate readings of material thickness.

Where measurements are to be taken through protective coatings the equipment must be capable of using the multiple echo technique in order that coatings are discounted from the displayed readings.

‘A scan’ flaw detectors, multiple echo direct reading gauges or a combination of both may be used for this purpose. If data-loggers are used, they shall also comply with these requirements.

*Note 1: if data logging equipment is to be used, the TM company shall demonstrate to the attending surveyor a robust method of checkpoint verification and traceability. This may be agreed during the kick-off meeting, and a demonstration presented to the surveyor on-board. If this equipment is to be used, the TM procedure shall include reference to this equipment, and to the method of checkpoint verification. The use of this equipment shall also be to the satisfaction of the surveyor, and where verification is not assured, the usage of non data-logging equipment shall prevail.*

Equipment must be maintained and calibrated regularly in accordance with a documented procedure and the status of calibration is to be displayed on each piece of equipment.

The range of materials, thicknesses, surface conditions and protective coatings upon which the equipment can be used must be stated, together with the tolerances on accuracy of measurement that can be expected.

Instructions for the safe and effective operation of the equipment must be available to all operators.

3.2.10 Quality Assurance System

Suppliers are required to have a documented system which covers at least the following items:

(a) Survey preparation (equipment required, surface preparation, preservation of protective coatings, checklists, etc.).

(b) Maintenance, calibration and operation of equipment.

(c) Safety requirements.

(d) Code of conduct to be observed by employees.
(e) Training programmes for personnel.

(f) The method and degree of supervision and verification to be applied, including sub-contractors if applicable.

(g) Survey recording and reporting.

(h) Periodic review of work process, procedures, complaints, corrective actions, and issuance, maintenance and control of documents.

(i) Quality management of subsidiaries and branches (see section 3.1.4 if applicable).

The documented system shall be approved and endorsed by the company quality management.

A documented Quality Assurance system complying with the ISO 9001 standard or equivalent, including the above items, is considered acceptable.

3.2.11 Reports

The recommended method of reporting is that specified in the latest Thickness Measurement and Close-up Survey Guide, with the support of the latest Thickness Measurement software supplied by LR Classification. Any other proposed reporting methods may be accepted, subject to special consideration by LR.

The reports shall include the current version of General Particulars Form 6059 (or as applicable for Offshore Units), countersigned by the attending and authorising surveyors, showing: name and type of ship; location and date(s) of measurement; the equipment used (including serial numbers); names of personnel and their qualifications, and all Data sheets.

Data sheets within reports are to identify the following:

(i) Locations of measurement.

(ii) Original thicknesses.

(iii) Measured thicknesses.

(iv) Percentage diminution.

(v) Maximum permissible diminishations.

Any sketches and drawings used in the preparation of the report must be included as an integral part of the report.
Thickness measurement supervisors are to liaise with surveyors to ensure that the reporting format is acceptable, and to confirm that the original thickness and measured thickness are correctly reported.

Reports are to be signed by the supervisor/lead operator of the thickness measurement firm. Printed names can be accepted on data sheets.

A copy of the firm’s certificate of approval shall be attached to the report.

4 Approval Submission

4.1 The following documents shall be prepared and submitted for review

(j) Description of the suppliers organisation identifying management structure and any branch offices, subsidiary companies or subcontractors branches (see section 3.1.4 if applicable).

(ii) Summary of extent of experience listing any major surveys completed in the previous three years with details of dates, Ship or Offshore Unit type and identity, type of survey and approximate numbers thickness readings reported.

(iii) Evidence of approval/acceptance by other bodies if any.

(iv) List of personnel to be involved in thickness measurement showing job titles (supervisor/operator), training, extent of experience and copies of qualification certificates.

(v) Type and scope of ultrasonic equipment used, and copies of calibration certificates.

(vi) Operators guide for equipment.

(vii) Thickness measurement procedure (note, this must also include a procedure or process for communicating with the Ship or Offshore Unit crew, prior to commencement of any work so that a safe system of work can be implemented).

(viii) Representative sample of a recent thickness measurement survey report including the General Particulars sheet (or equivalent for Offshore Units).

(ix) Record of customer complaints (where appropriate) and corrective actions agreed with client.
(x) Quality manual and/or documented procedures covering requirements as detailed in section 3.2.10.

If the firm has a quality management system approved to an internationally recognised scheme, for example, ISO 9001, then submission of the certificate will suffice.

(xi) LR local office to submit documents to MNDE department (materials@lr.org).

4.2 Audit

4.2.1 An audit will be made by the LR local office against the Audit Checklist, Form 2585, to confirm that the supplier is duly organised and managed in accordance with the documents submitted. A separate audit will be required for each branch or office of the supplier for which approval is requested, according to the same requirements as for the main office (see section 3.1.4).

4.2.2 For initial approval:

The capability of the firm is to be confirmed by practical demonstration and evidence of a satisfactory report.

For the practical demonstration, this may be established by either:

- An onboard survey (or onboard demonstration), for a ship or offshore unit or installation.
- Other relevant non-classification survey work, consisting of measurement through coatings, and on corroded (or simulated corroded) samples.
- The practical demonstration may also take place in the NDE laboratory, provided the above sample requirements are met.

The auditing surveyor is to witness the practical demonstration.

Reporting:

- The capability of the firm is to be confirmed by producing a satisfactory UT thickness measurement report, using the appropriate reporting software, where applicable.

4.3 Review

A review of the documents referenced in 4.1 will be undertaken by MNDE. Queries arising from the review will be referred back to the local LR office for clarification with the firm. These issues are expected to be resolved in a timely manner; otherwise further audits may be required by the LR surveyor, if circumstances change, at cost to the TM firm. The suitability of the firm for
Approval will be determined by reference to the criteria given herein and the details entered on the Audit Checklist form 2585. Endorsement of the checklist will signify that the firm satisfies the requirement for approval.

4.4 Certification

4.4.1 When a supplier has been deemed to satisfy LR requirements, a certificate of approval will be issued. The firm’s name will be entered into the LR database list of Approved Service Suppliers for Thickness Measurement.

4.4.2 The certificate of approval will contain the following information as a minimum:

(i) Name of firm and registered address, together with address of any branch or sub-office(s).

(ii) Scope of approval, i.e., one of the following types:

(iii) **Type A** – Ships, Ship Units\(^1\), and all Offshore Units\(^1\)

(iv) **Type B** - Ships - All vessels as defined in this procedure section 1.5 (i), and Ship Units\(^1\).

(v) **Type C** – Offshore Units\(^1\)

Note 1: (Ship Units and Offshore Units as defined in LR Rules and Regulations for the Classification of Offshore Units, Part 1, Chapter 2, Section 2)

(vi) Certificate number, date of issue and date of expiry (for each office, where applicable).

(vii) Names of approved supervisor(s) and operator(s).

4.4.3 Approval validity is for a three-years, subject to the supplier maintaining the system in accordance with LR requirements. Where any significant alteration to the certified system, including change of personnel is made, such alteration is to be immediately advised to Lloyd's Register.

4.4.4 Upon receipt of an application for amendment of a certificate, the supplier is to forward a request to MNDE (via LR local office), who will advise should any reviews or audits be required.

4.4.5 If a TM firm wishes to change the scope of their certificate of approval (e.g. from Type B or C to Type A), then advice can be sought from LR local Office. (see section 4.7)
4.5 **Withdrawal of Certificate**

4.5.1 LR reserves the right to cancel or suspend a certificate (as applicable) and inform the IACS members accordingly if:

(i) measurements have been improperly carried out or the results of measurements improperly reported.

(ii) significant alterations to the approved Quality System have been made without notification to LR or are such as to render the original approval invalid.

(iii) where corrective actions have not been taken to rectify previously reported deficiencies in the approved system of the supplier.

(iv) where deliberate distortion or omissions of facts are found.

(v) if the supplier no longer wishes to remain on the list of approved service suppliers.

4.5.2 If LR considers that a certificate of approval should be withdrawn or cancelled, the supplier will be informed in writing and be given the opportunity to take appropriate corrective action, or give notice of appeal.

4.5.3 If a certificate is withdrawn, suspended or has expired, the firm’s name will be removed from the LR service supplier database’s.

4.5.4 A supplier whose approval has been cancelled may apply for re-approval provided that the firm demonstrate that they have made the necessary changes to satisfy LR requirements.

4.5.5 Where LR are notified by another society that approval has been cancelled, LR may suspend its approval until the others society's cancelled approval is restored, or until LR are satisfied to continue with approval. During the suspension period, the supplier must not carry out any thickness surveys on LR Classed vessels.
4.6 Renewal of Approval

4.6.1 Applications for renewal of the period of validity should be received at least three months prior to the date of expiry.

4.6.2 Suppliers wishing to renew their approval should submit to the LR local office the following documents:

(i) Request for Approval Form 2584,

(ii) A list of current personnel, identifying qualifications, extent of experience and job title of each individual.

(iii) A copy of the current procedure for thickness measurement used by the supplier.

(iv) A sample of a recent report of a thickness survey (also to include the General Particulars form).

The report should be sufficient to demonstrate compliance with the requirements of Lloyd's Register for the reporting of thickness surveys.

(v) A list of all ultrasonic measuring equipment intended to be used in the survey, including copies of relevant calibration certificates.

(vi) Brief details of current training programmes (both Ultrasonic and Ship's or Offshore Unit structure).

4.6.3 On receipt of the Request for Approval form, arrangements will be made by the local LR office to carry out an audit of the supplier against the Audit Checklist, Form 2585.

4.6.4 The document package and the completed checklist showing the recommendations of the local office is to be forwarded to MNDE Department UK - for review in accordance with section 4.3

4.6.4 Upon satisfactory renewal, the firm will be approved for another three year period. A certificate will be issued (4.4) with a new expiry date and the firm’s entry in the approved lists, updated accordingly.

4.6.5 Where a firm has not performed any thickness surveys for LR in the last three years, the following shall apply:

(i) Practical demonstrations on corroded and coated samples.

(ii) Confirm use of the latest LR Close Up Survey requirements, and reporting software (as applicable).
(iii) Substantial attendance of the surveyor during next thickness measurement survey.

(iv) Review of thickness measurement reports produced for other classification societies, if applicable.

4.6.6 It shall be noted that an approval certificate expires after three years. Submissions received after the expiry periods are to be treated as Initial Approvals. Furthermore, TM companies are not approved to carry out Thickness Measurement surveys beyond the dates of the validity of the certificate.

4.7 Guidance notes on Changing Scope of Approval

It is normally expected that a TM Firm would ‘upgrade’ the scope of approval, i.e. add another category type, rather than delete one particular type (although the TM Firm may wish to delete a category if circumstances dictate that this is appropriate).

The LR local office shall be informed of this intention, and the surveyor will visit the TM Firm to review the documents, and any change in circumstances. An LR local office will charge a fee for this review, as the scope of the approval is changing (further details on request from LR local office).

The surveyor review will consist of, as a minimum, the following items:

- Personnel certification
- Training programme and appropriate records
- Experience in the new approval type
- Organisation structure changes (if applicable)
- TM procedure for new approval type

LR local office to submit documents to MNDE department (materials@lr.org) for review and certification.

A new certificate will be issued to the TM Firm to include the Approval Type and scope changes.

All other requirements of this procedure shall be met with respect to the validity of the approval, and re-certification, if Scope of Approval is changed.