FINAL REPORT FOR ISSUE

Research Contract:
Reviews of National Approvals for Drinking Water Construction Products (Phase 1).
Audit of Organisations Appointed to Certify Activities of Lining Contractors.

Report Prepared for:
Dept. for Environment, Food and Rural Affairs

Under contract No.:
DWI 70/2/159
## REVISION RECORD

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<th>Issue</th>
<th>Date</th>
<th>Prepared by</th>
<th>Checked by</th>
<th>Approved by</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>April 2003</td>
<td>Marcelle Paton-Smith</td>
<td>Paul Budgen</td>
<td>Garry Cooksley</td>
<td>Final Report for Issue to DWI</td>
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</table>
EXECUTIVE SUMMARY

1. This report documents the findings of an audit of the performance of the two currently designated Assessment Organisations for lining contractors, in relation to the specification of requirements for Assessors as issued by the Drinking Water Inspectorate (DWI) [1].

2. Both Assessment Organisations co-operated fully with the audit and provided suitable office facilities, information and records as requested.

3. Both Assessment Organisations were observed to be generally suitable as appointed Assessors in respect of the Specification of Requirements for Assessors [1].

4. Although the purpose of the audit was not to assess the technical competence of the Assessment Organisations, it was evident that the principal Assessor in each Organisation demonstrated a comprehensive understanding of the content and application of the relevant Code of Practice [2 and 3].

5. There is little or no involvement by staff other than the principal Assessor in each Assessment Organisation; this is as a consequence of the relatively small number of assessments that are required in each calendar year.

6. There were differences in emphasis between the two Assessment Organisations when assessing contractors for the purpose of accreditation. This difference may be as a result of the current differences between the two Codes of Practice [2 and 3] in respect of training qualifications required by the contractor’s staff who are involved in the accreditation trial.

7. Although both Assessment Organisations have produced and implemented procedures and instructions for the assessment and accreditation process, these procedures and instructions would benefit from a review of their comprehensiveness and application. Errors and omissions were found in the administration of the overall process within both Assessment Organisations.

8. It was discovered that a lining contractor has been erroneously listed in Appendix 4 of the DWI Approvals Database for December 2002, having not received full third party accreditation.
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<td>Summary of Compliance by Faber Maunsell with Specification of Requirements</td>
</tr>
</tbody>
</table>
1. **INTRODUCTION**

An audit was carried out of the two DWI-designated Organisations Appointed To Certify Activities Of Lining Contractors in relation to the Specification of Requirements for Assessors [1].

These two designated organisations were:

- Faber Maunsell Ltd at Prince Maurice Court, Hambleton Avenue, Devizes.
- WRc Plc at Frankland Road, Blagrove, Swindon.

The audit was carried out by Marcelle Paton-Smith, of Corporate Risk Associates Limited, between 5th and 18th March 2003. The audit reviewed lining contractor assessment activities carried out by the two designated organisations between January 2000 and February 2003. The findings and conclusions of the audit in respect of WRc and Faber Maunsell have been given in this report under Section A and Section B respectively.

The Assessor staff currently working for Faber Maunsell worked in a similar capacity in the predecessor organisations Warren Associates and Metcalf and Eddy. For clarity and ease of understanding, this report only makes reference to Faber Maunsell when reporting on the activities of these Assessor staff, even though they may have been working under the auspices of a predecessor organisation.

2. **BACKGROUND**

The use *in-situ* of epoxy resin and polyurethane rapid-setting resins in water supply pipes is subject to approval by the Secretary of State, under Regulation 25 of the Water Supply (Water Quality) Regulations 1989. The conditions of approval include strict requirements concerning the certification of lining contractors. The conditions of approval also require adherence by the water industry and its contractors to ‘In-situ Epoxy Resin Lining – Operational Requirements and Code of Practice’ 3rd Edition, (‘OR/CP’) published by WRc [2] and ‘In-situ Rapid-Setting Polymeric Lining – Operational Guidelines and Code of Practice’ (‘OG/CP’), published by Warren Associates (Pipeline) Ltd [3].

The assessment service for lining contractors concerning the supervised lining trial is provided by WRc and Faber Maunsell. The Drinking Water Inspectorate (DWI) designates these companies in accordance with the DWI specification of requirements for Assessors [1].

3. **OBJECTIVES OF THE AUDIT**

To review and report on the performance of the two designated organisations appointed to certify activities of lining contractors, by auditing their compliance with the Specification of Requirements for Assessors [1], excepting the requirements for independence from lining contractors and suppliers of epoxy resins. The audit reports on:
I. The general suitability of the appointed Assessors in respect of the Specification of Requirements for Assessors [1].

II. The competence and training of the individual Assessors nominated by the Assessor.

III. The adequacy of the documented procedures maintained by the Assessor.

IV. The thoroughness of the assessment procedure, by reference to a check on records maintained by the Assessor.

4. METHODOLOGY

It was considered that a witness audit of a practical assessment of a lining contractor, made by the assessing organisation, was neither practicable nor would it be necessary. The proper review of documentation, etc., as well as detailed interviews with relevant personnel provided the necessary appropriate information in order to carry out an effective and efficient audit. The two principal types of activity that were undertaken for the audit involved:

1. Reviews of documentation, records and databases.

2. Interviews with the assessing organisation’s personnel.

4.1 Reviews of Documentation, Records and Databases.

The written procedures and associated instructions for the full life cycle process were reviewed to form the basis for the detailed interviews with relevant personnel and also to assess:

- whether they adequately represent the necessary actions required to fully carry out both the spirit and intent of the assessment required under Regulation 25 of the Water Supply (Water Quality) Regulations 1989;

- the organisational arrangements from receipt of initial enquiry from the lining contractor to completion of the assessment process and notification of the result to the lining contractor;

- the appeals procedure which is available to the lining contractor, including how this process is recorded and adjudged;

- the comprehensiveness of assessment records, including the procedures in place to ensure that these are maintained for an appropriate period of time;

- the comprehensiveness of the contractor database, including the procedures in place to ensure that re-assessments are carried out if and when required;

- the comprehensiveness of audit reports, including records of any required follow up actions and how these are carried out;
- the control of communications with the lining contractor to ensure that they properly represent information associated with the assessment process;
- how responsibilities are defined for carrying out specific actions associated with assessments, including how staff are allocated tasks within the overall process;
- what records are maintained of the competency status of all Assessors;
- what arrangements are put in place to ensure that assessing staff are suitably qualified and experienced;
- what practical arrangements are in place to ensure that trainee Assessors are properly supervised when conducting assessments;
- what practical arrangements are put in place to ensure that un-supervised assessments are supported by access to technical advice from an expert Assessor;
- what evidence is available that an expert Assessor has reviewed and checked the records of all assessments carried out by an unsupervised new Assessor;
- whether Assessor’s training logs are properly completed.

4.2 Interviews with the Assessing Organisation’s Personnel

- Interviews were carried out with relevant personnel who are responsible for managing, supervising, administering and physically carrying out the assessments. The intention of these interviews was to assess:
  - whether the procedures and instructions are understood and followed;
  - what internal audit and checking processes are applied to ensure that procedures and instructions are complied with;
  - what issues and problems arise from both the organisational processes and the practical assessments, including the mechanisms for reporting and resolving matters arising;
  - whether the procedures and instructions would benefit from amendment in order to make them more relevant or understandable;
  - how records and databases are maintained;
  - how training and supervision arrangements for trainee Assessors are implemented.

These interviews covered additional material arising from reviews of the documentation, databases and records as well as the comments of those interviewed.
**SECTION A**

## A1 FINDINGS

### A1.1 Summary of Compliance

#### Table 1 Summary of Compliance by WRe with Specification of Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Framework for the Assessment Scheme</strong></td>
<td><strong>WRe</strong> stated that they are seeking accreditation as an organisation by the end of December 2003. It is their intention to include the procedures associated with epoxy resin and rapid set polymeric lining with this accreditation.</td>
</tr>
<tr>
<td><strong>Organisation and Responsibilities</strong></td>
<td>A single competent Assessor is responsible for all assessment activities.</td>
</tr>
<tr>
<td><strong>Documented Procedures Covering:</strong></td>
<td></td>
</tr>
<tr>
<td>Responsibilities for carrying out the assessment, making on site technical judgements, countersigning the assessment and deciding whether the Contractor can be approved.</td>
<td>Not Observed.</td>
</tr>
<tr>
<td>A list of competent and trainee Assessors</td>
<td>Not Observed.</td>
</tr>
<tr>
<td>Assessment procedure – overall procedure from receipt of the order from the Contractor through to approval (if successful) or failure.</td>
<td>Observed with the exception of ‘Transitional Audits’.</td>
</tr>
<tr>
<td>Checks to be undertaken during the assessment.</td>
<td>Observed.</td>
</tr>
<tr>
<td>Appeals, should the Lining Contractor disagree with the outcome of the assessment.</td>
<td>Observed.</td>
</tr>
<tr>
<td><strong>Database of Assessments Containing:</strong></td>
<td></td>
</tr>
<tr>
<td>Date of assessment.</td>
<td>Observed.</td>
</tr>
<tr>
<td>Date by which re-assessment is required.</td>
<td>Not Observed.</td>
</tr>
<tr>
<td>Type, model of equipment used for lining.</td>
<td>Observed.</td>
</tr>
<tr>
<td>Result of the assessment, including note of any non-compliance.</td>
<td>Not Observed.</td>
</tr>
<tr>
<td>Reference to assessment report.</td>
<td>Not Observed.</td>
</tr>
<tr>
<td>Date of approval notification.</td>
<td>Observed.</td>
</tr>
<tr>
<td>Name of Assessor.</td>
<td>Observed.</td>
</tr>
<tr>
<td><strong>Information Required in Assessment Report:</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirement</th>
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<tbody>
<tr>
<td>The assessment methodology.</td>
<td>Observed</td>
</tr>
<tr>
<td>The audit process including the checks that were made.</td>
<td>Observed</td>
</tr>
<tr>
<td>Any non-compliance with the relevant Codes of Practice.</td>
<td>Observed</td>
</tr>
<tr>
<td>Any recommendations for changes to the lining procedures or equipment.</td>
<td>Observed</td>
</tr>
<tr>
<td>Whether the Contractor is approved for the application of the resin by the lining equipment used during the assessment.</td>
<td>Observed</td>
</tr>
<tr>
<td>Training Log</td>
<td>Observed</td>
</tr>
</tbody>
</table>

A1.2 Framework for the Assessment Scheme

- **WRc** have recognised the requirement for a quality management system for the accreditation processes carried out by their organisation to meet the requirements of the EN ISO 9000 family of standards. They will be seeking accreditation as an organisation by the end of December 2003. The procedures associated with epoxy resin and rapid set polymeric lining are intended to be included with this accreditation.

A1.3 Organisation and Responsibilities

- The number of contractor and rig accreditations carried out per year by **WRc** is relatively small. Consequently, there are few staff involved and the Assessor is responsible within their organisation for:
  
  1. responding to approaches from lining contractors;
  2. liaising with the contractor;
  3. carrying out pre assessment checks
  4. carrying out the lining assessments;
  5. writing the assessment report; and
  6. organising the issue of the Approval Certificate.

- All **WRc** lining contractor assessments have been carried out since 2000 by a principal Assessor accompanied by an additional Assessor. The principal Assessor has carried out a total of 20 lining contractor assessments and 16 rig approvals as of February 2003. This principal Assessor had previously accompanied a competent Assessor for 6 assessments and arrangements for obtaining technical advice from this competent Assessor during lining trials continue.
Assessments which are carried out by WRc are incorporated into the pre-existing WRc Approval Scheme for the Water Fittings and Materials Directory. This Approval Scheme provides a database of all WRc Approved Water Fittings and Materials and is maintained within WRc by the Scheme Manager. The Scheme Manager is responsible for the regular review of expiry dates of Approvals on the database and would advise the principal Assessor of the need for re-accreditation approximately 12 months before the expiry date. This has not been necessary to date, as the 5 year re-accreditation requirement for lining contractors was introduced with effect from December 2001.

A1.4 Documented Procedures

- WRc have produced procedures for various activities associated with the assessment of lining contractors and lining rigs. Historically, WRc have carried out assessments for epoxy resin linings, and this is reflected in the scope of their procedures. WRc has not yet achieved ISO 9000 accreditation for their assessment procedures, although it is their stated intention to do so before 2004.

- WRC’s procedures are entitled ‘In-Situ Lining – WRc Assessment Procedures [4] and separately apply to both epoxy resin and rapid set contractor and rig approvals. The procedures include:
  
  a. telephone call procedures;
  
  b. internal training of auditors;
  
  c. accreditation requirements, including:
     
     – ISO 9000 Certification review;
     
     – approval of lining rigs and equipment:
       
       i. lining rig approval (new rig design);
       
       ii. approved lining rig with alternative (approved) resin;
       
       iii. lining rig approval (modification to design);
       
       iv. approval of in-line mixers or spinner heads.
  
  d. contractor approvals:
     
     – new contractor approval;
     
     – approved contractor with alternative (approved) resin;
     
     – approved contractor with alternative (approved) lining rig;
     
     – approved contractor with alternative (approved) lining rig-resin combination.
e. special cases:
   − previously approved contractor whose ISO 9000 Certification has expired;
   − name changes and take-overs.

d. the approval process:
   − accreditation: contractor approvals;
   − accreditation: lining rig approvals;
   − accreditation outputs;
   − database management.

e. appeals procedures.

In addition to the above, WRe have detailed and comprehensive site check sheets for:

a. contractor assessment/audit – epoxy lining;

b. rig approval – epoxy lining;

c. OR/CP transitional audit – epoxy lining.

These check sheets act as an aide memoir for the WRe Assessor, and constitute detailed instructions; there are also explanatory notes attaching to the contractor assessment check sheet. WRe have stated that it is their intention to revise these procedures in accordance with the new requirements of the 3rd Edition of the OR/CP. The transitional audits were undertaken to support the re-approval of previously approved contractors under the new requirements of the 3rd Edition of the OR/CP. No procedures were produced by WRe for this activity.

A1.5 Use of Procedures

- **WRe** were noted as consistently completing their own forms and checklists when carrying out lining contractor assessments.

- The OR/CP and the OG/CP require lining contractors to be accredited as relevant to their operation to BS EN ISO 9002 for epoxy resin and rapid set polymeric materials respectively. WRe’s procedures include a requirement to ensure that the lining contractor has accreditation, or is working towards accreditation. WRe maintain a spreadsheet listing approved contractors and their accreditation status and certifying body. The contractors listed within this spreadsheet were compared by the Auditor with other information held by WRe and found to be consistent with those records.
A1.6 Other Procedural Issues

- **WRc** have interpreted the DWI Specification of Requirements [1] in respect of ‘the receipt and storage of the raw materials’ as requiring them to check that this is covered in the lining contractor’s Quality Management System.

- **WRc** carried out so-called ‘transitional audits’ to assess lining contractor’s compliance with the 3rd Edition of the OR/CP which came into force in December 2001, (excepting the requirement for Part 2 accreditation for lining operatives). No formal procedures were drawn up for this process, but a modified checklist was used by the Assessor during the transitional audit lining trials. On successful completion of this trial, the lining contractors were subsequently issued with a letter of approval in respect of their compliance with the 3rd Edition.

10 such transitional audits were carried out, with 5 of the audits carried out where either the contractor or the lining rig (or both) had not achieved certification (**WRc** accreditation and approval) at that stage, although the letter of approval stated that both the rig and the contractor were approved under the 3rd Edition. One contractor (Assessment ‘19’) was refused approval under the 3rd Edition. Another contractor (Assessment ‘13’) was granted transitional approval, in respect of their compliance with the 3rd Edition, although their **WRc** approval was being withheld pending improvement actions and the provision of further information. No formal reports were issued to contractors as a result of the transitional assessments carried out by **WRc**.

A1.7 Records of Assessments

- **WRc** employ their ‘Approval Scheme’ database to record information regarding lining contractors. This database is only used for contractors who have achieved ‘Approved’ status and its primary purpose is to meet the needs of the **WRc** Approval Scheme. There is no other database containing records of assessments. Arrangements are in place to archive hard copy information for 6 years; electronic information is stored on a server which is backed up daily. In the longer term, electronic information will be archived on an archive server with no specified removal date, but at least for 6 years.

- **WRc** have placed all hard copy information and communications in a single folder for each Contractor. It was not possible for the Auditor to review electronic communications (e-mails) at **WRc** because these were not identified separately from all other communications carried out by the Assessor or his employing Organisation.

A1.8 Accuracy of Records

- It was discovered by the Auditor that contractor ‘19’ had been erroneously entered onto the DWI Appendix 4 Section 4A list of approvals: ‘Contactors Approved for the In Situ Application of Polymeric Coatings’, December 2002. This contractor was also noted on the **WRc** Approved Scheme database as having been awarded approval in June 2002. However, the assessment report for this contractor stated that approval was ‘withheld pending implementation of appropriate improvement actions’. **WRc** confirmed to the Auditor that the certificate of approval had been withheld pending resolution of the outstanding actions. It was noted by the Auditor that the letter of approval was filed on
the WRe server as ‘Letter of Approval – Not issued’ and the Certificate as ‘Certificate – Not issued’.

- Contractor ‘13’ was issued with a letter of approval in respect of compliance with the requirements of the 3rd Edition of the OR/CP in March 2002 for the same lining equipment and material for which WRe Approval had been withheld.

- A contractor (referenced by the Auditor as Assessments ‘5’, ‘9’ and ‘15’) is listed in Appendix 4 Section 4A as being approved for 2 resin materials, however WRe have, to date, issued a certificate for only one of the materials and not the other. WRe have agreed that this is an omission and that a second certificate is required.

A1.9 Assessment Report

- Assessments by WRe of the suitability of a lining contractor to use epoxy resin focused on the following:
  a. compatibility of the lining equipment;
  b. competence of the contractor;
  c. overall ability of the contractor to apply a lining of the correct specification using the defined equipment;
  d. knowledge of those aspects of the lining process not witnessed explicitly (including re-commissioning procedures); and
  e. compliance with the DWI regulations for the in situ application of approved epoxy resin materials to potable water mains.

There was considerable emphasis by WRe on the contractor staff’s expertise in carrying out the whole process from mains preparation to re-commissioning. This may be due in part to the fact that there is no current requirement for contractor staff to have attained Part 2 accreditation in epoxy resin lining. The reports did not contain any detailed numeric information on lining thickness, mix-ratios etc.

- The assessment reports authored by WRe contained a series of recommendations, some of which were mandatory either because they were conditions which were required to be met by the contractor in order to achieve approval, or they were required to be met for continuance of the approval. In this regard, they may be better described as ‘requirements’ and not ‘recommendations’.

A1.10 Accuracy of Assessment Reports

- Three assessment reports produced by WRe were examined in detail and compared with contemporaneous notes made at the time of the lining trial. No significant differences were found. The general text of each report was compared with the report recommendations and no significant inconsistencies were found. A comparison was made between each of the 20 lining trials reports and the associated approval letters regarding any conditions for approval. In the case of two different reports for the same
contractor (identified as Assessments ‘5’ and ‘9’ respectively), the text in the reports referred to certain conditions as well as a requirement for an additional audit. The conditions were reproduced accurately in the letters of approval to the contractor, however there was no mention in either of these letters of the requirement for an additional audit before approval would be granted.

A1.11 Training

- The qualifications and experience claimed by the principal Assessor at WRc suggested that he possessed sufficient knowledge and expertise to undertake assessments.

- WRc demonstrated an understanding of the training requirements associated with the accreditation process. The principal Assessor for WRc carried out a structured training programme of accompanying 6 audits with the previous Assessor, and has been awarded a certificate of competence as a ‘Site Supervisor’ by that Assessor. A similar programme of ‘shadowing’ and tutoring has been undertaken in respect of conducting training courses for Part 1 and Part 2 accreditation for lining contractor staff. The training record for the principal Assessor consisted of a list of lining trials in which he had participated, their dates and the name of the accompanying Assessor. There were no other Assessor training records.

A2 CONCLUSIONS

1. WRc appeared to endeavour to undertake their accreditation activities in a responsible and professional manner and generally complied with the Specification of Requirements for Assessors [1].

2. WRc have drawn up procedures both for the accreditation of lining contractors and lining rigs. These procedures reflect the protocol for assessments in the OR/CP as relevant to epoxy resin materials. However, they do not fully include all of the requirements as laid down in the DWI Specification of Requirements, [1], neither do they necessarily make reference to all associated instructions and other relevant documents.

3. WRc maintain a database of contractors who have received approval. This database is embedded in the WRc Approval Scheme Database and does not contain all of the information as required by the DWI Specification of Requirements [1].

4. WRc produce an assessment report which is issued to the lining contractor. The nature of the information contained in the assessment reports was found to be consistent with the requirements as set out in the DWI Specification of Requirements [1].

5. WRc do not currently hold accreditation for lining contractor or rig assessments for epoxy resin under the EN ISO 9000 family of standards. Compliance with the ‘spirit’ of the EN ISO 9000 family of standards was demonstrated by WRc in that they had documented assessment procedures, and had recognised the importance and relevance of experienced and trained Assessors. However, WRc do not
maintain a database of assessments fully in accordance with the DWI Specification of Requirements [1].

6. The DWI Specification of Requirements [1] states that the assessment should cover ‘site practice and final inspection of the lined pipe’. WRc place considerable emphasis on the competency of contractor personnel and report this in detail. This may have been due, in part, to the transitional arrangements for the implementation of the 3rd Edition of the OR/CP, which existed during the audit reference period (January 2000 to February 2003). These transitional arrangements do not require Part 2 qualification by contractor key personnel until 1st April 2003).

7. A lining contractor has been erroneously listed in Appendix 4 Section 4A of the DWI Approvals Database for December 2002, and also listed under the WRc Approvals Scheme although they have not received full third party accreditation from WRc. This error may have been prevented if an assessment database was maintained which tracked the entire process of accreditation, including outstanding remedial actions required from the contractor.

8. A lining contractor has not been issued with a certificate for one of the materials for which it has been approved by WRc, although it is listed as having approval in Appendix 4 Section 4A of the DWI Approvals Database for December 2002. This error may have been prevented if an assessment database was maintained which tracked the entire process of accreditation, including outstanding actions identified by the Assessment Organisation.
SECTION B

B1 FINDINGS

B1.1 Summary of Compliance

Table 2 Summary of Compliance by Faber Maunsell with Specification of Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framework For The Assessment Scheme</td>
<td>Faber Maunsell stated that they are seeking to include their procedures associated with rapid set polymeric lining within their existing accreditation for ISO 9002 before 2004.</td>
</tr>
<tr>
<td>Organisation And Responsibilities</td>
<td>A single Assessor is responsible for all assessment activities.</td>
</tr>
<tr>
<td>Documented Procedures Covering:</td>
<td></td>
</tr>
<tr>
<td>Responsibilities for carrying out the assessment, making on site technical judgements, countersigning the assessment and deciding whether the Contractor can be approved.</td>
<td>Not Observed</td>
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<td>Assessment procedure – overall procedure from receipt of the order from the Contractor through to approval (if successful) or failure.</td>
<td>Observed</td>
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<tr>
<td>Checks to be undertaken during the assessment.</td>
<td>Observed</td>
</tr>
<tr>
<td>Appeals, should the lining Contractor disagree with the outcome of the assessment.</td>
<td>Not Observed</td>
</tr>
<tr>
<td>Database of Assessments Containing:</td>
<td></td>
</tr>
<tr>
<td>Date of assessment.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Date by which re-assessment is required.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Type, model of equipment used for lining.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Material – manufacturer, identification of type.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Result of the assessment, including note of any non-compliance.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Reference to assessment report.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Date of approval notification.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Name of Assessor.</td>
<td>No Database Observed</td>
</tr>
<tr>
<td>Information Required in Assessment Report:</td>
<td></td>
</tr>
<tr>
<td>The assessment methodology.</td>
<td>Observed</td>
</tr>
</tbody>
</table>
### Requirement

<table>
<thead>
<tr>
<th>Requirement</th>
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<tbody>
<tr>
<td>The audit process including the checks that were made.</td>
<td>Observed</td>
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<td>Any non-compliance with the relevant Codes of Practice.</td>
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<td>Any recommendations for changes to the lining procedures or equipment.</td>
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<tr>
<td>Whether the Contractor is approved for the application of the resin by the</td>
<td>Observed</td>
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<tr>
<td>lining equipment used during the assessment.</td>
<td></td>
</tr>
<tr>
<td>Training Log</td>
<td>Observed</td>
</tr>
</tbody>
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### B1.2 Framework for the Assessment Scheme

- **Faber Maunsell** have recognised the requirement for a quality management system for the accreditation processes carried out by their organisation, to meet the requirements of the EN ISO 9000 family of standards.

- **Faber Maunsell** have an existing accreditation for ISO 9002. The Assessor has stated to the Auditor that he will be holding discussions with **Faber Maunsell**'s quality assurance staff, during March 2003, to set out a programme of work to include rapid set polymeric lining contractor accreditation and rig accreditation procedures in the Company’s ISO 9002 accreditation by the end of 2003.

### B1.3 Organisation and Responsibilities

- The number of contractor and rig accreditations carried out per year by **Faber Maunsell** is relatively small. Consequently, there are few staff involved and the Assessor is responsible for:

  1. responding to approaches from lining contractors;
  2. liaising with the contractor;
  3. carrying out pre assessment checks
  4. carrying out the lining assessments;
  5. writing the assessment report; and
  6. organising the issue of the approval certificate.

- All **Faber Maunsell** assessments (and those carried out by their predecessor organisations, namely Warren Associates and Metcalf and Eddy) have been carried out since 2000 by a principal Assessor accompanied by a trainee Assessor. The current principal Assessor has a practical background in epoxy resin lining of potable water mains and had completed 8 lining contractor assessments as of February 2003. In the
event of technical advice being required during a lining trial, the Assessor stated that he
would refer this to an external technical expert; this has not been necessary to date.

- Additional support is provided at Faber Maunsell by administrative staff who maintain a
  training database on which the training records of contractor and utility staff (trained by
  Faber Maunsell) are held.

**B1.4 Documented Procedures**

- **Faber Maunsell** have produced procedures for various activities associated with the
  assessment of lining contractors and lining rigs. Historically, **Faber Maunsell** have
  carried out assessments for rapid set polymeric (polyurethane) materials, and this is
  reflected in the scope of their procedures. **Faber Maunsell** have not yet achieved ISO
  9000 accreditation for their assessment procedures, although it is their stated intention to
do so before 2004.

- **Faber Maunsell** have procedures for both contractor accreditation [5] and rig
  accreditation [6] for the application of rapid-setting polymeric materials. There are, in
  addition, ‘aide memoir’ notes and information to assist the Assessor with the required
  operational practices for rectification of any non-conformance arising during the lining
  trial. These notes constitute detailed instructions in support of the overall procedures;
  however, they appear to be an informal document outside of the main procedures, and are
  not referred to by those procedures.

- There is no procedure in place at **Faber Maunsell** to identify the need to carry out lining
  contractor re-accreditations after 5 years. The principal Assessor stated that it was highly
  probable that contractors would request re-accreditation in the interim, because of
  changes to lining rig design, or because they wished to use a different lining material. It
  was also stated that the enquiry from DWI in 2002 to confirm the ISO 9000 accreditation
  status of contractors was expected to be an annual requirement and this would also
  prompt a review of their approval renewal date.

**B1.5 Use of Procedures**

- **Faber Maunsell** were noted as consistently completing their own forms and checklists
  when carrying out lining contractor assessments.

- There is no record of ISO 9000 accreditation of approved contractors at **Faber Maunsell**.
  Hard copy correspondence regarding the establishment of ISO accreditation was not
  consistently evident. **Faber Maunsell** were asked by the Auditor if they had followed up
  their correspondence to contractors which was prompted by a request for information on
  contractor ISO 9000 status from DWI in December 2002. **Faber Maunsell** stated that
  they had passed on to DWI all information received from contractors, but felt that it was
  not clear whether they should be subsequently following this up with those contractors
  who had failed to respond.

- **Faber Maunsell** carried out a lining trial for contractor ‘A’ in order to assess them for
  their suitability to apply a polyurethane material using a rig designed and constructed
by A’. The protocol contained within the contractor accreditation procedures states, in respect of the rig to be used in the trial, that:

‘Such equipment will have been assessed by a suitably experienced and qualified independent laboratory endorsed by DWI/CPP’.

The rig had earlier undergone a rig accreditation lining trial by Faber Maunsell on 21st February 2001. Faber Maunsell’s rig accreditation procedures require that:

‘The performance of a new rig design shall be monitored for a period of at least 3 months from the initial rig assessment...It should also be expected that at least once a month during this period the rig will be assessed on site conducting at least one lining to further confirm the information provided......The assessor will make the operator aware of the end of the assessment period and issue full certification’.

The 3-month monitoring period for the new design of rig would be expected to have expired in the third week of May 2001 (providing that there were no problems identified). The lining contractor accreditation trial took place in March 2001 during the period of ongoing rig assessment. This is not in accordance with the contractor accreditation procedures.

The assessment report stated that:

‘At the time of the trial, the rig had passed stage 1, a significant amount of trial lining had already taken place and it was still in the 3 month period’.

This statement confirms that the lining contractor accreditation trial took place using a rig that had not received approval. A letter was subsequently sent by Faber Maunsell to contractor ‘A’ dated 30th April 2001 informing them that they had been approved. This letter pre-dated the end of the 3-month monitoring period for the rig.

• It was noted that 5 staff working for contractor ‘E’, and listed by contemporaneous documents as being involved in a lining trial carried out by Faber Maunsell in July 2000, were recorded on the training database as passing their Part 2 assessment on 3rd July 2000, but their Part 1 assessment was 26th September 2000, i.e. Part 2 preceded Part 1. Faber Maunsell’s contractor accreditation procedures state that:

‘All personnel must have successfully achieved qualification in parts 1 and 2 of the training regime defined in the OG/CP... proof of certification will be required at the trial’.

It is understood from correspondence that the lining contractor accreditation trial was used as an opportunity to carry out the Part 2 assessments. The contractor was subsequently advised by letter on 25th August 2000 that Faber Maunsell were recommending to DWI that ‘E’ be accredited as a lining contractor. This date is before the apparent Part 1 qualification of the lining personnel used in the trial.

Similarly, it was noted in correspondence between Faber Maunsell and contractor ‘D’ that the contractor was informed that personnel involved in the accreditation trial must be ‘at least Part 1’. This is contrary to Faber Maunsell’s procedures.
Faber Maunsell’s contractor accreditation procedures require that the lining contractor provides to Faber Maunsell:

‘...fully completed paperwork as specified in the OG/CP for each lined length including copies of rig printouts’.

A review of the records retained in each contractor’s file was undertaken and, in the majority of cases, the paperwork was found to be present with the overall exception of CCTV records. It was stated to the Auditor by Faber Maunsell that the CCTV records are returned to the contractor for his retention.

Faber Maunsell’s procedures also require a review of maintenance and calibration records ‘6 weeks before the trial’. No evidence was found for this. Faber Maunsell stated to the Auditor that this review was carried out on site during the lining trial.

B1.6 Other Procedural Issues

The Faber Maunsell Assessor stated that no other Assessor checked his findings nor checked the assessment report and he was solely responsible for each assessment carried out. He is accompanied by a trainee Assessor who assists with the lining trial. The Assessor has carried out 8 assessments to date and is therefore theoretically a ‘new Assessor’ [1].

Faber Maunsell have interpreted the DWI Specification of Requirements [1] in respect of ‘the receipt and storage of the raw materials’ as requiring them to ensure that the manufacturer’s requirements for storage at an appropriate ambient temperature at the accreditation site are met.

B1.7 Records of Assessments

Faber Maunsell could not demonstrate any database relating to contractors except for a training database. This database records information relating to the Part 1 and Part 2 training and qualification of lining contractor and utility staff which is carried out by Faber Maunsell in respect of both epoxy-resin and rapid set polymeric lining. It was stated by Faber Maunsell that they would retain all records for a minimum of 7 years as required by the OG/CP.

Faber Maunsell have placed all hard copy information and communications in a single box file for each contractor. It was not possible for the Auditor to review electronic communications (e-mails) at Faber Maunsell because these were not identified separately from all other communications carried out by the Assessor or his employing Organisation.

B1.8 Accuracy of Records

The accreditation letters sent to approved lining contractors by Faber Maunsell were compared with the lining accreditation assessment reports and the corresponding contemporaneous notes. No errors were found either in the description of the equipment or the material for which approval was being granted. The DWI Appendix 4 Section 4B
list of approved contractors was compared with information from Faber Maunsell; no inconsistencies were found.

**B1.9 Assessment Report**

- The Faber Maunsell assessments focused largely on the technical aspects of the process; the objective of the assessment being "the physical application of the lining in accordance with the OG/CP" [6]. Their reports contained detailed numeric information in respect of mix ratios, spin-up times and lining thickness. There was little or no comment in the reports in respect of the activities and competence of lining contractor staff, except a statement that they were 'fully accredited' (i.e. attained Part 2). Faber Maunsell stated to the Auditor that, if they became aware during a lining trial that the contractor’s staff were evidently not fully competent, they would stop the lining trial. This has not happened to date.

- The assessment reports authored by Faber Maunsell contained a series of recommendations, some of which were mandatory either because they were conditions which were required to be met by the contractor in order to achieve approval, or they were required to be met for continuance of the approval. In this regard, they may be better described as ‘requirements’ and not ‘recommendations’.

**B1.10 Accuracy of Assessment Reports**

- The 6 assessment reports completed by Faber Maunsell in the period 2000 to 2003 and involving approved rapid setting polymeric material were reviewed and compared in detail, both with the contemporaneous notes made by the Assessor during the lining trials, and the various retained records and forms that were completed by the lining contractor. There were no significant differences between these documents and the report. There was, however, a transcription error in one assessment report when the concentrations of Total Organic Carbon (TOC) were compared with the corresponding WQC (Water Quality Centre) report of these concentrations in the water quality samples taken from the lined pipes. There were also a significant number of leachate rate calculation errors for TOC, 3,4-diethyltoluenediamine (DEDA) and Bisphenol A diglycidal ether (BADGE) variously found in 5 out of the 6 assessment reports produced by Faber Maunsell. In one report, (for contractor ‘B’), all of the TOC calculations were incorrect and 50% were incorrect in the other 4 reports (‘A’, ‘D’, ‘E’ and ‘F’). 25% of the BADGE calculations were wrong in 2 reports, (‘D’ and ‘F’), with a small number of incorrect BADGE and DEDA calculations in the remainder. These inaccuracies do not materially alter the outcome of the trials, but they suggest that there is no visual inspection made of these tables in the reports. This is demonstrated by the fact that 2 erroneous calculations were for concentrations found after 1 hour’s duration, when the leachate rate per hour should have corresponded to the concentration found after 1 hour, but the calculation reported a higher concentration.

- It was noted that the Faber Maunsell assessment reports did not consistently discuss and explain the phenomenon (when it occurred) of the initial 1 or 2 lining thickness readings on the rig printouts being less than 1 mm. If this was deemed to be sufficiently significant to report in some reports it is not clear why it should not be reported when it occurred in all other cases.
The mix-ratios calculated for the Faber Maunsell lining trial for contractor ‘D’ were calculated to be 5.4%. This is an absolute variance of 8% above the maximum permitted +/-5% variance for mix-ratios during lining of potable water pipe. This was deemed to be acceptable by Faber Maunsell despite being contrary to the OG/CP. Faber Maunsell have produced an internal document which lists the recommended rectification required for various non-conformances. This document recommends ‘NCR (Non-Conformance Record), weight checks and pipe sample’ as the rectification for ‘Out of specification mix-ratio’. There is no mention of this internal document in the assessment report, nor does it appear to be referenced by the procedure. The assessment report for contractor ‘D’ gave no explanation as to why this out of range value was deemed to be acceptable.

The Auditor reviewed the Faber Maunsell training database. A detailed comparison was made between the records of Part 1 and Part 2 contractor staff accreditations and the contractor staff given as being involved with three different contractor lining accreditation trials carried out to demonstrate the contractor’s compliance with the OG/CP. It was noted that lining contractor staff used for the lining accreditation trial for contractor ‘E’ were not qualified to Part 1 at the time of the trial. The trial was apparently used to assess staff for their Part 2 qualification as it took place on the same day as the qualification date (July 3rd 2000). The assessment report for ‘E’ stated that:

‘The key operatives responsible for preparing and operating the lining rig and other equipment for the trial were fully trained and accredited in line with the OG/CP requirements’.

This statement appears to be inaccurate because Faber Maunsell’s training database demonstrated that the key operatives were not accredited prior to the lining trial.

B1.11 Training

Curriculum Vitae were reviewed for all staff engaged in assessment activities at Faber Maunsell. These demonstrated that they possessed relevant qualifications and/or practical experience in mains rehabilitation.

Faber Maunsell demonstrated an understanding of the training requirements associated with the accreditation process. The principal Assessor at Faber Maunsell is accompanied by a trainee Assessor for each audit with the intention that the trainee will become experienced enough to carry out assessments on his own. Faber Maunsell are of the opinion that, in any case, two Assessors are required at a lining trial in order to properly observe all of the necessary activities. The training record for the trainee Assessor consisted of a list of lining trials in which he had participated, their dates and the name of the accompanying Assessor. There were no other Assessor training records except that it was observed that the training database lists one of the Assessors with Part 1 and Part 2 qualification dates, however, their Part 1 qualification had expired in October 2002.

It is Faber Maunsell’s stated intention that staff who carry out Part 2 training for contractor and utility staff will, themselves, have to undergo a new Part 3 assessment which will provide them with an in-house training qualification.
B2 CONCLUSIONS

1. **Faber Maunsell** appeared to endeavour to undertake their accreditation activities in a responsible and professional manner and generally complied with the Specification of Requirements for Assessors [1].

2. **Faber Maunsell** have drawn up procedures for the accreditation of lining contractors and lining rigs. These procedures reflect the protocol for assessments in the OG/CP as relevant to rapid-set polymeric materials. However, they do not fully include all of the requirements as laid down in the DWI Specification of Requirements, [1], neither do they necessarily make reference to all associated instructions and other relevant documents.

3. **Faber Maunsell** do not maintain a contractor database. This is not in accordance with the DWI Specification of Requirements [1].

4. **Faber Maunsell** produce an assessment report which is issued to the lining contractor and is also sent to DWI. The nature of the information contained in the assessment reports was found to be consistent with the requirements as set out in the DWI Specification of Requirements [1].

5. **Faber Maunsell** do not currently hold accreditation for lining contractor or rig assessments for rapid-set polymeric materials under the EN ISO 9000 family of standards, although they already hold ISO 9002 accreditation for other unrelated activities. Compliance with the ‘spirit’ of the EN ISO 9000 family of standards was demonstrated by **Faber Maunsell** in that they had documented assessment procedures, and had recognised the importance and relevance of experienced and trained Assessors. However, **Faber Maunsell** do not maintain a database of assessments in accordance with the DWI Specification of Requirements [1].

6. The **Faber Maunsell** principal Assessor has carried out a total of 8 assessments to date. According to the DWI Specification of Requirements, this means that he is still a ‘new Assessor’ and an ‘expert Assessor’ should ‘review the records of the assessment and check that all of the required information has been obtained and correctly interpreted’ [1]. This has not been possible, as there is no one currently employed by **Faber Maunsell** who is an ‘expert Assessor’ as defined by the DWI Specification of Requirements, [1]. Because of the small number of assessments carried out each year, it may be difficult for any Company to be able to fully comply with the trainee-new-expert Assessor protocol as laid down in the DWI Specification of Requirements [1].

7. The DWI Specification of Requirements [1] states that the assessment should cover ‘site practice and final inspection of the lined pipe’. **Faber Maunsell**, place considerable emphasis on the performance of the lining equipment and the quality of the lining, with little or no comment on the activities and procedural compliance of the lining gang with the OG/CP.

8. The **Faber Maunsell** assessment reports are sent to DWI and the majority of these reports were found to have erroneous calculations. As the Assessor was
unaware of the errors, and there appeared to be no correspondence between DWI and Faber Maunsell regarding them, the use subsequently being made of the reports by DWI is unclear if they have not challenged these calculations.

9. It was noted by the Auditor that Faber Maunsell had exercised discretion during a lining trial in respect of the acceptability of results of the physical monitoring that was carried out. This discretion had been applied where the overall mix-ratio had been in excess of the maximum variation permitted, but approval was nevertheless granted.
5. SUMMARY RECOMMENDATIONS

- The technical competence of the two Assessment Organisations was recognised and no recommendations are considered necessary in respect of technical competence.

- Both Assessment Organisations need to ensure that they maintain records and act fully in accordance with the existing Codes of Practice and the DWI Specification of Requirements as neither currently demonstrate consistent compliance in this regard.

- DWI should ensure that they review all information passed to them by the Assessment Organisations in respect of Lining Contractor Accreditation Trials.

- Consideration should be given to harmonising the OR/CP and the OG/CP, as there is a lack of consistency in approach between the two Codes of Practice.

- The DWI Specification of Requirements should be a controlled document.

5.1 Detailed Recommendations

1. An overall process map should be drawn up to cover the entire process of accreditation including the responsibilities of each organisation, i.e. DWI, the Assessment Organisation and the contractor. This process map will demonstrate:
   - the procedures required by each Organisation in order to properly discharge their responsibilities;
   - the information required by each Organisation in order to properly discharge their responsibilities; and
   - the interfaces between each Organisation which require agreement and formalisation.

2. A review should be carried out of the differences between the approach and focus for lining accreditations adopted by the two Assessment Organisations and an Industry Best Practice agreed. This Best Practice should include:
   - the information required before commencement of the trial;
   - the observations to be made during the trial;
   - the critical success factors required for acceptance of the trial;
   - the scope and content of the subsequent report.

3. A standardised tracking database should be agreed for each assessment requested by the contractor to track the progress of their accreditation from first contact to final, or refusal of, approval. The database should be used to record milestones as laid down by quality procedures as a record of adequate completion of key steps by all parties.
4. Ensure that all requirements stated in assessment reports to the contractor that are mandatory for approval, or the continuance of approval, are set out in the report as requirements rather than recommendations. These requirements should employ correct phraseology in respect of ‘shall’ in accordance with the phraseology used in the OR/CP and OG/CP so this is implicitly understood by the contractor as mandatory and not advisory.

5. If areas of discretion are permitted on behalf of the Assessment Organisation regarding any aspect of lining trial accreditations, these should be explicitly stated and defined to avoid confusion and drift of the standards that are applied.

6. The use of lining accreditation trials to simultaneously carry out Part 2 accreditation of the contractor’s staff involved in the trial should be reviewed against the apparent spirit and intent of the OG/CP that trained and accredited staff should be used. However, it is understood that the OG/CP protocol does not explicitly state the requirement to use fully accredited staff for the trial.

7. Guidance from DWI to the Assessment Organisations may be considered necessary in order to ensure a common interpretation of the DWI Specification of Requirements [1]. A particular example of this is in respect of ensuring that the assessment covers ‘..all aspects of the operation from receipt and storage of the raw materials...’ as this is apparently being interpreted differently by the two Assessment Organisations.

8. DWI may wish to review the content of its letters of approval to contractors accredited to use rapid-set polymeric material to line potable water mains. These letters appear not to have an expiry date and may therefore be considered to confer approval in perpetuity which is not in accordance with the OG/CP which states that renewal is required 5 yearly.
6. REFERENCES

1. DWI: Specification of Requirements for Organisations Providing an Assessment Service for Contractors Engaged in the *In-situ* Application of Polymeric Materials to water Supply Pipes.


4. WRc plc: Assessment Procedures - *In Situ* Lining, WRc/DRM/01/03.
