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QA PROGRAMME
FOR THE ENIQ PILOT STUDY

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APPROVAL SHEET PILOT STUDY DOCUMENT

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CONTENTS

1. SCOPE

This document describes the Task 2.2 Pilot Study and sets out how the activities of this task will be controlled. The work will follow the principles given in the first (First Issue - ENIQ REPORT No 1, EUR 16139, 1995) and second issue (to be published) of the European Methodology for Qualification of Non-Destructive Tests.

The aim of the Quality Assurance (QA) programme is to ensure that the written technical requirements of the Task 2.2 pilot study are met in practice.

In this document, the situation considered in the ENIQ pilot study is described.

2. DEFINITIONS

For the purposes of Task 2.2 the definition of terms given in the "Glossary of Terms and Standards Used in Qualification" – draft final report of 24 October 1995 will apply. This draft final report funded by the CEC DGXI under Contract Number ETNU/CT/94/0132-UK has been widely circulated within ENIQ.

3. GENERAL DESCRIPTION OF THE TASK 2.2 PILOT STUDY

As mentioned under Scope above, the pilot study will be carried out in accordance with the principles set out in the European Methodology Document. It aims to explore the way in which detailed procedures for qualification of inspection are developed from these principles. In doing this, the intention is also to provide evidence that qualification carried out in this way is satisfactory in terms of providing confidence that the inspection is capable of meeting the requirements imposed on it by an overall structural integrity safety case. Furthermore, it is also the purpose to test the feasibility of the European methodology. The way this will be achieved is by applying the general principles of the European to one specific example.

The example that was chosen for the pilot study is the qualification of an inspection of austenitic pipe to pipe and pipe to elbow welds. All aspects of the inspection will be qualified. The procedure and equipment qualification will involve open trials on test pieces containing defects while that of the personnel will be done through blind trials. In addition to practical trials, qualification will also involve the production of a technical justification as required by the methodology document.

The inspection which will be qualified, will be an automated one involving a scanner and digital flaw detector. The inspection procedure will be produced specially for this exercise and will be tailored to the particular requirements of this inspection.

Qualification will involve a combination of satisfactory practical trial results and a convincing technical justification. In this way, the overall case for the inspection is a stronger one than could be provided by test pieces alone. If qualification reveals shortcomings in any aspect of the inspection, modifications will be made and the qualification will be repeated until a satisfactory inspection is achieved.

Once the inspection has been qualified, it will be applied to a number of “real” components, some containing defects removed from operating reactors and others containing simulated defects but welded using the same materials and procedure as the qualification test pieces. The results obtained will be compared in detail to those in the first qualification part of the pilot study. From this comparison, conclusions will be drawn about the value of qualification in providing confidence in the inspection.

As indicated above two types of ISI components under test will be considered:

1. a first set for which the qualification test pieces replicate exactly the size, geometry and macrostructure;
2. a second set on which less information is available and for which the qualification test pieces do not replicate in detail the size, geometry and macrostructure.

It will be interesting to compare the results obtained on these 2 different sets of ISI assemblies, although it should be stressed that the first set is considered to be the most important one.

Appendix 2 shows the steps in the pilot study in some detail.

4. IMPLEMENTATION OF QA PROGRAMME

4.1 Procedure for implementation of QA programme

The ENIQ Programme Manager will be responsible for the implementation of this QA programme and the associated documentation. The intention is that quality will be ensured by the participation of the Programme Manager in the project and not by a formal system of audit. Appendix 1 to this document contains a list of the points in the programme at which formal approval by the Programme Manager is necessary before work can proceed further.

All participants in the Task 2.2 pilot study will receive up to date copies of this QA programme and the associated documents for the control of activities within the study. All participants will be given a briefing on the requirements of the QA programme by the Programme Manager.

4.2 Progress control system

Progress of the work in the pilot study will be monitored at the different ENIQ meetings that are held (Steering Committee, Task Force, Task Group 2.2). The Programme Manager will report on the status of the pilot study. This will include review of the activities, progress made, results obtained, problems encountered and planning. Furthermore, newsletters will be issued on a regular basis to report about the progress of the pilot study.

In between these ENIQ meetings, regular project meetings are held between the Programme Manager and the Chairman of Task Group 2.2.

4.3 Non-conformity

Any participant in the pilot study who discovers a non-conformance with the QA programme or associated documentation will report the non-conformance to the Programme Manager for resolution. If the Programme Manager is unable to resolve a non-conformance, he will take it up with the ENIQ Task 2.2 committee for resolution.

5. RESPONSIBILITIES OF PARTICIPANTS

This pilot study will inevitably be carried out under different circumstances from those which will apply in a real inspection. In the latter, a number of parties will be involved and they will each have their own role to play in qualification. These parties include:

- The inspection vendor carrying out the inspection
- The plant operator which owns the plant and is hence responsible for the adequacy of the inspection
- The qualification body which carries out the qualification
- The safety authority who is responsible to the national government for plant safety.

The responsibilities of the different parties are set out in detail in the European Methodology document.

In this pilot study, the role of the different parties is assumed by different parts of ENIQ and the JRC. The equivalencies are as follows:

The inspection vendor, carrying out the inspection, will be an inspection team from the JRC NDT Department. This team will be supplemented by inspectors with industrial experience.

The plant operator

- Sets the requirements for ISI
- Sets the performance for ISI
- May assess the qualification procedure proposed by the qualification body and comment on it
- Either writes the inspection procedure or accepts one prepared by the inspection vendor
- Either prepares the technical justification or approves one prepared on the plant operators behalf.
- Supervises all the inspection activities that affect performance, including receipt and verification of equipment, qualification of personnel, content of procedures and evaluation of results.

The first three of the above responsibilities have either been discharged by the ENIQ Steering Committee already or will be. The final three, in this exercise, will be taken by a group comprising the Chairman of ENIQ Task 2.2, the ENIQ Programme Manager and other JRC NDT staff who are not members of the inspection team.

The qualification body

- Develops the qualification procedure
- Applies qualification according to this procedure, including NDT procedure assessment, technical justification assessment and practical trials
- Designs and produces test pieces
- Assesses and reports the results
- Produces the qualification dossier
- Issues qualification performance documents for certification
- Prepares a quality assurance programme.

In this pilot study, the role of the qualification body will be played by people of JRC Petten, not involved in the inspection, and ENIQ Task Group 2.2. The practical organisation of the assessment of the NDT procedure, technical justification and inspection results obtained during open and blind trials are described in document ENIQ.PILOT(96)7 (“Qualification procedure for the ENIQ pilot study”).

The safety authority (or regulatory body) who is to be responsible to the national government for plant safety. Their responsibilities will vary depending on the legal and regulatory requirements in their country.

For the purpose of the pilot study, the role of the safety authority will be assumed by a sub-group within the ENIQ Task Force. This sub-group will be responsible for reviewing and approving this QA programme, the qualification dossier and the final report of the pilot study.

6. TEST PIECES

6.1 Test piece quality checks

The test piece quality checks will be carried out, before practical qualification work commences, by personnel of the JRC NDT Department who will not be involved in the blind trial qualification. The documentation provided by the different test piece manufacturers will be reviewed. The test pieces will be examined using X-rays and ultrasonics to ensure that the defects are as intended. It is also important to check that the volume around each defect does not contain significant indications that would make the defect unusable for qualification.

A brief report will be prepared containing the main conclusions of the quality checks.

The final stage of checking the test pieces will be their destructive examination following all the practical trial work. Designated members of Task 2.2 will decide where the cuts will be made in the test pieces for the destructive examination.

6.2 Confidentiality of test pieces for blind trials

Test pieces that will be used for blind trials, will be stored in a room where only authorised people have access. The detailed information on the exact location and dimensions of the defects will only be available to the people of JRC Petten involved in the fabrication and certification of the qualification test pieces.

The inspection people involved in the blind trials will have no knowledge of the defects introduced prior to the inspection.

7. DOCUMENTATION AND REPORTING

All documents relating to the pilot study will be given a unique reference number: ENIQ.PILOT(X)Y where X stands for the year in which the document was issued and Y is a number attributed to each document. An overview of the all the reports that will be prepared in the framework of the pilot study is given in a table shown in Appendix 3. This table has been structured in such a way that it shows in which report or in which section of a particular report the main steps of the pilot study programme, given in Appendix 2, can be found.

The Operating Agent (OA), JRC Petten, will attribute the numbers to the different documents issued. The OA will also keep the archives of the documents.

The front page of each document will contain at least the following information:

- title
- document number (see Appendix 3)
- version: draft or final
- date of issue.

Each pilot study document will contain an approval sheet (see Appendix 4), bearing the signature of the Programme Manager and containing the following information:

- distributed for comments on *[date]*
- approved following the written procedure or
  approved at the meeting of *[group]* on *[date]*
- issued on *[date]*.

For the purpose of this pilot study, each of the pilot study documents will be approved by the party as defined in section 5. A document can be approved either at a meeting or by using a written procedure. If the written procedure is followed, the approval sheet given in Appendix 5 will be used. For the written procedure, comments should be sent within 4 weeks of distribution of the document. No comments sent within that period implies approval of the document sent. The ENIQ Programme Manager will judge whether the received comments require further discussions. If that is not the case, the document will be issued as a final pilot study report. All final pilot study documents are only for programme use until they have been approved by the Steering Committee of ENIQ, followed by the attribution of an EUR-number along the normal procedures for official publication by the European Commission.

APPENDIX 1

QA approval points

There are a number of key points throughout the ENIQ pilot study where formal approval from the Programme Manager is necessary before further steps are taken. The form below must be signed and dated by the Programme Manager at the appropriate points.

Programme Point	Signed	Date
Procedure submitted to TAG		
TJ submitted to TAG		
TAG approval of procedure		
TAG approval of TJ		
Qualification test pieces certificated		
Open trials carried out and results assessed		
Blind trials carried out and results assessed		
Attenuation measurements on qualification test pieces		
Grain structure assessment of qualification test pieces		
Confirmation of procedure parameters		
Update of TJ		
Combine trials results with TJ to give overall qualification		
ISI test pieces certificated		
ISI trials carried out and results assessed		
ISI and qualification results compared and final report issued		

APPENDIX 2

Detailed steps in the pilot study

1. Objectives

2. Organisation of the pilot study: different phases

3. QA programme

4. Phase 1: Tasks (contents of qualification dossier)

4.1 Description of the situation for the ENIQ pilot study

4.1.1 Description of the component to be non-destructively tested

4.1.2 Description of type and dimension of defects to be detected and sized

4.1.3 Inspection performance to be achieved (ISI objectives)

4.1.4 Logic behind choice of inspection performance

4.1.5 Inspection procedure

4.1.5.1 Guidelines for the development of an inspection procedure

4.1.5.2 Measurements

4.1.5.3 Detailed Procedure

4.1.6 Description of the equipment

4.2 Qualification procedure

4.3 Qualification test pieces

4.4 Execution of the Qualification

4.4.1 Technical Justification

4.4.1.1 Pre-trials:
- Essential variables analysis
- Justification of choice of inspection features

4.4.1.2 Post-trials

4.4.2 Assessment of Technical Justification and procedure

APPENDIX 2 continued

4.4.3 Non-blind practical trials for equipment/inspection procedure

4.4.3.1 Execution

4.4.3.2 Evaluation of obtained results

4.4.4 Blind practical trials for personnel

4.4.4.1 Execution

4.4.4.2 Evaluation of obtained results

4.4.5 Evaluation of test piece trial results and Technical Justification together

5. ISI simulation

5.1 Identification of ISI simulation assemblies

5.2 Certification of ISI simulation assemblies

5.3 Practical trials on the ISI simulation assemblies

5.4 Evaluation of inspection results obtained on ISI assemblies

6. Assessment of the pilot study

6.1 Approach that will be followed for the assessment of the pilot study

6.2 Results

APPENDIX 3

List of pilot study reports

STEPS IN THE PILOT STUDY	REPORT NUMBER OR SECTION	TITLE
1. Objectives	See section 3 in ENIQ.PILOT(95)2	
2. Organisation of the pilot study: different phases	See section 3 in ENIQ.PILOT(95)2	
3. QA programme	ENIQ.PILOT(95)2	QA programme for ENIQ Task 2.2 pilot study
4. Phase 1: Tasks (contents of qualification dossier)		Qualification dossier of the ENIQ pilot study
4.1 Description of the situation for the ENIQ pilot study	ENIQ.PILOT(96)3	
4.1.1 Description of the component to be non-destructively tested	See section 4 of ENIQ.PILOT(96)3	
4.1.2 Description of type and dimension of defects to be detected and sized	See section 5 in ENIQ.PILOT(96)3	
4.1.3 Inspection performance to be achieved (ISI objectives)	See section 7 in ENIQ.PILOT(96)3	
4.1.4 Logic behind choice of inspection performance	See section 8 in ENIQ.PILOT(96)3	
4.1.5 Inspection procedure		
4.1.5.1 Guidelines for the development of an inspection procedure	ENIQ.PILOT(95)1	Guidelines for the development of an inspection procedure
4.1.5.2 Measurements	ENIQ.PILOT(96)4	Measurements in order to define the procedure
4.1.5.3 Detailed Procedure	ENIQ.PILOT(96)5	Inspection procedure for the ENIQ pilot study

APPENDIX 3 continued

STEPS IN THE PILOT STUDY	REPORT NUMBER OR SECTION	TITLE
4.1.6 Description of the equipment	ENIQ.PILOT(96)6	Equipment used for the ENIQ pilot study
4.2. Qualification procedure	ENIQ.PILOT(96)7	Qualification procedure
4.3. Qualification test pieces	ENIQ.PILOT(96)8	Detailed description of the qualification test pieces
4.4 Execution of the Qualification		
4.4.1 Technical Justification		
4.4.1.1 Pre-trials - Essential parameters analysis - Justification of choice of inspection features	ENIQ.PILOT(96)9	Pre-trials Technical Justification
4.4.1.2 Post-trials	ENIQ.PILOT(96)10	Post-trials Technical Justification
4.4.2 Assessment of Technical Justification and procedure	ENIQ.PILOT(96)11	Assessment of Technical Justification and procedure
4.4.3 Non-blind practical trials for equipment/inspection procedure 4.4.3.1 Execution 4.4.3.2 Evaluation of obtained results	ENIQ.PILOT(96)12	Results of non-blind practical trials of the pilot study
4.4.4 Blind practical trials for personnel 4.4.4.1 Execution 4.4.4.2 Evaluation of obtained results	ENIQ.PILOT(96)13	Results of blind practical trials of the pilot study
4.4.5 Evaluation of test piece trial results and Technical Justification together	ENIQ.PILOT(96)14	Results of the qualification part of the pilot study

APPENDIX 3 continued

5. ISI SIMULATION		
5.1 Identification of ISI simulation assemblies	ENIQ.PILOT(96)15	Description of ISI assemblies
5.2 Certification of ISI simulation assemblies	ENIQ.PILOT(96)15	Description of ISI assemblies
5.3 Practical trials on the ISI simulation assemblies	ENIQ.PILOT(96)16	Pilot study: ISI simulation results
5.4 Evaluation of inspection results obtained on ISI assemblies	ENIQ.PILOT(96)16	Pilot study: ISI simulation results
6. ASSESSMENT OF THE PILOT STUDY		
6.1 Approach that will be followed for the assessment of the pilot study	ENIQ.PILOT(96)17	Pilot study: approach that will be followed for the assessment
6.2 Results	ENIQ.PILOT(96)18	Lessons learned from the ENIQ pilot study

APPENDIX 4

APPROVAL SHEET PILOT STUDY DOCUMENT FOR PROGRAMME MANAGER

TITLE DOCUMENT: *[title document]*

DOCUMENT NUMBER: *[document number]*

This document was distributed for comments on *[date]*:

signature of Programme Manager: *[signature]*

This document was approved on *[date]* at the meeting of the *[group]*:
or
This document was approved following the written procedure on *[date]*:

signature of Programme Manager: *[signature]*

Final version of this document has been issued on *[date]*:

signature of Programme Manager: *[signature]*

APPENDIX 5

APPROVAL SHEET PILOT STUDY DOCUMENT FOR ENIQ MEMBERS

TITLE DOCUMENT: *[title document]*

DOCUMENT NUMBER: *[document number]*

I approve this document for publication as an official ENIQ pilot study report (indicate as appropriate):

- yes •
- no •
- yes with the following comments •

Note that if you do not send back this approval sheet before the date given hereunder, this implies approval of the document.

Comments (add sheets if necessary):
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Name:……………………………………………………
Company:………………………………………………
Address:…………………………………………………
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Phone:……………………………………………………
Fax:………………………………………………………

Date:……………………………………………………

Signature:………………………………………………..

To be returned before *[date]* to:
P. Lemaitre
JRC Petten
P. O. Box 2
Nl-1755 ZG Petten
The Netherlands

Phone: + 31 22456 5420
Fax: + 31 22456 1568

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JRC Petten
Institute for Advanced Materials
P.O. Box 2
NL – 1755 ZG Petten
The Netherlands

ABSTRACT

One of the major achievements of the European Network for Inspection Qualification (ENIQ), composed of European nuclear plant operators, service vendors, qualification bodies and manufacturers, was the approval of the European methodology for qualification of non-destructive tests.

The first issue of this document was published in March 1995 and the second issue was published in February 1997. The ENIQ European methodology document describes inspection qualification as the sum of the following items: practical assessment (blind or non-blind) – conducted on simplified or representative test pieces resembling the component to be inspected and technical justification, which involves assembling all evidence on the effectiveness of the test, including previous experience of its application – experimental studies, mathematical modelling, physical reasoning (qualitative assessment) and so on.

In the European methodology, only general principles are provided on how to do inspection qualification. It does not contain detailed guidelines of how to do inspection qualification for a specific component. That is why, within the framework of ENIQ, it was decided to conduct a pilot study in order to explore ways of how to apply the European methodology allowing at the same time to test its feasibility for implementation.

In this document, the quality assurance programme, which was used for the ENIQ pilot study on wrought stainless steel welds, is described.