PBM2 Appendix 1 Process Description

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0 Introduction

PBM 2's main document describes ***What*** is to be done. The process in this appendix describes ***How*** qualification activities are to be performed.

The process has been divided into six main parts, as found in sections 1-6 of this document. Also see the overview of the process in figure 1 and section 7.

The activities included in the main group ”Qualify NDE System” (section 3) are not described in this document. For description of these activities, the SQC document “Qualify NDE System” is referred to, [3]. SQC is responsible for ensuring that the document reflects the current requirements on qualification. Alterations are communicated via THAG ÅK and the current edition shall be accessible on SQC’s website.

Note that this is the generally preferred order of the work flow. Certain activities may be performed in parallel or in a different order. This is, for example, decided by the scope and schedule of the qualification.

Deviations in the order of the work flow should, in advance, be agreed between the parties involved.

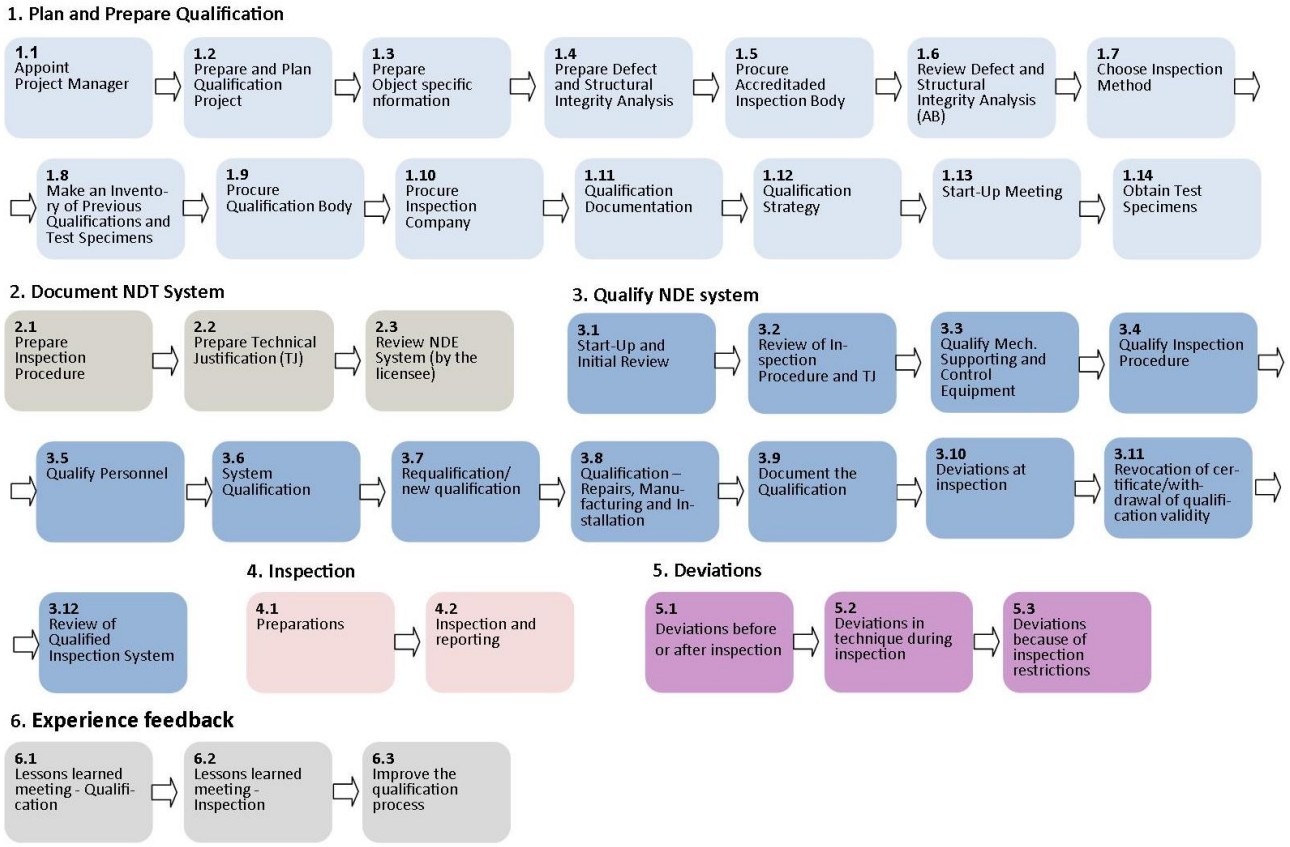

Figure 1 Overview of the process chart

1 Plan and Prepare Qualification

The licensee is generally responsible for planning and preparing qualifications.

1.1 Appoint the Licensee´s Project Manager

The licensee appoints a project manager, who must have the adequate education and training, experience and competence for this task. The project manager must also be assigned the required personnel resources and other aids, to be able to perform the qualification project successfully.

The project manager has the technical and financial responsibility, and is also responsible for the qualification project's quality (safety, environment and finances). The project manager should have fundamental knowledge of the inspection technique to be qualified. This includes responsibility for planning and controlling the qualification project's resources.

The project manager shall continuously keep the parties involved informed of the progress of the work and ensure that all decisions taken are documented. The project manager shall also ensure that necessary decisions are made. All changes in the qualification project and other significant events must be documented. The project manager shall agree in writing any changes in the project's scope with all the parties concerned, and document them in a clear manner.

1.2 Prepare and Plan Qualification Project

1.2.1 Qualification data

Before a qualification project commences, the project manager must make sure that all input data and information required to start the project is available. The project manager must also ensure that the input data is quality assured.

Preparing a qualification project also involves producing object-specific information, necessary inspection requirements, time schedules and procurement documents for the qualification project. It is very important to have well defined inspection requirements, since these will be the basis on which further work is governed.

1.2.2 Plan qualification

We know from experience that for major inspection projects that there must be at least two years available from project start to inspection in order to complete a qualification.

Generally, realistic detailed planning cannot be done until the licensee has ordered the accredited laboratory (AL). It is important, however, that the licensee as soon as possible forms an idea of the probable time required to complete a qualification project. Planning must be done before the qualification project begins and must be continuously reviewed by follow-up thereafter.

While work is in progress, the project manager must stay informed about the progress of the work and any problems that arise that will require a special effort to find a solution.

With major qualification projects, it is often an advantage to divide them into sub-projects. It is important that sub-projects are well defined and limited and that interfaces with other sub-projects are clear.

1.2.3 Prepare a project description

A qualification project can have a project description produced by the project manager. The description shall include the information required to be able to perform the qualification project. Material produced during the preparation becomes the input data for the project. The project description shall also include a resource plan, which forms the basis for allocating resources to the project.

The project description is produced in order to clarify roles, quality-assure and clarify the need for resources.

1.2.4 Follow-up

There shall be routines for following up finances, techniques, time and quality. Follow-up shall be performed regularly, and reviewed in relation to the plans for the project. All deviations from these plans shall be followed up and corrective measures taken. The project manager shall document all important events in the project.

Financial divergences shall be analysed and if possible rectified, as well as reported to those concerned.

1.2.5 Meetings

Meetings have many purposes, which fall into three main groups: information, planning and decision-making. The person who calls a meeting shall clarify its purpose in advance. All meetings shall have an agenda, even though this may be very simple in many cases.

Minutes shall be kept of all meetings. In major projects, meetings shall follow pre-set formalities for calling, presentation lists, minutes, adjustment of minutes etc. Minutes shall be written and distributed quickly. For each item that is not settled, the minutes shall state who is working on the question and when concrete results shall be reported. Generally, the project manager summons the meeting and is the chairman.

There shall be a routine for how the specific qualification project is to be continuously reported and with what frequency. It may be an advantage to specify which routine that will apply for fixed meeting dates during the course of the project. Reporting should include a list showing the status of all relevant documents.

1.3 Prepare Object-Specific Information

Basic information from manufacturing documentation and a number of different items of object-specific information need to be identified for the production of different qualification documents, such as:

- Damage tolerance analysis
- Defect and structural integrity analysis
- Procurement documentation
- Qualification documentation
- Test specimen specifications.

Collecting object-specific information often requires access to areas that are only accessible during maintenance outages.

Appropriate parts of the following information from manufacturing documentation should be included:

- Identity number of the inspection object in question
- Drawings of the inspection object
- Welding instructions that state welding procedure, i.e. WPS
- Documents stating if and how heat treatment was performed
- Description of the surface (surface finish and surface undulations)
- Material certificate of materials included in the inspection object
- NDE records from prefabrication, assembly and in-service inspection
- Documented repairs and processing
- Documented deviations regarding dimensions, material thickness, internal and external geometrical variations, surface conditions
- Inspection conditions
- Ferrite content of austenitic castings.

Appropriate parts of the following MTO factors (man, technology, organisation) should be included:

- Ergonomic space for inspection personnel
- Working temperature
- Lighting conditions
- Noise level
- Need for scaffolding
- Surface and general dose rate at the inspection object
- Need for extra protective equipment.

The object description may be prepared as a separate document or be included as part of the defect and structural integrity analysis.

1.4 Prepare Defect and Structural Integrity Analysis

The defect and structural integrity analysis is defined in the PAKT definition list as follows:

"Defect and structural integrity analysis
A systematic analysis based on the component's constructive design, manufacture, installation, operating history and anticipated future operating conditions. The defect and structural integrity analysis identifies probable damage mechanisms and describes anticipated defect types and appropriate inspection areas."

A defect and structural integrity analysis describes critical and acceptable defect sizes and the growth rate of defects under current operating conditions in the environment in question, resulting in the qualification defect size. Calculations are made for pre-determined defect orientation according to adopted standards and calculation methods.

A defect and structural integrity analysis describes what defect types may exist in the component(s) for which the qualification in question will apply. The defect description includes all defect types that may reasonably exist in the component and that need to be assessed. The following information is required for the defects to be included in the qualification, with respect to position, orientation and properties.

- Defect types
- Defect location
- Defect orientation
- Tilt and skew of the defects
- Defect morphology (fine/rough surface, possible branching, defect width)
- Defect sizes of longitudinal and transverse defects with respect to height (depth) and length (acceptable defect size, qualification defect and detection target which shall be possible to detect, characterize and where applicable, sized).

The defect and structural integrity analysis also states the inspection volume.

1.5 Procure Accredited Inspection Body

The procurement of an accredited inspection body shall be done in accordance with the licensee's normal procurement procedures and in good time. If a review of the defect and structural integrity analysis is included in the procurement, an agreed schedule including follow-up shall be produced.

1.6 Review of Defect and Structural Integrity Analysis (AB)

The defect and structural integrity analysis shall be reviewed by an accredited inspection body (AB) in accordance with their technical instructions.

A certificate of the review is issued by AB.

1.7 Choose Inspection Method

Based on the object description and defect and structural integrity analysis, the licensee can propose a preliminary inspection method. The choice of the inspection method is dependent on defect types, inspection volume, location and accessibility of the inspection area etc. The final choice of inspection method is made in connection with the procurement of an inspection laboratory.

1.8 Make an Inventory of Previous Qualifications and Test Specimens

The licensee should investigate whether any previous qualifications and/or test specimens exist that can be used for the object in question.

As an aid at the inventory, SQC's databases for qualification certificates and test specimens can for instance be used. These are available on SQC's website.

When making an inventory of previous qualifications, the following qualification alternatives should be considered:

- New qualification
- Combination of existing and new qualification
- Extension of existing qualification.

A new qualification means that the inspection object's material, geometry, defects etc. differ to such an extent in relation to what has previously been qualified that the inspection system cannot be technically justified on the basis of previously performed qualifications.

A combination of an existing and a new qualification means that an existing qualification can be used, but the new inspection system cannot be fully technically justified and needs to be supplemented in other respects.

Extension of an existing qualification can be performed when required changes can be technically justified.

1.9 Procure Qualification Body

Procurement of a qualification body (QB) shall take place in accordance with the licensee’s regular procurement procedures and be done in good time. The preliminary scope and time schedule shall be included in the procurement.

QB shall appoint a qualification manager for each qualification task. This person will have full responsibility for the qualification on QB's behalf, with regard to technical content, planning and finances, and will be the licensee´s main contact.

1.10 Procure Inspection Laboratory

The procurement of an inspection laboratory (accredited laboratory, AL) must begin in good time. For complicated assignments, the procurement shall be completed about two years before the planned inspection.

The inspection scope must be well defined and precisely described in detail in the request for quotation, so that the inspection company is able to understand the inspection scope and present a relevant quotation. The request shall also state how the quotation is to be structured so that it can be evaluated by the client.

Before or in connection with the licensee's preparation of the request for quotation to AL, QB can assist with technical support and advice on the licensee's request.

It is important that all requirements and conditions are described in the request for quotation, so that prospective suppliers know what is needed to submit a quotation. Hence, the request for quotation should for instance include the following information:

- Object description.
- Defect description.
- Detection target/qualification defect.
- Tolerances for sizing.
- Special requirements on inspection technique (characterization, positioning etc.).
- Special requirements on inspection equipment.
- Requirements on qualification strategy.
- Inspection scope.
- Available test specimens.
- MTO aspects.
- Requirements on frequency of meetings and locations.
- Requirements on the extent of shift work/working hours.
- Frequency and routines for reporting of inspection results.

- Requirements on accreditation, certification and third-party status.
- Requirements on quality and environmental plan.
- AL’s prerequisites, i.e. transports, office areas, lifting operations, decontamination, impact on other work etc.
- Requirements for materials used in inspection equipment (normally according to TBM).
- Requirements for FME (Foreign Material Exclusion).
- Requirements for export control.
- Requirements for non-disclosure agreements.
- Training of personnel.

In addition to financial terms the quotation should as a minimum also include the following information:

- Description of the inspection system
- Presentation of information and requirements according to the request for quotation
- Qualification strategy (preliminary or final)
- References
- Project organisation
- Time schedule for qualification
- Time schedule for in service inspection including mobilisation, time by the object and demobilisation
- Preliminary estimation of inspection limitations
- Any risks and problems that may arise during the course of the project activities
- Clear presentation of any deviations in relation to the request for quotation.

In other respects, the procurement of an AL shall be performed in accordance with the licensee's general procurement procedures.

QB should review the prerequisites for qualification and the time schedule before the procurement is concluded in order to assess the possibility to perform the qualification in question.

1.11 Qualification Documentation

The qualification documentation is a document in which the licensee summarizes and describes the objectives of the qualification and what requirements QB shall qualify the inspection procedure against. The qualification documentation may also be produced earlier in the process and form the basis of the procurement.

The qualification documentation is generally based on the following factors being determined:

- Type of qualification
- Defect description
- Detection target/qualification defect
- Tolerances for sizing
- Characterisation requirements
- Tolerances for positioning
- Sizing interval
- Inspection method(s)
- Extent of practical demonstrations
- Number and type of test specimens
- Mock-up needs.

The qualification documentation is documented in a report which is reviewed in accordance with standard routines. Documentation and objective can be included as part of the project description.

1.12 Qualification Strategy

A qualification strategy presents how requirements and conditions are fulfilled and shall where applicable include the following information:

- Object description
- Requirements on the inspection system
- Description of the inspection system
- Description of the qualification strategy
- The need of test specimens and mock-up
- Proposal for procedure, personnel and equipment qualification
- Scope of technical justifications.
- Risks.

The qualification strategy is generally produced by AL, but may also be issued by the licensee.

1.13 Start-Up Meeting

Every qualification begins with a start-up meeting at which the prerequisites of the qualification are presented.

The participants are generally the licensee, AL and QB.

The following subjects should be addressed at the meeting:

- Inspection object.
- Qualification documentation.
- Qualification strategy.
- Test specimens.
- Time schedule.
- Risks.
- Project organisation and contacts.
- Experiences from previously performed qualifications and inspections.
- List of documents and routines for revision.
- Handling of non-disclosure information (for example hard drives).

1.14 Obtain Test Specimens

Test specimens are used within the qualification projects to develop technique and procedure, and for practical demonstrations with the aim to supplement and verify standpoints and justifications in the technical justification (TJ).

Open test specimens with known defect content are used for the development and qualification of procedures.

Blind test specimens with classified content are used for qualification of personnel and systems.

1.14.1 Manufacturing and quality assurance of test specimens

Test specimens must be designed to be an adequate simulation of the objects they are intended to simulate, based on the object description. Prior to qualification, the requirements on the test specimen shall be assessed based on the inspection system and the inspection object. Important dimensions shall be checked in consultation with AL and TSM (Test Specimen Manufacturer). Defects in the test specimen shall be based on the defect description.

Defects shall be simulated with the same technique in open as in blind test specimens and in other respects represent an equal inspection challenge.

In order for a defect simulation from a specific test specimen-/defect simulation manufacturer to be considered relevant and approved a comparison shall be made with signal responses from real defects for each specific NDE method/application. The comparison shall normally be performed by QB with a representative NDE technique. Decisive for which parameters and criteria are to be taken into account is the current NDE method the test specimen and defect simulation are to be used for. QB´s instructions contain detailed descriptions of which parameters that are to be considered for each NDE method. In general, specified tolerances for manufacturing regarding length, position, height and width of defects shall be met.

A new simulation technique from a manufacturer is approved by manufacturing a test specimen with defect simulations. The test specimen then undergoes destructive and non-destructive testing and an assessment is made as to whether the simulation technique meets the requirements or not.

Approved simulation techniques and manufacturers of these have been summarized in a defect matrix that also serves as a guide-line during the choice of test specimen manufacturer and the defect simulations which the respective manufacturers have a documented capacity to manufacture. A summary of the investigations and statements which the matrix is based on can be found in report [9].

Existing types of defects that can be simulated:

- Manufacturing defects – lack of fusion, slag, geometrical defects, heat cracks.
- Mechanical fatigue.
- Thermal fatigue.
- Intergranular stress corrosion cracking – IGSCC.
- Interdentritic stress corrosion cracking – IDSCC.

Shortage/failures in already approved suppliers/simulation technique are handled via deviations.

1.14.2 Defect specification and technical justification, test specimens

A defect specification is the drawing that in detail describes the number of defects, defect types, defect sizes, defect placing, coordinate system and simulation technique for a test specimen. A technical justification shall be written for the defect specification.

In the event the qualification includes practical demonstrations, QB is responsible for preparing defect specifications and TJ for blind test specimens intended for qualification of personnel. These documents are classified as secret.

Regarding the open test specimens for the procedure qualification, the licensee is generally responsible for the defect specification and the technical justification, TJ. However, as it is part of the qualification prerequisites, it shall be reviewed and approved by QB.

At the request of the licensee, QB can also prepare defect specifications including associated TJ, for the open test specimens.

A Technical Justification for a test specimen shall include:

- Description of the inspection object.
- A defect description (from defect and structural integrity analysis).
  - Defect types and sizes included in the qualification.
  - Defect orientations of the damage mechanism; tilt and skew.
  - Length and height of the detection target.
- Inspection requirements (for example inspection volume, interval for sizing etc.).
- Any inspection restrictions relevant to the design of the test specimen.
- Description of the design of the test specimen.
- Description of the inspection technique.
- Coordinate system.
- Justification of chosen defect simulation.
- Justification of chosen defects.

1.14.3 Design and quality assurance of test specimens

Manufacturers of test specimens must be assessed and approved by the licensee (audit). They must have a documented capacity to manufacture the types of simulations required to represent real defects. Test specimen manufacturers (TSM) shall work according to a quality assurance system which meets the requirements given in EN ISO 9001 or corresponding. Approved manufacturers are represented in the Defect Matrix; see report as per reference [9]. Manufacturing shall take place in accordance with a detailed manufacture and inspection plan which has been reviewed and approved by the licensee and QB.

The inspection plan should, were applicable, refer to inspection designations in KBM [10].

The plan shall as a minimum include the following information:

- Participants at inspection designations (TSM, the Licensee, QB, AL).
- Quality control of the material included (IP-200).
- Welding and manufacturing procedure/-s which to the extent possible shall be identical to the ones used for the intended inspection object (IP-100).
- Welding inspection (EP 3-12).
- Inspection of heat treatment (EP 3-10).
- Inspection during and after manufacturing of defects (EP 3-12).
- Surface inspection (EP 3-16, alt. EP3-18).
- Visual and dimension inspection (EP 3-13).
- Marking and identification (EP 6-09).
- Inspection of packing and preservation (EP 435).
- Review of final quality control documentation before delivery (EP 190).
- Receiving inspection and fingerprint (performed by QB according to separate internal instruction).

Persons that perform non-destructive testing according to above-mentioned inspection plans shall at least have competence according to ISO-EN 9712 or equivalent for the used inspection method.

Companies that perform other inspection activities such as visual and dimension inspection, pressure tests etc. at manufacturing shall have the necessary technical resources and personnel with the necessary education, practice, experience and technical knowledge for the tasks in question.

When the test specimen is ready for delivery, a receiving inspection shall be performed to ensure that specified dimensions, documentation, markings etc. have been fulfilled. Receiving inspection according to inspection plan is first performed by TSM and then by the licensee together with QB for open test specimens. Receiving inspection of blind test specimens is performed by QB, but if permitted by the confidentiality requirements, the licensee can participate.

The receiving inspection can be performed either at the manufacturer before the delivery or at the recipient (QB, the licensee, AL or at the storage for test specimens).

The licensee shall perform an audit of manufacturers of test specimens to an adequate extent. QB shall be informed about such audits and be offered to take part.

Deviations during manufacturing shall be reported by TSM to the licensee that forwards to QB for assessment. The assessment shall include the specific qualification purpose as well as the approval of TSM´s simulation technique according to [9].

Manufacturers must have an approved non-disclosure agreement. Other organisations connected with test specimens (the licensee, AL and QB) must have a quality assurance system which ensures that classified information is handled accordingly and that confidential relations with personnel in these organisations are established to the adequate extent.

1.14.4 Fingerprint

A fingerprint (FP) must generally be performed for every manufactured test specimen, to ensure the quality of the test specimen. The fingerprint is intended as an assessment of whether the test specimen's defect simulation fulfils the defect specification. The fingerprint is the quality assurance of the test specimen before procedure and personnel qualifications. The FP is also intended as an assessment of the relevance in signal responses from defect simulations versus the defect types they are intended to represent. This entails that FP should be performed by the use of the NDE method intended for the qualification and inspection of the inspection object in question.

FP should to the extent possible use the intended inspection technique.

FP for test specimens is normally performed by QB. FP for blind test specimens shall be performed in such a way that the secrecy concerning blind test specimens can be guaranteed.

For noted deviations, QB makes an assessment whether these can be accepted or not. Small deviations for defect position can normally be accepted. Incorrect placement in relation to weld or similar are not normally accepted.

If there are incorrect defects or satellite defects and unplanned defects, the test specimen might not be approved. QB shall asses if the test specimen despite the errors can fulfill the intended purpose and then make a clear statement. However, test specimens might be useful to a limited extent or after repair. The result of QB's assessment should be registered in a revised as-built drawing.

QB's final assessment and approval of the test specimen is an overall assessment of delivery check and fingerprint.

When using existing test specimens, not originally manufactured for the specific qualification project, the test specimen shall be technically justified and be approved by QB for the new object.

Old fingerprint reports shall be reviewed thoroughly before use of the test specimens. It should be verified that open and blind test specimens correspond. If fingerprint reports are missing or are insufficient because of age or other reasons, an assessment shall be made whether a new fingerprint is needed. This shall be accounted for in the technical justification for the test specimen.

The test specimen shall be finally assessed and approved before it is used in a qualification.

QB shall archive documentation of test specimens in information and quality assured manners.

2 Document NDE System

Generally, the appointed accredited laboratory is responsible for ensuring that the activities in section 2 are performed in the way, and with the quality specified in the procurement documentation.

The NDE system includes procedure, personnel and inspection equipment.

In order to be able to *prepare an inspection procedure and document an NDE system*, the following conditions must be in place:

- Anticipated defects shall be identified
- An overall concept of how inspection is to be performed shall be agreed with the client (the licensee)
- Information about the inspection area's geometry, material and other component information necessary for the inspection
- MTO information that may affect the inspection result shall be identified.

2.1 Prepare Inspection Procedure

The inspection procedure is prepared by the appointed accredited laboratory (AL) and should generally comply with ENIQ Recommended Practice 12 ”Strategy and Recommended Contents for Inspection Procedures” [6].

It is important to remember that an inspection procedure is an instruction for inspection personnel how to perform an inspection. This must therefore be taken into consideration when preparing the procedure. The inspection procedure shall be unambiguous and systematically designed to ensure that the result is reproduced irrespective of which operator that is using it. Parameters included shall be stated with tolerances or ranges.

A procedure shall as a minimum include the following information:

- Inspection object and scope.
- Defect types.
- References, such as TJ and equipment manuals.
- Certification and qualification requirements for personnel.
- Equipment description.
- Calibration and verification description.
- Description of data acquisition.
- Description of evaluation.
- Reporting requirements.
- Description of what the inspection protocol shall contain.

The information given in the inspection procedure must be justified, which is done in a technical justification.

2.2 Prepare Technical Justification (TJ)

The technical justification (TJ) refers to information that is reported in order to verify and justify the technical solution chosen to perform the defined inspection assignment.

A technical justification (TJ) shall generally comply with ENIQ Recommended Practice 2 ”Strategy and Recommended Contents for a Technical Justification” [6].

The TJ shall include information about the component to be inspected as well as information about the inspection technique/procedure including the manipulator. In the former, this may refer to geometry, material, operating conditions and etc., and in the latter this may refer to technical inspection details, important/essential variables, inspection tolerances etc.

The TJ must include a measurement uncertainty analysis. As a tool, the software UINDT may for instance be used.

An example of a TJ is given in Enhagen 1 [8].

A TJ may consist of many different kinds of information, such as references to and quotations from the open literature, derivation of physical phenomena, mathematical modelling, results of experiments and analyses and reports of trials performed specifically for the inspection procedure in question.

TJ for inspection system and manipulator should be issued separately from the TJ for the rest of the NDE system.

2.3 Review NDE System (by the licensee)

The licensee shall thoroughly review the inspection procedure and the TJ in accordance with the following points:

– Is the inspection procedure unambiguous and systematically designed and does it contain the information required to perform and document the inspection correctly?

– Does the TJ contain the information required and is the information described to an adequate extent?

– Does the inspection procedure and the TJ meet the requirements and are they considered approved for being submitted to QB for review?

It is advisable for AL and the licensee to perform a final check of the inspection procedure, for instance by means of a Procedure Acceptance Test (PAT), in order to ensure the quality before the qualification.

PAT is to be performed in accordance with a predetermined programme. The results of the PAT must be documented.

Inspection system and manipulator shall generally be demonstrated to the licensee in a Factory Acceptance Test (FAT). This is generally performed in connection with equipment qualification, see section 3. FAT programmes are issued by AL. A FAT includes for instance demonstration of safety functions, FME-requirements and other requirements from the licensee not included in the equipment qualification.

3 Qualify NDE System

Qualification of NDE systems is not described in this document. A description of these activities is found in the SQC document ”Qualify NDE system” [3]. SQC is responsible for ensuring that the document reflects valid requirement for qualification. Alterations are to be communicated via THAG ÅK and the valid edition shall be accessible on SQC’s website.

4 Inspection with a Qualified Inspection System

After approved qualification inspections are carried out at the power plants. The inspection can be done directly after a specific qualification or according to a previously qualified/general procedure.

4.1 Preparations

Before the inspection, the following information must be checked/reported:

- That the scope of the inspection is stated in the procedure or other documentation
- Drawings of inspection objects (if not described in procedure)
- Experiences from previous inspections.
- Certificates for accreditation and third-party status
- Certificates for personnel, ISO 9712
- Qualification certificates for procedure
- Qualification certificates for equipment
- Qualification certificates for personnel
- Training of personnel.

4.2 Inspection and Reporting

Inspection is carried out according to procedure and with scope according to inspection program.

If deviations occur during inspection, this must immediately be reported to the licensee´s management/project manager.

After the inspection is finished and evaluated, the result is reported when the inspection protocols are handed to the licensee.

What the protocol shall contain is described in the procedure.

4.2.1 Reporting of defects at inspection with qualified procedure

Defects must be reported showing the greatest value for height and length. The defect can then be contained within a rectangle.

The circumscribed rectangle represents the size of the defect; see figure 2.

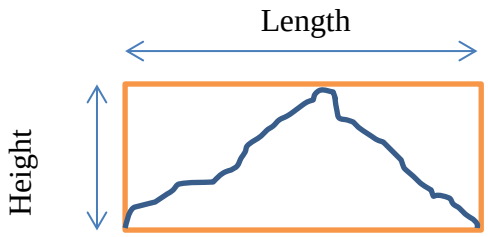

Figure 2 Size of defect

If one of the defect's measured dimensions (length or height) is less than the detection target, this measurement must be reported as "less than detection target".

If one of the defect's measured dimensions (length or height) is greater than the detection target, the actual measurement and the measurement tolerance must be reported.

5 Deviations

Deviations during the qualification process (including inspection) are divided into three categories:

– Deviations before or after the inspection.
– Deviations in technique during inspection.
– Deviations because of inspection restrictions

It is for all deviations important that customers and other parties concerned immediately are informed that the deviation has occurred.

5.1 Deviations before or after the Inspection

Deviations during the qualification process, before or after the inspection, are handled within the quality system of the organisation where the deviation occurs. Generally a deviation report is prepared.

The deviation report can for example contain:

– Type of deviation
– Cause of deviation
– Immediate corrective action and motive for action
– Measure to prevent recurrence of deviation
– Final assessment.

The customer shall be informed of the content and the proposed action.

A meeting can be held to discuss the deviation before the action. The organisation where the deviation has occurred is responsible for summoning of the meeting.

5.2 Deviations in Technique During Inspection

In the event of deviations in technique (procedure, personnel and equipment) during inspection, AL submits a deviation report to the licensee for review and further handling. The deviation report shall as a minimum include the following:

– Object
– Procedure
– Type of deviation
– Cause of deviation
– Immediate corrective action and motive for action
– Measure to prevent recurrence of deviation
– Final assessment.

The deviation report is reported by the licensee to QB for assessment if the inspection performed still may be considered adequate or whether supplementary qualification with respect to procedure, personnel and equipment is required.

AB shall make sure that the deviation has been reviewed by QB before the Certificate of Conformity is issued ("IOÖ").

If the deviation in technique is not accepted by QB, i.e. the inspection performed is not considered adequate, the deviation might have to be handled as a scope deviation by AB or as an exemption by the Swedish Radiation Safety Authority (SSM).

Deviations at inspections with general/common procedures, QB shall assess if the deviation can affect inspections at other licensees. If this is the case, QB shall inform all licensees and AL, which uses the general/common procedure, about the implication of the deviation.

5.3 Deviations because of Inspection Restrictions

In the event of inspection restrictions which are not already described in the procedure or inspection plan, AL shall submit a deviation report to the licensee for review and further handling. The deviation report shall as a minimum include the following:

- Object
- Procedure
- Cause of inspection restrictions
- Extent of inspection restrictions

The deviation including measures is reported by the licensee to AB for review and assessment.

6 Experience Feedback

6.1 Lessons Learned Meeting - Qualification

Addressing experience from qualification activities is an effective way of improving the qualification process. Every qualification brings valuable new experiences. Once a qualification project has been completed, the project manager (from the licensee) invites to a lessons learn meeting where results, experiences gained, and opinions from the parties involved are discussed. All the parties involved, i.e. the licensee, AL and QB, should participate in this meeting.

The lessons learned meeting after qualification should, to make sure that all experiences are observed, if possible be held as soon as the qualification is finished.

All the main stages included in the qualification in question shall be discussed at the meeting. Proposal for the agenda;

- Qualification documents from the licensee
- AL qualification strategy
- Test specimens
- The licensee’s review of Procedure and TJ (incl. PAT)
- QB’s review of Procedure and TJ
- Procedure qualification
- Equipment qualification and FAT
- Personnel qualification
- QB’s final documentation

With respect to the above-mentioned main stages as per the agenda, the following points should, where applicable, be taken into consideration;

- Was the stage performed as planned or not?
- Did the produced documentation have the expected quality?
- Was the agreed time schedule complied with?
- Were the personnel sufficiently trained and prepared.

Any deviations shall be accounted for and, if possible, proposals for measures to be taken shall be given.

Opinions and experiences presented are documented in writing and distributed to the parties concerned. The parties involved are each responsible for making use of gained experiences within their own organisations.

6.2 Lessons Learned Meeting – Inspection

Addressing experiences from inspections are an effective way of getting continuous improvement. Every inspection brings valuable new experiences. After the inspection is completed, the project manager (from the licensee) invites the parties concerned to a lessons learned meeting at which results, experiences gained, and opinions from the parties involved are discussed. All the parties involved, i.e. the licensee, AL and QB, should participate in this meeting. QB participates at the meeting if questions regarding the qualification have been raised during the inspection.

All the main stages included in the inspection in question shall be discussed at the meeting. Proposal for the agenda;

- The licensee´s documentation for inspection
- Training of personnel
- Prerequisites, scaffolding, space etc.
- Did the documentation comply with the reality
- Inspection equipment
- Time schedules
- Inspection
- Results/reporting
- Deviations
- Decontamination/transports
- Miscellaneous

With respect to the above-mentioned main stages as per the agenda, the following points should, where applicable, be taken into consideration;

- Was the stage performed as planned or not?
- Did the produced documentation have the expected quality?
- Was the agreed time schedule complied with?

6.3 Improve the Qualification Process

In order to improve the process, experiences gained must be continuously documented and distributed to those concerned by the qualification activities.

It is an important task of a forum such as THAG-ÅK to follow up on and inform about experiences gained.

It is therefore the responsibility of the members of THAG-ÅK, by means of various activities, to ensure that experiences gained become known and implemented. This can be done in general such as by presentations at conferences, and also more directly, such as in FOP - nuclear power (Swedish domestic association – “Föreningen Oförstörande Provning).

7 Process Description – Flow chart