ENIQ position on

Guidance on the Specification of Input Parameters to Inspection and Inspection Qualification Requirements

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Peter Kelsey (retired, formerly Rolls Royce)
Tommy Zetterwall (Swedish Qualification Centre)
Etienne Martin (EDF)
Patrice Jardet (EDF)
Russ Booler (AMEC Foster Wheeler)

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NUGENIA Association
c/o EDF, avenue des Arts, 53
B - 1000 Bruxelles
Belgium

For more information please contact the NUGENIA Secretariat:
secretariat@nugenia.org

POSITION PAPER

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1. Scope

The document provides guidance on the specification of input parameters for the inspection and inspection qualification process. The guidance, which is independent of inspection technique, describes what input information is required and provides a recommended format for its presentation. Whilst the document provides some general guidance on how to generate this information, the detailed approach, such as how to determine the qualification defect size from fracture mechanics, is outside of the scope.

In order to create good input information for the inspection vendor and the qualification body, reliable data about the test object is required. These data are called input parameters and comprise basic information such as the characteristics of the defects to be detected and sized, as well as a series of object-specific details and working environment factors which together make up the object description. The generation of this information requires the co-operation of a wide range technical disciplines.

It is the licensee's responsibility to ensure that the necessary input parameters are produced. In order to facilitate the production of inspection objectives, information can be summarized in an inspection datasheet such as that shown in Appendix 1.

It is recommended that the licensee provides the input parameter datasheet for comment by the qualification body (QB) and any other relevant involved parties, to get consensus that the requirements are properly described.

2. Contents of Input Parameter Specification

The following section provides guidance for the minimum content for the minimum input parameters.

In defining the content and format of an input parameter datasheet, there are a number of key points that need to be covered:

- Objectives of the inspection and inspection qualification.
- A full description of the component to be inspected including material, surface finish and access.
- Type, dimension, orientation, morphology and location of defects to be detected and/or sized, depending on the defect situation considered.
- The inspection performance (detection, characterization, sizing and location) to be achieved.
- If applicable, the acceptance and rejection criteria for any detected defect criteria.
- The qualification level required (if concept is used).
- NDT procedure, equipment and personnel requirements.
- Environmental consideration if applicable.

Two very useful references are openly available that provide detailed information of different flaw types:

1. Wåle J., Crack characterisation for in-service inspection planning – An Update, SKI Report 2006:24
2. F. Michel et al., Compilation of current active or potential Damage Mechanisms in European Light-Water Reactor Power Plant Components, Report of the FP5 project Nuclear Risk-Based Inspection Methodology for passive components (NURBIM), Contract no. FIKS-CT-2001-00172, 2004.

APPENDIX A: RECOMMENDED FORMAT FOR PRESENTING INPUT INFORMATION

Unique identifier - *Each Input Parameter Datasheet should be given a unique identifier taken from a recognised reference*
Name of component: *This should be unambiguous and be self-explanatory – nozzle attachment weld, thermal shield support ledge, system identification etc.*
Input Parameter Data Sheet

Scope	*The full range of component geometries, dimensions and materials to which the Input Parameter Data Sheet applies*	**Type**	*Fabrication or ISI*
Inspection Code	*e.g. ASME Section XI (if relevant)*	**Safety Class**	*e.g. SC1 (if relevant)*

Component Material and Geometry	
Manufacturing Details:	*Relevant details of manufacturing process*
Appropriate Drawings:	*A list of the drawings and information that indicate the geometry, materials and fabrication process of the component that is relevant to inspection. This information should also provide a clear indication of the space envelopes available around the inspection area for access – this is particularly important for ISI.*
Parent Material:	*Include the general material type (e.g. carbon steel) and specification and the product form, forged cast etc. The grain size should also be specified where relevant (e.g. ultrasonic inspection).*
Welding process, procedure and material:	*Describe the relevant features of the weld and note that this is particular important for welds with large grains such as stainless steel and Inconel welds. In such cases it is helpful to provide a through section macrograph.*
Buttering/Cladding Material:	*If relevant. The manufacturing process of any buttering or cladding can have a significant effect on the inspection performance. It is helpful to provide a through section macrograph.*
Weld Crown Configuration:	*Machined flush, as welded, hand ground etc.*
Surface form and Roughness:	*The surface morphology of the inspection surface can have a significant influence on achievable inspection performance. Ideally quantitative statements should be given (e.g. 3.2μm Ra for a good machined surface finish) and an indication as to how the final surface was fabricated (i.e. machined, hand ground, as-welded etc.*
Access condition	*e.g. Access from scaffolding outside of biological shield*

Historical information	*e.g. Repairs performed during fabrication* *e.g. Reportable indications from previous inspections*

Defect Description			
Nature of Defect		**Tilt**	**Skew**
Brief description of the type and location of the defect (s): buried weld defects, lack of sidewall fusion etc. *- growing from fabrication defect by fatigue (mechanical or thermal)*		*Orientation of defect(s) (with axes clearly defined, e.g. in a drawing) For example:* *i) Longitudinal with the following local deviations:* *tilt up to ±10˚, skew up to ±2°*	
Gape:	*Distance between faces of defect e.g. 25 µm (min)*	**Roughness:**	*Roughness of defect faces e.g. between 3µm and 20µm*
Inspection Volume:	*In addition to a description of the inspection volume include a reference to a drawing.*		
Qualification defect Size	*This is the target defect size for the inspection defect for which the inspection must many cases the qualification defect size, depth, length and width, will be defined via a structural analysis and fracture mechanic calculation. For instance, crack width is important for visual inspection techniques.* *It can be done for respectively object and situation or values can be taken from a Code and Standard E.g. i) a=10mm, L=20mm (with a and L defined in a drawing)*		
Sizing accuracy:	*E.g. ±5mm in the through-wall direction and ±10mm in the circumferential direction. (ability to resolve defects may also need to be specified).*		
Locational accuracy:	*E.g. Through-wall position to be measured to an accuracy of ±5mm* *Axial position to be measured to an accuracy of ±5mm* *Circumferential position to be measured to an accuracy of ±5mm*		
Performance Requirements:	*This describes the detection performance (usually described in qualitative terms) and evaluation performance that the inspection must achieve and be qualified against. E.g. Highly reliable detection and rejection of planar flaws at, or larger than, the Qualification Defect Size. Planar defects to be located in sized within the tolerances set by this*		
Notes:	*Include here any additional relevant information that may be important to the inspection design and qualification such as known weld repairs etc.*		

Authorised for Issue - Licensee	*Signature and date:*
Endorsed by – Qualification Body	*If relevant.*