

Guiding Principles for the contents of Particular Materials Appraisals

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Introduction

A *Particular Material Appraisal* (PMA) is the process by which the pressure equipment manufacturer ensures that each proposed material that is not in a harmonised standard or covered by a European Approval for Materials (EAM) conforms to the applicable Essential Safety Requirements (ESR) for materials. Particular material appraisals are part of the “records and correspondence relating to conformity assessment” referred to in Article 10 (4) and therefore subject to the requirements, which include the preparation of appropriate documentation.

As required by the Pressure Equipment Directive 97/23/EC (PED) Annex I section 4.2, the pressure equipment manufacturer is responsible for preparing documentation for materials to be used for pressure equipment in categories I to IV. For pressure equipment in categories III and IV this documentation is submitted to the Notified Body in charge of the conformity assessment for the equipment so they can perform an appraisal of the particular material with regard to the pressure equipment, the intended use and applicable design rules.

This documentation shall describe the material properties in a manner that is concise, complete and correct. In general, rules for calculation, design and manufacture relating to the specific material should be considered in the PMA.

Decisions made concerning a specific material for use in a specific sets of conditions, do not need to be repeated. However, manufacturers and where applicable notified bodies must ensure the PMA is suitable for its application and that this is recorded in the technical documentation.

Pressure equipment manufacturers may utilise PMAs prepared and supplied by another manufacturer, e.g. the manufacturer of an assembly, on condition that the PMA is reviewed and adopted by the PE manufacturer and where applicable the NB in charge of the conformity assessment procedure, to ensure accuracy of the document and suitability for the application.

1. Language

No specific requirements, however generally in the same language as the technical documentation.

2. Numbering

No specific requirements however shall be traceable to the application and material specification.

3. Naming

It is not mandatory to provide a material name, however the identification of the material shall be given.

4. Origin

The material specification shall be indicated with its date. Where this is a publicly available specification the actual data need not be included in the text of the PMA. However, supplements to or deviations from these specifications shall be stated. PMAs related to publicly available specifications are only valid for the particular dated version. If the basic specification is not publicly available, it shall be attached to the PMA.

5. Scope of PMA

The document shall describe the proposed application and range of conditions that are applicable; these must be supported by assured properties in the material specification.

6. Recognized safe use (applies only where a history of safe use is claimed)

In the case of materials recognised as being safe to use before 29 November 1999, the manufacturer and/or the notified body shall take account of the existing data when certifying such conformity.

7. Contents of PMA

This will comprise qualitative and quantitative data.

Qualitative data includes delivery conditions, and where applicable, heat treatment requirements, and information on further processing and weldability. Quantitative data will comprise mechanical data, creep resistance etc. where this differs from or supplements that in the specification adopted.

The material grouping in accordance with CR ISO 15608:2000 is relevant where welding is undertaken.

Evidence shall be provided that the relevant ESRs have been met.

Any restrictions applicable to the use of the material shall be stated, e.g. extent of cold work, special controls for permanent joining, etc.

Note: Although the directive does not require PMAs for welding consumables (See WGP Guideline 7/12), however, it may be appropriate to utilise this form of documentation to demonstrate conformity with the ESR 4.2(a) - (see WGP Guideline 7/10).

8. Structure of document

There is no format specified in the directive, however an example of a suitable layout is given in Appendix 1. The information required may also be given elsewhere in the technical documentation of the pressure equipment.

The document in Appendix 1 addresses the ESRs relating to the material properties. The equipment manufacturer must also address the ESRs relating to material selection. This format could be extended to include documentation of ESRs relating to selection, e.g. PED Annex I – 4.1(b), (d) and (e).

9. Verification testing requirements

In general, testing by the material manufacturer (sampling, frequency of testing, and test method) is to be performed as foreseen in the original specification.

However, the limitations in Appendix 2 apply

10. Certification and marking

The pressure equipment manufacturer is required to obtain certification from the material manufacturer that affirm compliance with “a specification and comply with PED Annex I, 4.3 and relevant guidelines.

11. Information for further processing

See Section 7

Verification testing may be required in cases where the properties of the material have been altered by processing operations performed subsequent to the material manufacturing process. Where required testing shall be performed as specified in the original specification. For example, where plate material is purchased from a material manufacturer and is subsequently cold formed into a dished end, the mechanical properties will be altered. In such cases it may be necessary to “verify” that appropriate properties are still available in the material and continue to meet the applicable ESRs.

12. Availability

PMA's shall be available for national authorities upon request for a period of 10 years after the last pressure equipment has been manufactured.

Contrary to the requirements for EAMs, there is no requirement to make PMA's publicly available.

Appendix 1

Example of a suitable format for documentation of a PMA

Pressure Equipment Manufacturer:		
PMA Ref. No.	Rev.	Material Group Per CR ISO 15608:2000
Material specification including date:	Grade:	Delivery condition:
Application:		
Applicable Design Code:		Dimension range:
Maximum allowable temperature:		Minimum allowable temperature:
Compliance with Essential Safety Requirements for materials (in finished pressure equipment)		
Property	Requirement	Details of Compliance
Appropriate properties (Annex I - 4.1(a)) (Assured by material manufacturer)	Proof strength/Yield strength (at appropriate temperature) UTS Creep data	
Sufficiently ductile (Annex I - 4.1(a)) (Annex I - 7.5)	In steel; A_{\min} 14%	Min specified longitudinal % Min specified transverse %
Sufficiently tough (Annex I - 4.1(a), Annex I - 7.5)	e.g. in steel; KV_{\min} 27J at 20 °C or lowest operating temperature.	
Not significantly affected by ageing	Appropriate selection. Suitable composition (e.g. for non alloy steel $Al/N \geq 2$)	
Test programme	Per Appendix 2	Doc No.
Results of test programme		Test report

The named material specification may be used for the construction of pressure equipment intended for use within the stated limits and subject to the following restrictions:

Restrictions:

Signed:

(Pressure Equipment Manufacturer)

Date:

Confirmed:

Notified Body (Cats III & IV only)

Date:

Appendix 2

Supplementary Testing Requirements

For new materials with limited data or for situations where supplementary requirements have been included in the PMA, the following applies:

A test programme will be developed to produce results, which are of sufficient reliability for the intended use. It is recommended that a notified body is involved with agreeing the test programme and witnessing the resulting testing. EN 764-4 provides guidance on the preparation of test plans. Consideration will be given to the number of samples, the variability of the materials, known facts, which could invalidate the results. E.g. impact properties on high sulphur casts and/or with an adverse Mn:C ratio.

The results obtained shall not be used to justify increases in allowable stress on the basis of individual tensile test values.

In general, testing (sampling, frequency of testing, and test method) is to be performed as foreseen in the original specification.

However,

- the testing methods have to be compatible with the PED requirements. In particular, the test results have to be consistently comparable;
- if a European testing standard (EN or EN ISO) is available, the testing method employed shall be replaced by the tests contained in the respective EN (or EN ISO) unless the testing foreseen in the original specification better reflects the state of the art than the corresponding EN (EN ISO). Examples of such standards are:

EN 10002-1 Tensile testing at room temperature

EN 10002-5 Tensile testing at elevated temperatures

EN 10045-1 Charpy impact test

EN ISO 3651-2 Intergranular corrosion resistance

Depending on product form and type of material, the sampling and frequency of testing shall as a minimum be based on the analogous European standard (EN). e.g.: EN 10028-1 and –7 for flat products, EN 10213-1 for castings, and EN 10222-1 for forgings.