

## Introduction

A *Particular Material Appraisal* (PMA) is the process by which the pressure equipment manufacturer demonstrates that each proposed material that is not referenced in a harmonised standard or covered by a European Approval for Materials (EAM) conforms to the applicable Essential Safety Requirements (ESR). A Particular Material Appraisal is therefore a "description of the solutions adopted to meet the essential requirements of the directive where the standards referred to in Article 5 have not been applied" and forms part of the Technical Documentation for the pressure equipment.

The pressure equipment manufacturer must first select material that is suitable for its intended purpose, e.g. resistance to corrosion, suitable for subsequent manufacturing processes etc: this process is applicable to all materials regardless of whether its source is a harmonised standard, a material issued with an EAM or a material assessed through the PMA route. As the issue of "suitability" material selection is applicable to all sources of material it is not therefore addressed in these guiding principles.

The Particular Material Appraisal therefore is an appraisal of the proposed material for its compliance with the applicable ESRs for the particular conditions under which the equipment is designed to work. This appraisal should result in documentation that describes the material, its properties and compliance with the applicable ESRs in a manner that is concise, complete and correct. Where justifiable the PMA may be applicable over ranges of parameters appropriate to the manufacturer's fabrication scope (e.g. thickness, temperature, etc) providing the assessment is based on the worst case scenario. If the material is intended to be used outside this approved range a new PMA is required, with appropriate justifications.

The pressure equipment manufacturer is responsible for the preparation of the documentation for the PMA and, where appropriate, submits this to the NB for review and approval. The NB is required to be involved with the PMA process where the pressure equipment is being assessed in accordance with modules applicable to categories III & IV. This does not preclude the NB from providing assistance to the manufacturer in the preparation of PMAs to ensure that they are of an appropriate technical quality. In any case the pressure equipment manufacturer is responsible for the PMA documentation.

On completion of the appraisal process the manufacturer may be considered to have demonstrated that the material specification is acceptable for use in the manufacture of pressure equipment within the range stated in the PMA. However, manufacturers and, where applicable, Notified Bodies must ensure that the material is suitable for each application and that this assessment is recorded in the applicable technical documentation.

Although PMAs do not provide a "presumption of conformity", decisions made in the appraisal of a material for use in a specific set of conditions do not need to be repeated. Further appraisals will have to be made if there are any changes in the defined scope e.g.:

- Design Code
- Material product form or delivery condition
- Material specification or grade
- Design temperatures outside the range approved
- Thickness beyond the range approved
- Increased/additional requirements for a specific application

A PMA is the property of the pressure equipment manufacturer. However, in some cases such as assemblies, manufacturers may utilise PMAs prepared and supplied by another manufacturer. In which case the PMA shall be reviewed and adopted by the manufacturer utilising the PMA and, where applicable, the Notified Body in charge of the conformity assessment procedure.

## Guiding Principles for the Contents of Particular Materials Appraisals

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### **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. 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 or limitations applied to these specifications shall be stated. PMAs related to publicly available specifications are only valid for the particular dated version. If the material specification is not publicly available, it shall be attached to the PMA.

### **4. Scope and Contents of PMA**

The document shall describe the scope of the proposed application and acceptable range of use. The content will include both qualitative and quantitative data.

Qualitative data shall address the delivery conditions including, 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 inclusion of material grouping in accordance with the relevant qualification standard may be helpful where welding is undertaken.

Evidence shall be provided that the relevant ESRs will be 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) it may be appropriate to utilise this form of documentation to demonstrate conformity with the ESR 4.2(a) - (see WGP Guideline 7/10).

### **5. Structure of the Document**

A recommended format for a PMA is given in Appendix 1.

### **6. Testing Requirements**

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

The PMA may include requirements for verification testing, for example in cases where the properties of the material could be altered by processing operations subsequent to the material manufacturing process, shall be performed in accordance with the original specification under the responsibility of the pressure equipment manufacturer.

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

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### **7. Certification and Marking**

The pressure equipment manufacturer is required to obtain certification from the material manufacturer that affirms compliance with the material specification. For pressure equipment in categories II, III and IV this must take the form of a certificate of specific product control i.e. Inspection Certificate EN 10204 type 3.1 or type 3.2 (see WGP Guideline 7/5). Marking of the material shall be in accordance with the material specification and shall include at least

- The manufacturer's name or mark
- The material specification and grade
- Identification which permits traceability from the product heat and/or lot to the certification in the case of a certificate of specific product control

### **8. New Materials**

For new materials or materials with limited data a test program shall 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 program prior to production of the material and to witness the acceptance testing. EN 764-4 provides guidance on the preparation of testing programs. Consideration must be given to the number of samples, the variability of the materials and known metallurgical phenomena which could invalidate the results e.g. impact properties on high sulphur casts and/or with an adverse Mn:C ratio. In general, testing (sampling frequency, type of testing and test method) shall be performed as foreseen in an equivalent recognised standard for the same product form.

### **9. Availability**

A PMA forms part of the Technical Documentation and shall be retained for a period of 10 years after the last pressure equipment has been manufactured.

## Recommended Format of a PMA

Pressure Equipment Manufacturer:		
PMA Ref. No.	Rev.	Material Group for Welding
Material specification including date:	Grade:	Delivery condition:
Product Form:	Application:	
Applicable Design Code:	Dimension range:	
Maximum allowable temperature:	Minimum allowable temperature:	
<b>Compliance with Essential Safety Requirements for materials</b>		
Property	Requirement	Details of Compliance * (to be verified on material certification)
Appropriate properties (Annex I - 4.1(a)) (Assured by material manufacturer)	Proof strength/Yield strength (at appropriate temperature) UTS Creep data	<i>Quote <math>R_{e1}</math>; <math>R_{e2}</math>, <math>R_m</math>, <math>R_{m/T}</math> etc from material specification or where appropriate properties are obtained</i>
Sufficiently ductile (Annex I - 4.1(a)) (Annex I - 7.5)	In steel; $A_{min}$ 14%	<i>Quote minimum elongation specified in material specification, <math>A_{min\ long}</math> % <math>A_{min\ trans}</math> %</i>
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.	<i>Quote impact strength and coincident minimum temperature specified in material specification or provide justification per WGP Guideline 7/17</i>
Not significantly affected by ageing (Annex I - 4.1(c))	No specific quantitative requirement specified	<i>a) Select materials that are not liable to (strain) ageing b) confirm that material specification ensures <math>Al:N_2</math> ratio &gt; 2:1 c) confirm plastic deformation not sufficient to cause strain aging.</i>
Suitability for intended processing (Annex I - 4.1(d))	No specific quantitative requirement specified	<i>Manufacturer must select materials that have appropriate properties for the intended manufacturing processes, e.g. for welding (carbon equivalent), forming (ductility), heat treatment (composition, section size, etc).</i>
Material Certification	Cat I - Certificate affirming compliance with the specification. Cat II, III & IV - Certificate of Specific Product Control.	<i>Certification according to EN 10204:2004 Test Report "type 2.2"  Certification according to EN 10204:2004 Inspection Certificate "type 3.1 or "type 3.2"</i>
Material Marking	Traceability to heat/lot identity of the material manufacturer	<i>Method of traceability to the certification supplied by the material manufacturer.</i>

\* Contents of this column are provided for guidance to the responses required, other solutions may be equally valid.

**Additional Requirements:**

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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:

- \*e.g. Restrictions: Carbon 0.22% max, Sulphur 0.015% max, Phosphorus 0.020% max

Signed:

(Pressure Equipment Manufacturer)

Date:

Confirmed:

(Notified Body (Cats III &amp; IV only))

Date: