Requirements for CE Marking of Fired Heaters

Know Your Audience

Contents

- Where is it required
- What is required
- What Directives Apply
  - ATEX
  - Machinery
  - Pressure Equipment
- What needs to be done
- What difference will it make
- Who is responsible
- What will it cost
- What are the pitfalls to avoid

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Where is it required

Within the EU (includes EEA)

Optional from 29th Nov 1999 Required from 29th May 2002

Other countries may require (eg Turkey Tunisia)

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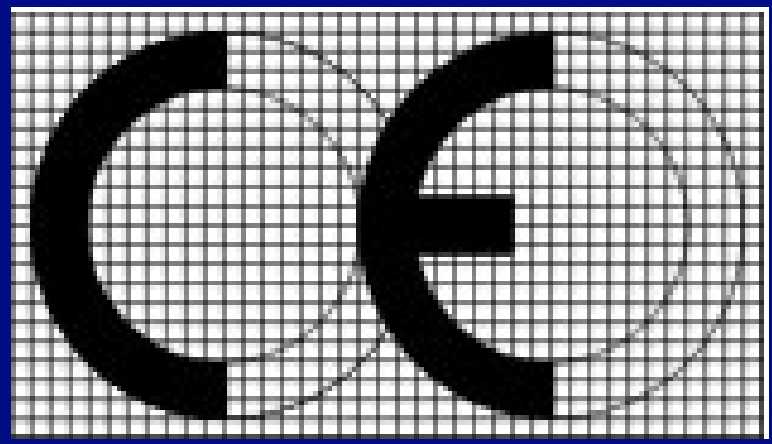
CE Marking – What is required

- "Declares the completion of conformity assessment and that the equipment or assembly complies with the provisions of the (Pressure Equipment) Directive and meets the essential safety requirements.
- "Where the pressure equipment or assembly is subject to other Directives covering other aspects which provide for the affixing of the CE marking, the latter shall indicate that the pressure equipment or assembly in question is also presumed to conform to the provisions of those other Directives."
- Third party conformity assessment is carried our by Notified Bodies who are appointed by Member States



CE Marking – What is Required

- **Based on the "New Approach"**
  - **Harmonisation is limited to essential requirements.**
  - **Only products fulfilling the essential requirements may be placed on the market and put into service.**
  - **Harmonised standards are presumed to conform to the corresponding essential requirements.**
  - **Application of harmonised standards or other technical specifications remains voluntary, and manufacturers are free to choose any technical solution that provides compliance with the essential requirements.**
  - **Manufacturers may choose between different conformity assessment procedures provided for in the applicable directive.**

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What Directives Apply- ATEX

- **Directive 94/9/EC Equipment for use in Potentially explosive atmospheres.**
- **Parallel directive 1999/92/EC minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.**
  - **Responsibility of plant operators**
- **Note “Equipment” not just electrical equipment.**
- **Fired heaters are usually located within “Hazardous Areas”**

What Directives Apply- ATEX

- **Does ATEX apply to fired heaters ?**
  - **“In some cases a product may only contain a potentially explosive atmosphere which is deliberately ignited. It is clearly not the intention that these fall under the scope of directive 94/9/EC unless other relevant hazards exist.”**
  - **“in most cases this is due to moving parts able to create a potential ignition risk either from hot surfaces, or friction sparks … usually has to be connected to a power source”**
  - **Domestic gas appliances are exempt because an occasional gas leak is on considered a hazardous area.**

Example of a Machine

What Directives Apply- Machinery

- **Do fired heaters fall within the Machinery Directive**
  - **An assembly of linked parts or components, at least one of which moves, with the appropriate actuators, control and power circuits, etc., joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material.**
  - **Steam boilers are except from the machinery directive**
  - **EN746 relates to provide "one means of compliance with the essential safety requirements of the Machinery Directive"**
  - **EN746 part 2 applied to all fired heater combustion systems.**
  - **Use EN746 or demonstrate "Equivalent Safety"**

What Directives Apply- PED

- All fired heater pressure parts fall within Pressure Equipment Directive (>0.5 bar).
- Main Features
  - The Directive arises from the European Community's Program for the elimination of technical barriers to trade.
  - No specific design rules given
  - Required to consider all hazards
  - Requires a Notified Body Verification
  - Specific requirements for materials (eg impact testing)
  - Requirements for QA and testing
  - Relative Risk is categorised, higher risk has more stringent monitoring.

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Making a Wrong Assumption

What Needs to be Done - ATEX

- **Use ATEX certified electrical components is that enough ?**
  - **those additional ignition and other relevant hazards (as defined in Annex II), which become relevant because of the final combination.**
- **“Compliance with directive 94/9/EC is ensured without any further conformity assessment provided the installer has correctly followed the instructions”**

What Needs to be Done - ATEX

- Very little guidance is given and NoBo's may not be of much help
- Main issue is hot surfaces
  - Insulated combustion air ducting
  - Inlet and outlet manifolds and piping
  - Refractory damage.
- One approach is provide a risk assessment and Warn the end user, precautions may include
  - Gas Tightness of insulation cladding
  - Hot work permit for insulation repair
  - Ignition potential if refractory damage, look for signs

What Needs to be Done – Machinery

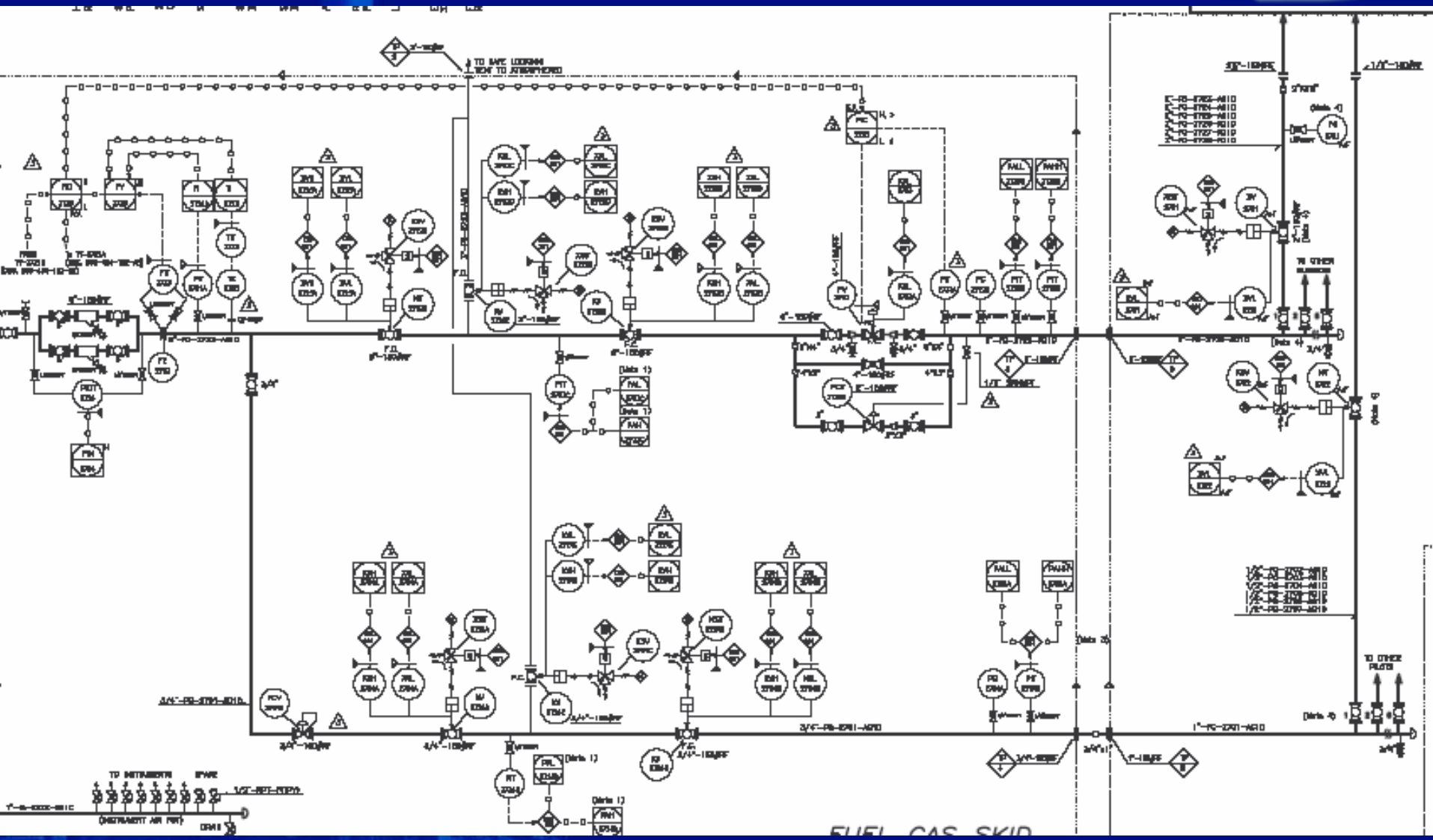
- Machinery must be designed and constructed to avoid any risk of explosion posed by the machinery itself or by gases, liquids, dust, vapours or other substances produced or used by the machinery to that end the manufacturer must take steps to:

- avoid a dangerous concentration of products,
- prevent combustion of the potentially explosive atmosphere,
- minimise any explosion which may occur so tha it does notendanger the surroundings.
- The same precautions must be taken if the manufacturer foresees the use of the machinery in a potentially explosive atmosphere.
- Generally NoBo not required for Machinery Directive for Fired Heaters

What Needs to be Done – Machinery

- **EN746 contains typical requirements for Fired Heater safeguarding**
  - **Double block and vent with pressure proving for pilot and main**
  - **Flame detection (unless all surfaces above 750 Deg C).**
  - **Individual automatic flame isolation on loss of flame**
  - **High and Low Pressure trips**

What Needs to be Done – Machinery



What Needs to be Done - PED

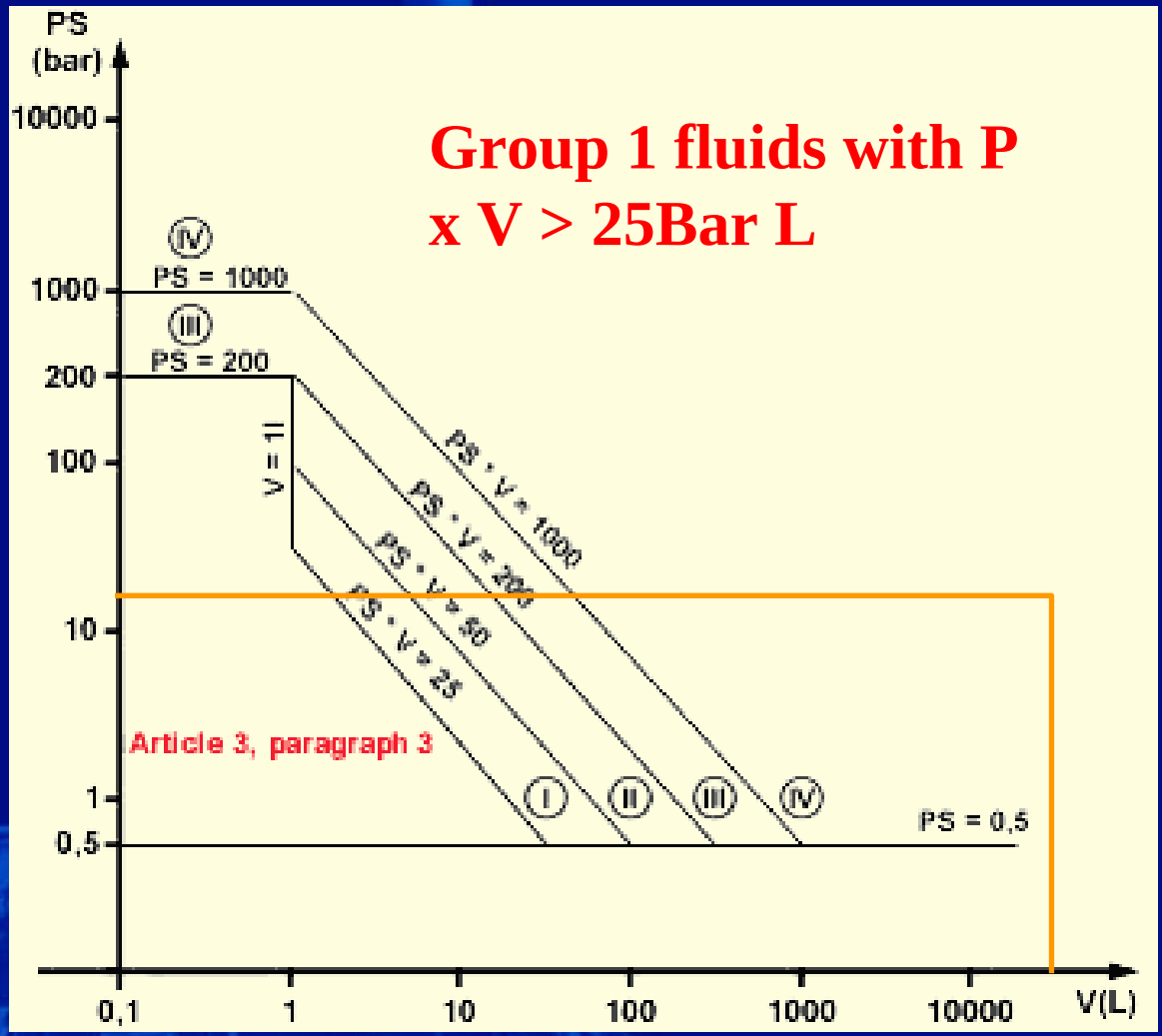
- **Which category ?**
  - **Flammability / Toxicity**
  - **Vapour or Liquid**
  - **Pressure and volume**

  Fluid Group
  - **Group 1 comprises fluids defined as:**
    - explosive, extremely flammable, highly flammable,
    - flammable (where the maximum allowable temperature is above flashpoint),
    - very toxic, toxic,
    - oxidizing.
  - **Group 2 Rest**
- **Gas or Liquid**
  - **If the vapour pressure at max temperature is >0.5Bar a then it's a gas !**

What Needs to be Done - PED

- Example
  - Crude heater 2000m of 6in tubes with design pressure of 15Barg and design temperature of 400 Deg C
  - It's a gas
  - Its group 1 (flammable)
  - Volume is 56000 L

What Needs to be Done - PED



- Note that most fired heater will be in Category IV

What Needs to be Done - PED

- I = Module A
- II = Module A1, D1, E1
- III = Modules B1 + D, B1 + F, B + E, B + C1, H
- IV = Modules B+ D, B + F, G, H1

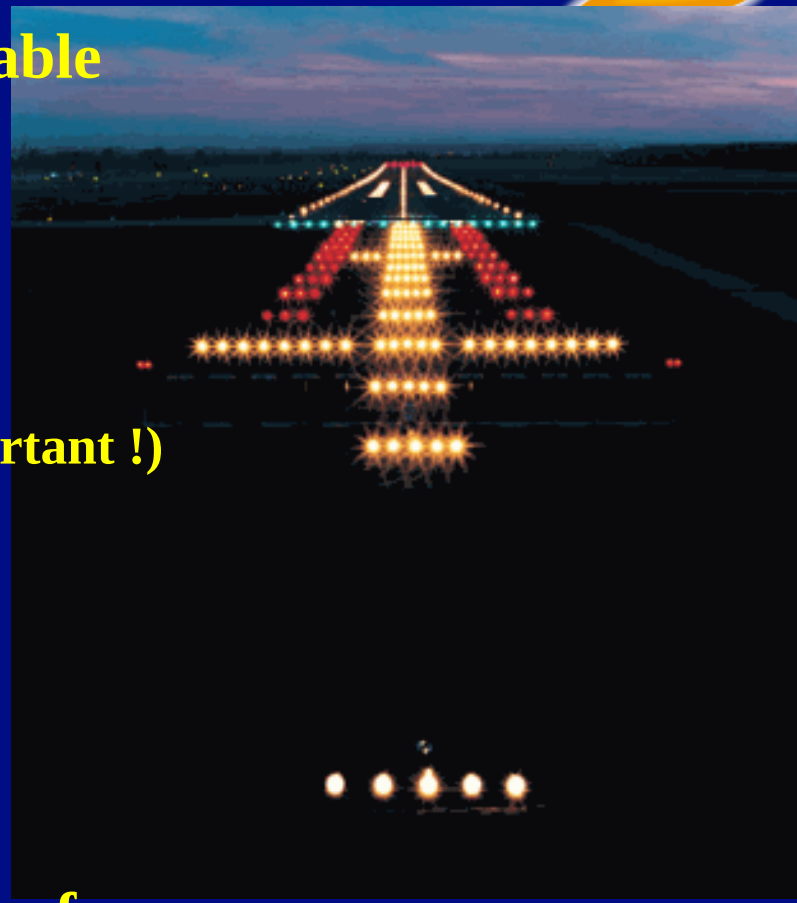
Note that most fired heaters will be Category IV. Some low temperature hot oil heater may be lower.

What Needs to be Done - PED

- **Module G**
  - Full NoBo examination of each item
  - Material Certification
  - Technical documentation
  - Testing during manufacture
  - Final inspection and proof test
- **Module H & H1**
  - Full accreditation of manufactures QMS
  - Examines design
  - Carried out final assessment

What Needs to be Done - PED

- **ESR Check list main points applicable to heater are as follows.**
  - **Corrosion**
  - **Fluid toxicity / flammability**
  - **High / Low Pressure**
  - **High / Low temperature (Low is important !)**
  - **High or Low flow**
  - **Overheating**
  - **Flexibility / fatigue / wind earthquake**
  - **Venting**
- **Manufacturer is responsible for definition of safe working envelope of the equipment in each of these areas.**



What Needs to be Done - PED

- Corrosion
  - Who specified the corrosion allowance -
  - State the need for inspection
- High / Low Pressure
  - Whos scope is the relief valve
  - Is the equipment designed for full vacuum
- High / Low temperature (Low is important !)
  - How is this protected, TMT high outlet temperature alarm trips, who's scope / responsibility

What Needs to be Done - PED

- High or Low flow
  - How is low flow protected
  - Who is responsible
- Overheating
- Flexibility / fatigue / wind earthquake
- Venting
- Manufacturer is responsible for definition of safe working envelope of the equipment in each of these areas.
  - Inform client where necessary protection measures are in his scope.
  - Make sure that operating and maintenance instructions address the ESR's

What Needs to be Done - PED

- **Undertake the pressure part design and consider PED rules for allowable stress.**
  - **Limits on alowable stress as a % of tensile and yield.**
- **Order the material in accordance PED requirements.**
  - **Elongation requirements apply for SS**
  - **Impact testing at MDMT !**
  - **If not European material you need a Particular Material Appraisal.**

What Needs to be Done - PED

- Manufacturer must have ISO9001.
- Fabricate in accordance with PED requirements.
  - European NDE operator qualifications required
- Erect and undertake any closing (site) welds under the responsibility of the manufacturer and his NoBo
- Undertake final Proof test (hydrotest) NoBo to attend.
- Provide Operating and Maintenance instruction to ensure that all the essential safety requirements are met.

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What Difference Will it Make

- For a well designed API560 heater which has a fully automated safeguarding system and has undergone HAZOP and safety reviews etc with good QA and well put together operating and maintenance manual…… NOT MUCH
  - SS not in the creep range will be a little thicker
  - Impact testing will be required for pressure part materials
  - More people will have signed for it (NoBo, CE Mark etc)
  - CE marking done properly should ensure that you get safe good quality products.
  - It should keep out the cowboys.

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Who is Responsible

- **The NoBo**
  - Appropriate QA system which addresses PED
  - Maintain CE accreditation, (NoBo visits)
  - These are not major issues for good suppliers who work to ISO9001 anyway.
- **The Manufacturer ie primary Vendor.**
  - May subcontract the manufacture
  - Not the same as ASME where the fabricator is the “Manufacturer”.
  - If outside EU the person who brings the equipment to market eg Agent.
- **The Authorised Signature**
  - Person who takes legal responsibility and signs the Declaration of Conformity.

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How Much Will it Cost

- **The following are the overhead costs**
  - **Appropriate QA system which addresses PED**
  - **Maintain CE accreditation, (NoBo visits)**
  - **These are not major issues for good suppliers who work to ISO9001 anyway.**
- **The following direct costs.**
  - **NoBo direct cost (less for module H and H1)**
  - **Impact testing of steel materials.**
  - **Costs associated with non European fabricators**
  - **SS may be thicker in some instances**
  - **Additional paper work.**

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Making a Wrong Assumption

Common Pitfalls

- **Another contractor does the erection and the closing welds under his PED.**
  - **Closing welds must be done under the "supervision" of the fired heater manufacture who applies the CE mark.**
- **I cant use ASME codes or materials.**
  - **Yes you can if you produce a PMA to demonstrate equivalent safety**
- **I can use ASME codes and materials with no further requirements.**
  - **No you must have the material impact tested at the MDMT and respect certain limits of allowable stress which may be lower.**
- **For a hot water heater with outlet temperature 130Deg C fluid is a liquid so I am in Cat II**
  - **No for PED its a Gas as it would be a gas if it leaked out.**

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Common Pitfalls

- **NoBo missed the final hydrotest but we had to ship as the client boat had arrived.**
  - **Generally whilst many things are flexible the final hydro is a must.**
- **We ATEX certificates for all our instruments that's then end of our responsibility under ATEX**
  - **The fired heater contains hot surfaces and falls under ATEX**
  - **Additional hazards that may arise due to the assembly should be considered.**
  - **Instructions on how to put it together need to be provided.**

For More Information

- **ATEX**
  http://ec.europa.eu/enterprise/atex/guide/atexguidelines_august2008.pdf

- **Machinery directive**
  http://ec.europa.eu/enterprise/mechan_equipment/machinery/direct/dir98-37.htm#annI

- **PED**

  http://ec.europa.eu/enterprise/pressure_equipment/ped/index_en.html

BOUSTEAD INTERNATIONAL HEATERS

THANK YOU