1. Purpose of the guide and area of application

1.1. Purpose

The aim of this guide is to define useful criteria for examining applications for Technical Appraisals for press fitting metal systems.

Metal systems can be made up of different materials, described in this guide and subject to specific assessments.

The criteria examined during appraisal notably include the description and identification of the products, the performances presented and a description of the evidence used to check these performances.

1.2. Area of application

The various fields of application that can be covered are as follows:

- Sanitary application;
- Cooling application with minimum temperature of 5°C;
- Low-temperature heating applications or connection to low-temperature networks;
- High-temperature heating application.

For all applications, the application pressure is expressed in Maximum Allowable Pressure (MAP) and can be 10 or 16 bar.

Note 1: MAP may vary according to diameter.

Note 2: use in gas networks is not covered by this Technical Guide.

2. Product description

2.1. General

2.1.1. Identity – Area of use

- Applicant name and address;
- Manufacturer name and address: head office and plant(s);
- Trade name of the product.

2.1.2. Production

The production site must be ISO 9001 certified or have a quality management system based on ISO 9001.

The average annual production quantities of the factories for the products under consideration must be submitted to CSTB.

2.2. Definition of constituent materials

The origin, nature, dimensions and tolerances of all the product's components must be communicated to CSTB.

2.3. Product definition

It includes:

- Grades of pipes and fittings used (standards, references);
- External diameters and pipe thickness as well as tolerances;
- The range of fittings (tees, elbows, sleeves, reducers, combination male and female fittings);
- References for crimping tools with clamping force;
- Jaw and chain references;
- The references and characteristics of the seals used;
- A list of the main physical, physicochemical and mechanical characteristics;
- The inspections (methods, frequency, specifications) carried out during incoming inspection, during production and in the factory laboratory;
- Product marking;

- Description of the manufacturing process from receipt of raw materials to the finished product;
- Delivery condition of pipes and fittings (length, plastic bag, cardboard, etc.).

Note: For steel systems, the use of electrogalvanising (or galvanising) for heating applications is not permitted. With the exception of the following cases:

- on the part of the pipe that is not in contact with water;
- on all parts of the press fittings.

2.4. Limits on use

Any limits on use in the areas under consideration must be specified (e.g. PMA and maximum temperature of use specific to an application).

AISI 304 (1.4301) stainless steel systems are not permitted for domestic use.

2.5. Health compliance

The holder undertakes to comply with the regulations, and in particular all the regulatory obligations relating to products that may contain hazardous substances for their manufacture, their use in the structures in the accepted field of application and their operation. The verification of information and statements issued in application of the regulations in force does not fall within the scope of this Technical Guide. The applicant bears full responsibility for this information and statements made.

The fittings must be covered by an ACS certificate (Sanitary Conformity Assessment) filed with CSTB. Organic components must comply with the Order of 29 May 1997 and amendments thereto, and metal components must comply with the Order of 25 June 2020.

2.6. Installation description

Technical specifications for installation are detailed in:

- DTU 60.1 Domestic plumbing for residential buildings;
- DTU 60.5 Copper pipes;
- the 2021 professional design and implementation rules for 'hydraulic pipework for heating and air-conditioning installations'.

The applicant must provide technical documentation explaining how the system is to be used, together with an assembly diagram (pipe + fitting).

The dimensions of the fitting depths must be supplied. The applicant's technical documentation must specify that a mark with the corresponding dimensions must be made on the tube before crimping.

3. Technical sub-folder

This sub-folder must include all the reports by which the applicant intends to provide proof of the properties claimed.

The test methods and specifications used to assess the file are given in Appendix A and Appendix B respectively.

The tests carried out according to the type of application are described in Appendix C.

3.1. General characteristics

Reference standards	Products
NF EN 1254-7	Copper and copper alloy fittings
Pr EN 10352	Crimp fittings in Stainless Steel
Pr EN 10358	Carbon steel press fittings
NF EN 10312	Stainless steel pipe
NF EN 10305-3	Carbon steel pipe
NF EN 10255 NF EN 10216-1 NF EN 10217-1	

NF EN 1057	Copper pipes

Metal systems are made up of the following components:

Pipe

The pipe must be smooth and may be made of the following materials:

- Carbon steel (with electrogalvanised coating allowed on the outside only);
- Stainless steel;
- Copper.

Fittings

Fittings can be made of the following materials:

- Stainless steel;
- Carbon steel (with approved electrogalvanised coating);
- Copper and copper alloy fittings.

Seals

Seals must be made of elastomer and comply with EN 681-1.

The tests used to check the general characteristics are described in appendix B.

3.2. Assessment of service life - durability and fitness for purpose

Service life factors to consider

The area of use and possible applications must be declared by the applicant in accordance with paragraph 2.1.1 of this guide.

The service life of the system is assessed by whether the press fitting joint complies with standard NF EN 681-1 for the applications requested.

For the proposed applications, the lifespan of the system is equivalent to that of traditional systems.

The chemical compositions of the metal components of the fitting and the tube must be supplied, together with the corresponding evidence.

3.3. Suitability for use

Suitability for use is assessed with reference to the regulations in force and current installation practice in France, including the minimum range required for an installation and the corresponding experimental system checks. In the case of press fittings, the entire range of tools on offer must be represented.

Characteristics of suitability for use:

- Resistance of connections to internal hydrostatic pressure ;
- Resistance of connections to pressure cycles ;
- Assessment of the burst pressure of the connections ;
- Resistance of connections to a heating circuit ;
- Resistance of connections to thermal cycles under pressure[1];
- Determination of the tensile strength of connections;
- Determination of the tensile strength of connections after the heating circuit.

The tests used to assess these characteristics are described in Appendix A.

3.4. Composition of the range

The range of pipes and fittings presented enables the most commonly used installations for the intended purpose: DN 10 to DN 108.

All diameters in the range must have fittings for connection to the rest of the network (metric/gas thread). The proposed range of fittings must also include elbows, tees, sleeves, reducers and plugs for each diameter.

For copper systems, the condition of the tubes used must be indicated.

[1] if for sanitary use.

Appendix A - Test methods

The table below shows the main test methods used.

Tests	**Method**
Chemical composition analysis	CETIM internal procedures T-9818 and T-9932
Resistance of connections to internal hydrostatic pressure	NF EN ISO 1167-1, 2, 3 and 4 of May 2006
Resistance of connections to pressure cycles	Appendix B§3
Burst pressure on metal products	Internal method HES/CA/MI/01 of 26/11/2012
Resistance of connections to a heating circuit	Appendix B§5
Resistance of connections to thermal cycles under pressure	NF EN 12293 of October 1999
Determination of the tensile strength of connections	Appendix B§4
Determination of the tensile strength of connections after the heating circuit	Appendix B§4 & Appendix B§5

Appendix B– Specifications

The specifications are defined in the reference product standards except for the tests listed below:

1/ Chemical composition analysis

On a sample of three DN ≥ 32 fittings, an analysis of the chemical composition of the constituent materials is carried out in accordance with CETIM internal procedures T-9818 and T-9932.

2/ Resistance of connections to internal hydrostatic pressure

On assemblies, resistance to internal hydrostatic pressure is assessed with 1-hour tests at 20 °C and 110 °C and at pressures of 30 bar or 48 bar, depending on the Maximum Allowable Pressure declared (3 times 10 or 16 bar).

3/ Resistance of connections to pressure cycles

Under the test conditions of standard T54-094, the system must remain leakproof after 20,000 cycles at pressures of 10/30 bar or 16/48 bar, depending on the Maximum Allowable Pressure declared, at a frequency of 1 Hz. The test is carried out at 23°C.

4/ Determination of the tensile strength of connections (Tensile strength of assemblies)

The specimens are prepared in accordance with standard NF EN ISO 1167. The assemblies should be 30 to 40 cm long. The conditioning is done in air for one hour at 23°C. The break value of the connections must be determined. The specimen is stretched at a constant speed of 100 mm/min.

5/ Resistance of connections to a heating circuit

In the case of a system applying for class 5, a circuit made up of pipes and fittings representative of the range of products offered must be subjected to continuous water circulation at 110 °C, under a test pressure of 10 bar, for a minimum of 1000 hours without fault.