

### 2.3.3 Longitudinal stresses

The sum of longitudinal stresses  $\sigma_L$ , in N/mm<sup>2</sup>, due to pressure, piping weight and any other external loads is to be such as to satisfy the following equation:

$$\sigma_L \leq K_T$$

where  $K_T$  is defined in [2.3.2].

### 2.3.4 Alternative limits for permissible stresses

Alternative limits for permissible stresses may be considered by the Society in special cases or when calculations have been carried out following a procedure based on hypotheses other than those considered above.

## 2.4 Junction of pipes

### 2.4.1 General

a) The junctions between metallic pipe lengths or between metallic pipe lengths and fittings are to be made by:

- direct welding (butt-weld, socket-weld)
- bolted flanges (welded-on or screwed-on)
- threaded sleeve joints, or
- mechanical joints (see [2.4.5]).

The joints are to comply with a recognised standard or to be of a design proven to be suitable for the intended purpose and acceptable to the Society. See also [2.1.2].

The expression "mechanical joints" means devices intended for direct connection of pipe lengths other than by welding, flanges or threaded joints described in [2.4.2], [2.4.3], [2.4.4].

- b) The number of joints in flammable oil piping systems is to be kept to the minimum necessary for mounting and dismantling purposes.
- c) The gaskets and packings used for the joints are to suit the design pressure, the design temperature and the nature of the fluids conveyed.
- d) The junction between plastic pipes is to comply with Ch 1, App 3.

### 2.4.2 Welded metallic joints

a) Welded joints are to be used in accordance with Tab 15. Welding and non destructive testing of welds are to be carried out in accordance with Article [3].

b) Butt-welded joints are to be of full penetration type, with or without special provision for a high quality of root side.

The expression "special provision for a high quality of root side" means that butt welds were accomplished as double welded or by use of a backing ring or inert gas back-up on first pass, or other similar methods accepted by the Society.

c) Slip-on sleeve and socket welded joints are to have sleeves, sockets and weldments of adequate dimensions in compliance with a standard recognised by the Society.

**Table 15 : Use of welded and threaded metallic joints in piping systems**

Joints	Permitted classes of piping	Restrictions of use
Butt-welded, with special provision for a high quality of root side (1)	III, II, I	no restrictions
Butt-welded, without special provision for a high quality of root side (1)	III, II	no restrictions
Slip-on sleeve and socket welded (2)	III	no restrictions
Threaded sleeve joints with tapered thread (3)	I	not allowed for: <ul style="list-style-type: none"> <li>• pipes with outside diameter of more than 33,7 mm</li> <li>• pipes inside tanks</li> <li>• piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur (4).</li> </ul>
	III, II	not allowed for: <ul style="list-style-type: none"> <li>• pipes with outside diameter of more than 60,3 mm</li> <li>• pipes inside tanks</li> <li>• piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur (4).</li> </ul>

Joints	Permitted classes of piping	Restrictions of use
Threaded sleeve joints with parallel thread and tightening suitable for intended design conditions (3)	III	not allowed for: <ul style="list-style-type: none"> <li>• pipes with outside diameter of more than 60,3 mm</li> <li>• pipes inside tanks</li> <li>• piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur (4).</li> </ul>
<p>(1) For expression “special provision for a high quality of root side” see [2.4.2] b).</p> <p>(2) Particular cases may be allowed by the Society for piping systems of Class I and II having outside diameter <math>\leq 88,9</math> mm except for piping systems conveying toxic media or services where fatigue, severe erosion or crevice corrosion is expected to occur.</p> <p>(3) In particular cases, sizes in excess of those mentioned above may be accepted by the Society if found in compliance with a recognised national and/or international standard.</p> <p>(4) Threaded sleeve joints may be accepted for connecting instrumentation lines equipment (e.g., pressure/temperature sensors) to piping conveying flammable media if such connections comply with a recognized national and/or international standard, such as ASME B31.1 and ASME B31.3. The use of threaded sleeve joints is limited to external diameters up to 25 mm.</p> <p><b>Note 1:</b> Other applications will be specially considered by the Society.</p>		

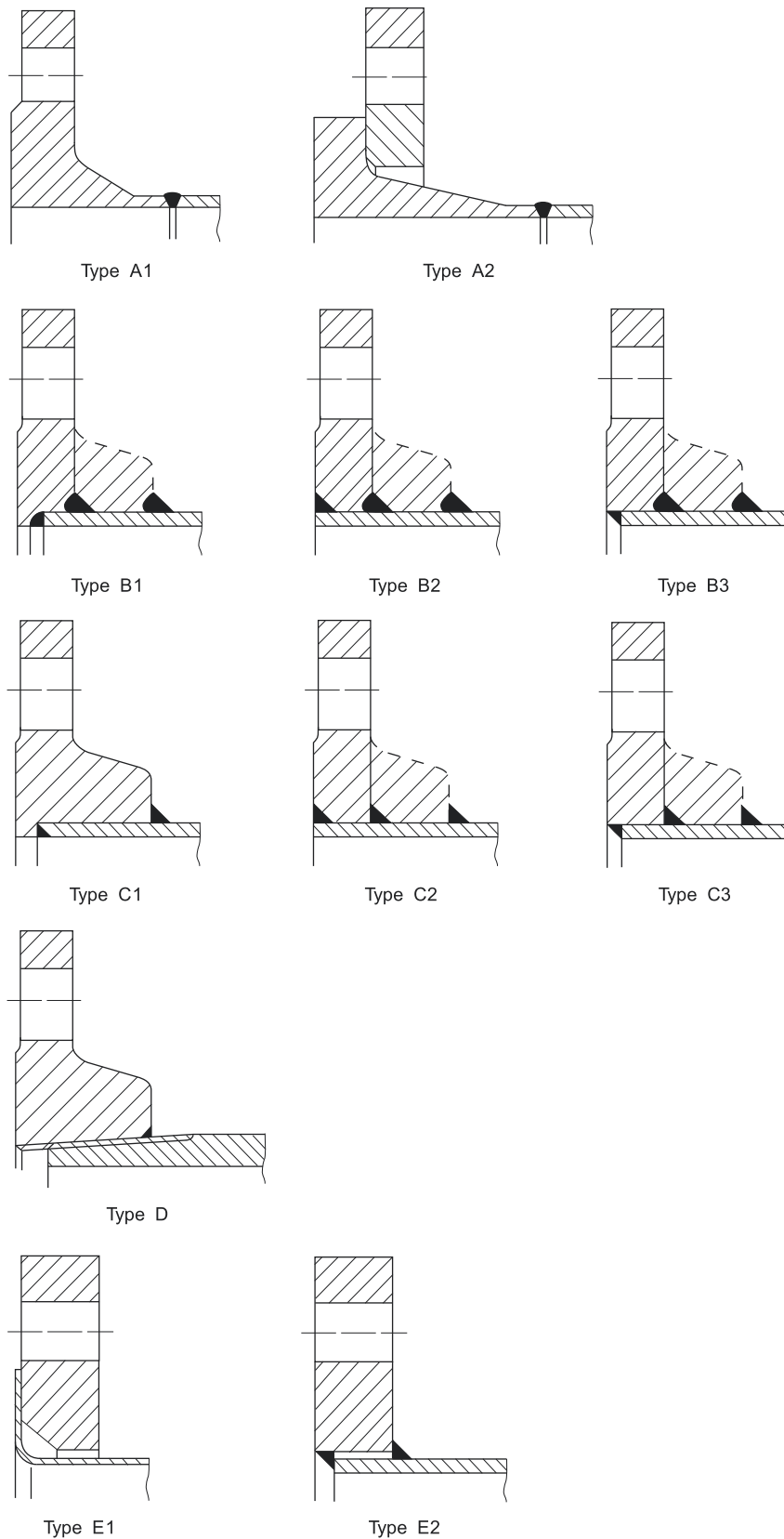
### 2.4.3 Metallic flange connections

- In general, the metallic flange connections used for piping systems are to be in compliance with a standard recognised by the Society.
- The material used for flanges and gaskets is to be suitable for the nature and temperature of the fluid, as well as pipes on which the flanges are to be fitted.
- The dimensions and configuration of flanges and bolts are to be chosen in accordance with recognised standard intended for design pressure and design temperature of the piping system. Otherwise, the flange connections are subject to special consideration.
- Flanges are to be attached to the pipes by welding or screwing. Examples of acceptable metallic flange connections are shown in Fig 1. However, other types of flange connections may be also considered by the Society in each particular case, provided that they are in accordance with national or international standards applicable to the piping system and recognise the boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.
- Permitted applications are indicated in Tab 16.

**Table 16 : Use of metallic flange connections in piping systems (types as shown in Fig 1)**

Type of media conveyed	Class of piping (see Tab 3)		
	I	II	III
Toxic or corrosive media Flammable liquids (where heated above flashpoint or having flashpoint $< 60^{\circ}\text{C}$ ) Liquefied gases	A1, A2, B1, B2, B3 (1) (2) (4)	A1, A2, B1, B2, B3, C1, C2, C3 (1) (4)	not applicable
Fuel oil Lubricating oil	A1, A2, B1, B2, B3	A1, A2, B1, B2, B3, C1, C2, C3	A1, A2, B1, B2, B3, C1, C2, C3, E2
Steam Thermal oil	A1, A2, B1, B2, B3 (2) (3)	A1, A2, B1, B2, B3, C1, C2, C3, D, E2 (6)	A1, A2, B1, B2, B3, C1, C2, C3, D, E2
Other media as water, air, gases (refrigerants), non-flammable hydraulic oil, etc.	A1, A2, B1, B2, B3 (3)	A1, A2, B1, B2, B3, C1, C2, C3, D, E2 (6)	A1, A2, B1, B2, B3, C1, C2, C3, D, E1, E2 (5) (6) (7)
<p>(1) When design pressure <math>p</math> (see [1.3.2]) exceeds 1 MPa, types A1 and A2 only.</p> <p>(2) For nominal diameter <math>ND \geq 150</math> mm, types A1 and A2 only.</p> <p>(3) When design temperature <math>T</math> (see [1.3.3]) exceeds <math>400^{\circ}\text{C}</math>, types A1 and A2 only.</p> <p>(4) For cargo piping of ships having the service notation <b>chemical tanker</b>, IBC Code Ch. 5, 5.3 and Pt D, Ch 8, Sec 5, [3.1.4] are to be applied. For cargo piping of ships having the service notation <b>liquefied gas carrier</b>, Pt D, Ch 9, Sec 5, [8.3] is to be applied.</p> <p>(5) Type E2: only for design pressure <math>p \leq 1,6</math> MPa and design temperature <math>T \leq 150^{\circ}\text{C}</math>.</p> <p>(6) Types D and E2: only for design temperature <math>T \leq 250^{\circ}\text{C}</math>.</p> <p>(7) Type E1: only for water pipelines and for open ended lines (e.g. drain, overflow, air vent piping, etc.).</p>			

Figure 1 : Examples of metallic flange connections



Note 1: For type D, the pipe and flange are to be screwed with a tapered thread and the diameter of the screw portion of the pipe over the thread is not to be appreciably less than the outside diameter of the unthreaded pipe. For certain types of thread, after the flange has been screwed hard home, the pipe is to be expanded into the flange.

Note 2: The leg length of the fillet weld, as well as the dimension of the groove penetration in the flange, is to be in general equal to 1,5 times the pipe thickness but not less than 5 mm.