

THERMAL EXPANSION

When planning and installing distribution pipe lines, along with the structural requirements, thermally caused linear expansions must be considered.

Pipes may not be installed rigidly between two fixed points. You must always compensate for the length variation of the pipes. Open laid pipes that are fully exposed to thermal expansion must be provided with suitable compensation for expansion and contraction. For this you need to know the location of all fixed points. Compensation is always provided between two fixed points and changes of direction.

Typical installations can be classified as:

- Installations that allow thermal expansion.
- Installations that do not allow thermal expansion.

And the following specifications apply to each of them:

▸ Installations than allow thermal expansion

1. Fixed points.

A fixed point exists when the pipe run is fixed to a place without the possibility to move. Pipe supports with clamps which hold the pipe are not considered as fixed points, since they allow movements. Only in the event of a change of direction, support clamps can be regarded as fixed points. Fixed points location

must be determined in such a way that pipe expansion may be limited or allowed in a direction not causing problems.

The following drawing graphically shows what is explained above:

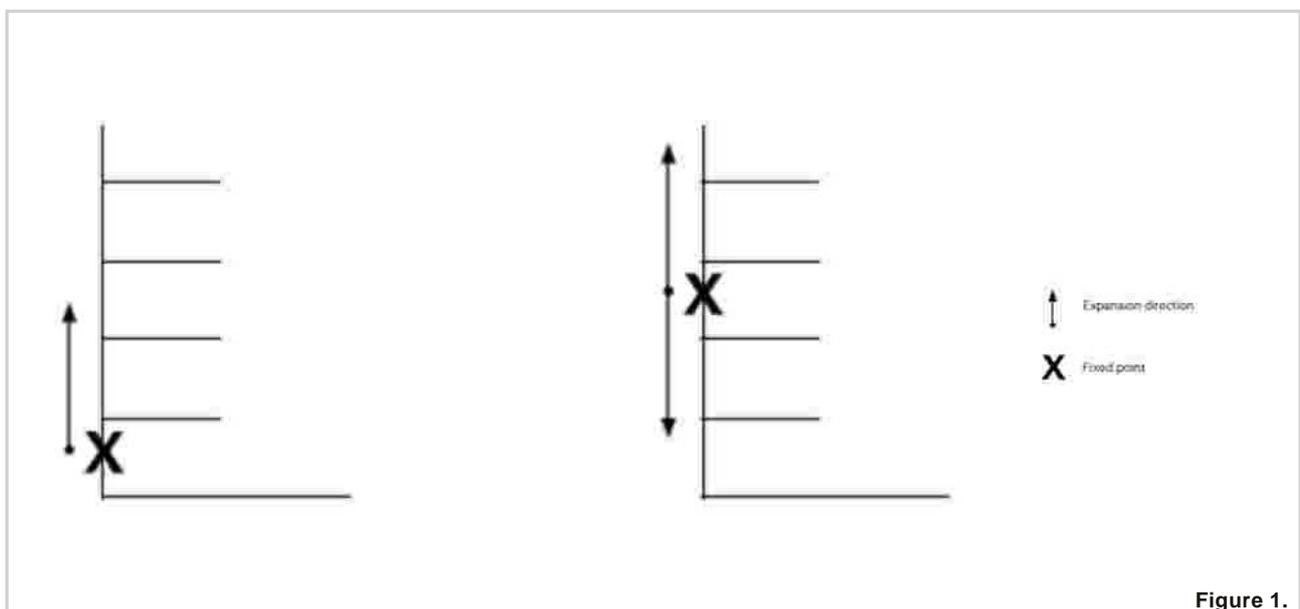
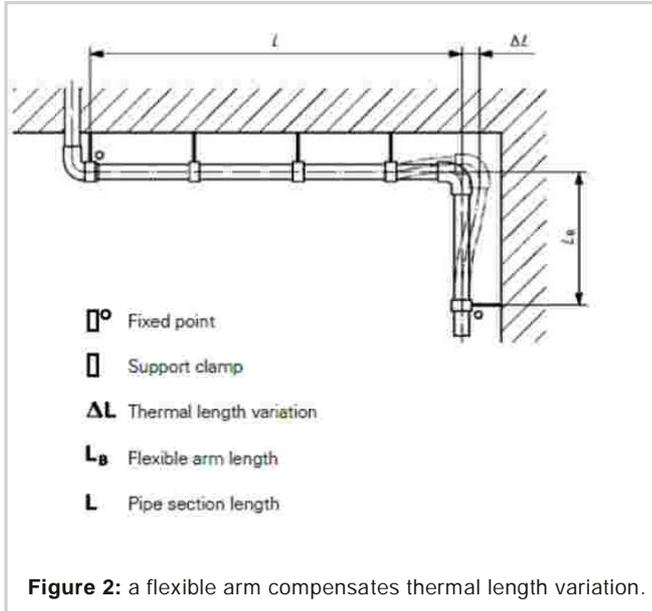


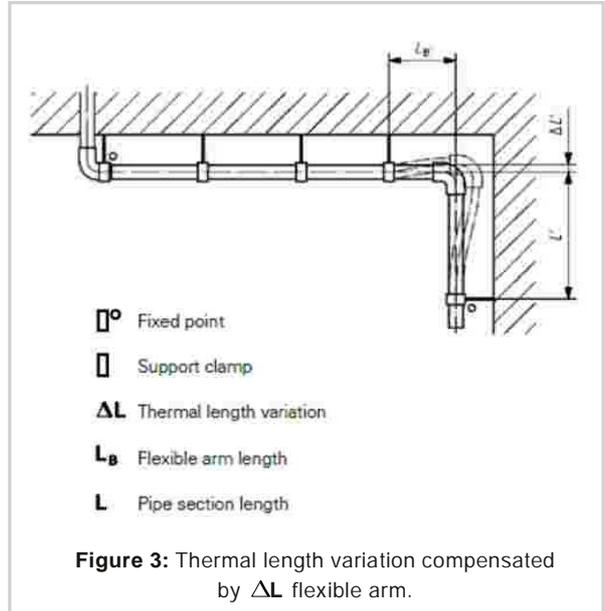
Figure 1.

2. Expansion by means of a flexible arm.

The flexible arm should be long enough to prevent damage, and support clamps should be placed sufficient far from the wall to allow for longitudinal thermal expansion.



Since the support clamp is located on a change of direction, this point can be considered a fixed point. Then, from this point on, the thermal length variation shall be compensated.



Use the formula below to calculate the minimum length of **L_B**, the flexible arm:

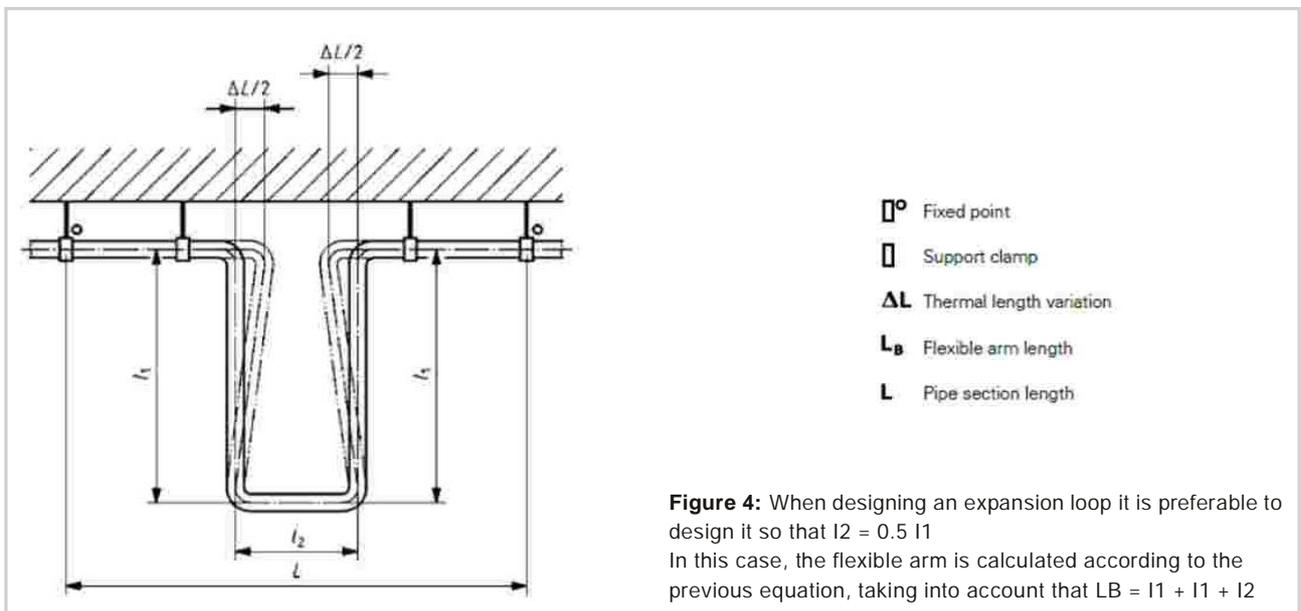
$$L_B = c \cdot \sqrt{(d_e \cdot \Delta L)}$$

Where:

- ΔL = Thermal length variation (mm)
- L_B = Flexible arm length (mm)
- c = Material constant (32 for PE-X, 6 for Multilayer)
- d_e = Outside diameter of the pipe (mm)

3. Expansion by means of an expansion loop.

The following schema applies:



4. Expansion by means of trays and support clamps.

This type of compensation is more commonly used for pipe diameters above 40 mm, normally aimed

to main distribution installations.

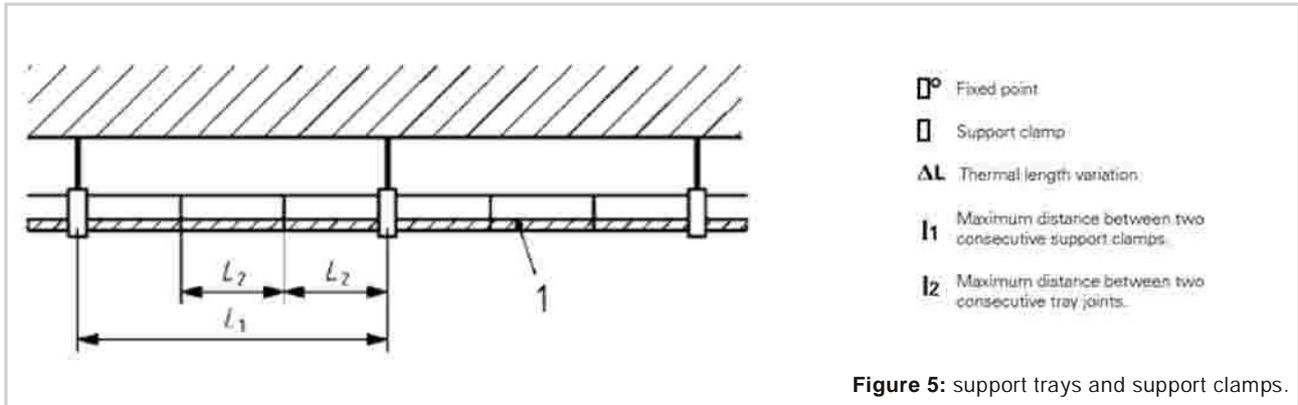


Figure 5: support trays and support clamps.

5. Expansion by means of support clamps.

This is, probably, the most common fixing method in plumbing installations.

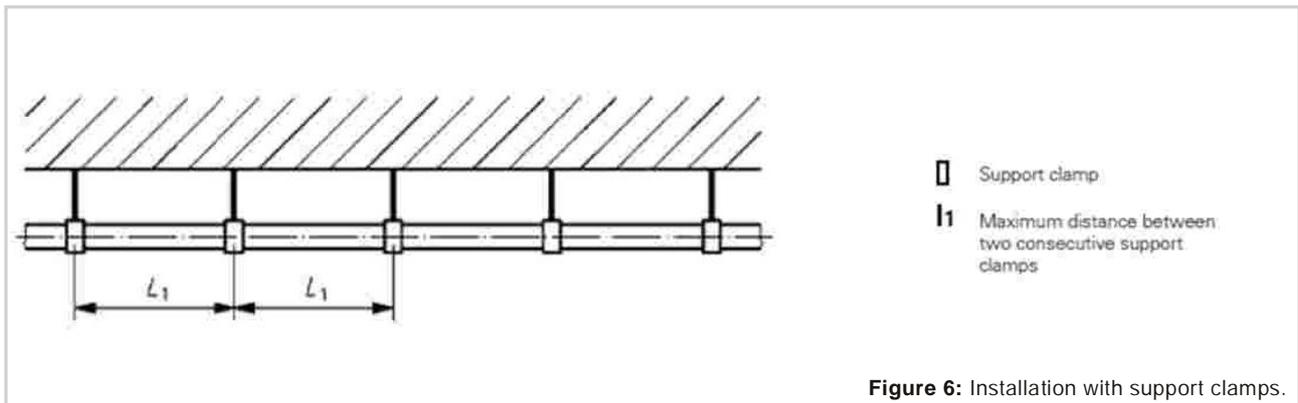


Figure 6: Installation with support clamps.

Approximate values:

External \varnothing pipe mm	L_1 (mm)	
	Cold water	Hot water
≤ 16	750	400
>16 a ≤ 20	800	500
>20 a ≤ 25	850	600
>25 a ≤ 32	1.000	650
>32 a ≤ 40	1.100	800
>40 a ≤ 50	1.250	1.000
>50 a ≤ 63	1.400	1.200
>63 a ≤ 75	1.500	1.300
>75 a ≤ 90	1.650	1.450
>90 a ≤ 110	1.900	1.600

• Installations than do not allow thermal expansion

In many occasions, it is necessary to install the pipe between two fixed points. Then, thermal expansion and contraction forces are transferred to the building structure thanks to the pipe supports. It is important to mention that this circumstance does not consist of any inconvenient due to the minimum thermal expansion and contraction forces pertaining to these pipes. Some examples shall be described on figures 7, 8, 9 and 10.

1. Fixed points.

Fixed points are laid out in such a way that no contractions or dilatations may occur. The maximum distance between two consecutive fixed points shall

not be in excess of 6 m. The following drawing graphically shows what is explained above.

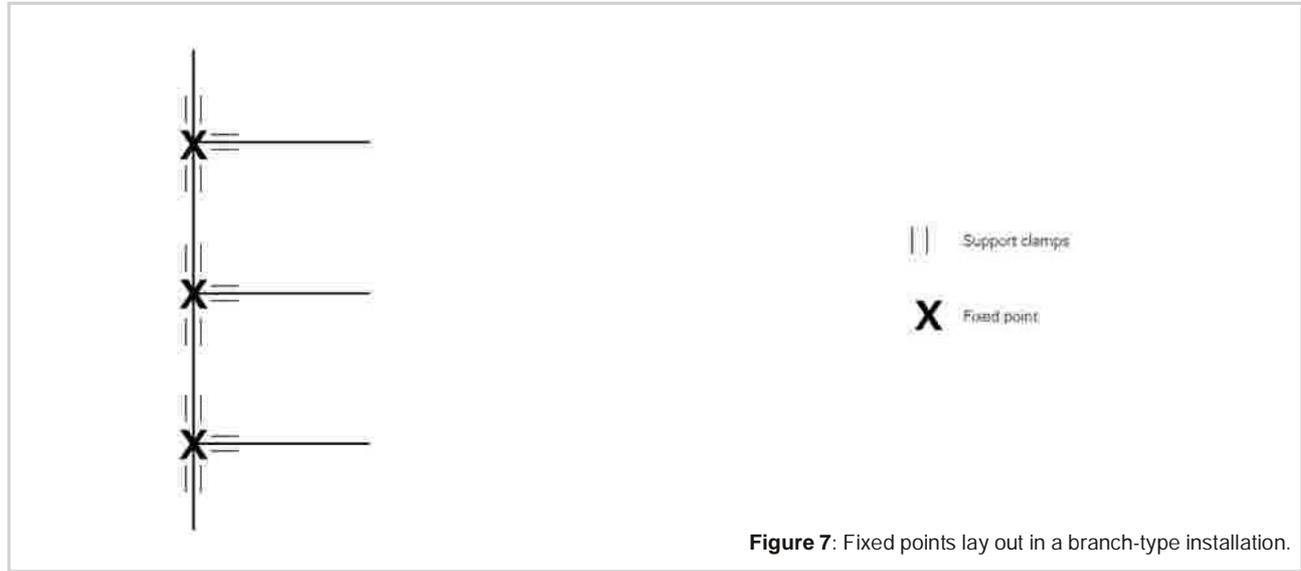


Figure 7: Fixed points lay out in a branch-type installation.

2. Expansion by means of fixed points and support trays.

The maximum distance between two consecutive fixed points, support clamps or support tray joints

must meet the requirements specified before.

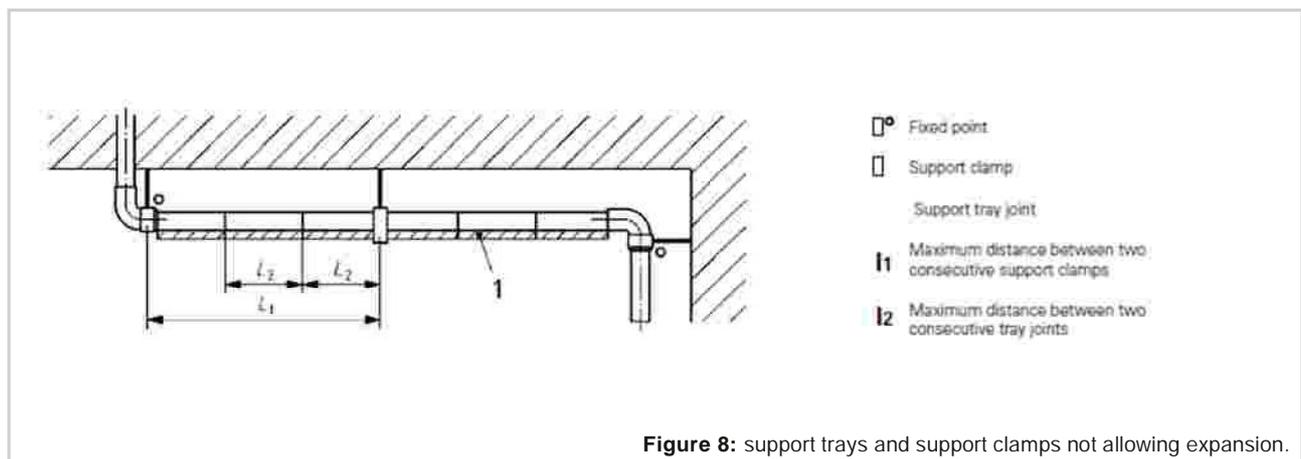
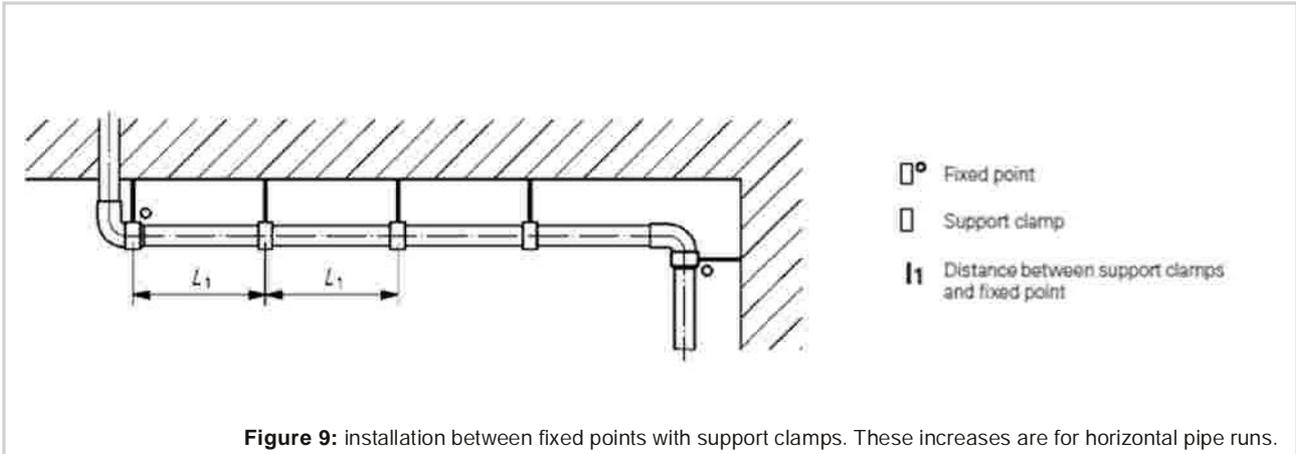


Figure 8: support trays and support clamps not allowing expansion.

3. Expansion by means of trays and support clamps.

The maximum distance between fixed points and support clamps, as figure 9 shows, must meet the

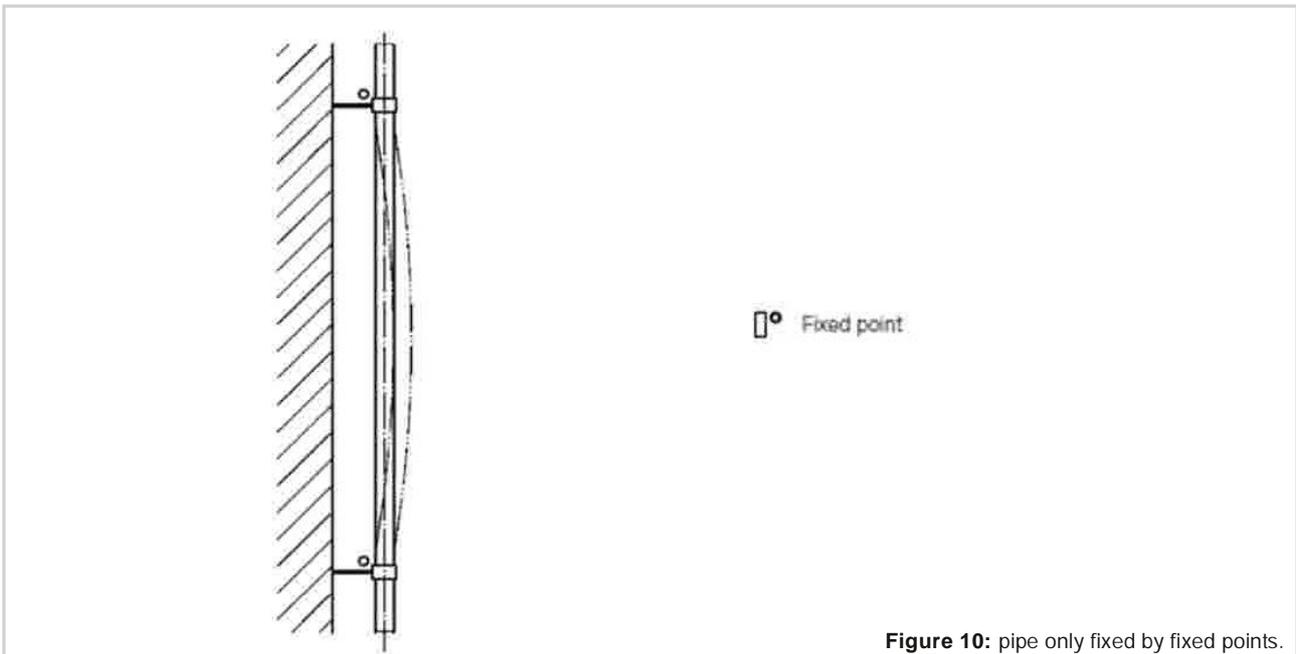
specifications on L1 distance table.



4. Installation of pipes fixed only by fixed points.

In this case, thermal expansion and contraction forces are partly transferred to the building structure thanks to the pipe supports.

This type of installation can be used when the pipe thermal expansion in the installation is visually acceptable or the aesthetic aspect is not even



5. Naked pipes embedded in concrete.

Pipes can be properly embedded without any problem. Dilatation and contraction forces are minimal in comparison to that of metallic pipes and

no damages are produced due to these thermal dilatations.