

Fabrication

Heat bending

For applications that require long radius bends it may be necessary to use heat bending to form plastic pipe. This is a recognized technique that has been used for many years in the workshop to produce bends and offsets in pressure and non-pressure pipes. It is particularly effective on pipes manufactured from PVC-U, PVC-C and ABS.

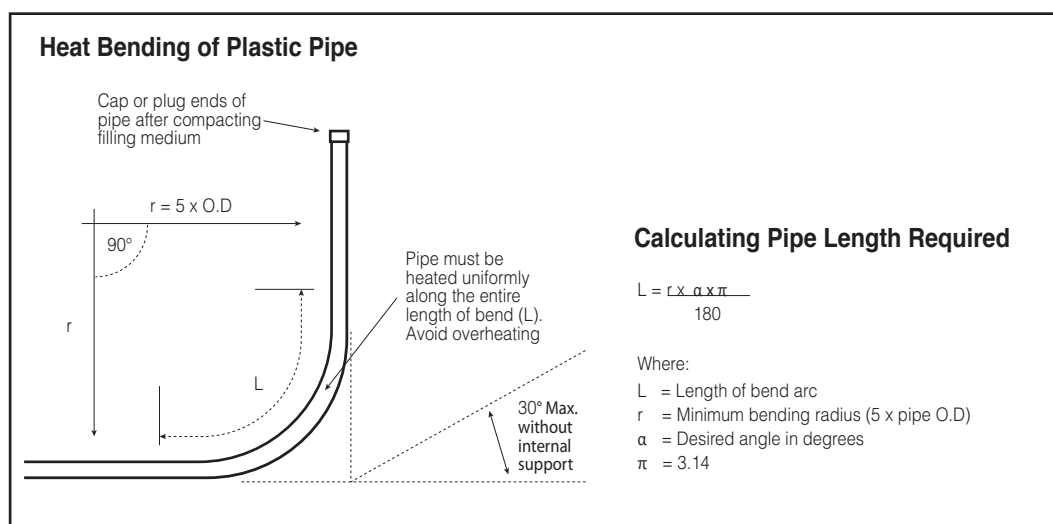
Successful bending requires that the appropriate amount of heat be applied uniformly to the required length of pipe to be bent. The heating method used must provide the necessary amount of heat over the required length of pipe in a reasonable amount of time. Several common pipe heating methods used involve the use of hot air ovens, electric box heaters, electric pipe heating blankets, and flameless hot gas torches.

Temperatures necessary to heat the pipe are dependent on the material, the pipe size and the severity of the desired bend radius. Care should be taken to avoid exposing the pipe to bending temperatures for an excessive length of time, as irreparable distortion and deformation will occur. Localized overheating must be avoided. Successful minor bends (< 30°) can be achieved with minimum distortion at lower temperatures without internal support. Tighter bends (> 30°) will require higher temperatures as well as internal support to prevent wall distortion/collapse.

Common methods used to provide internal support to the pipe during the bending process include using a filling medium such as sand or prelate (cat litter), inserting a coiled spring into the pipe, or in some cases providing internal pressure. Filling the pipe with fine grain sand or prelate prior to heating provides the internal support necessary to prevent collapse, while at the same time provides an excellent medium for uniform heat distribution during the heating process.

The filling medium used should be packed tightly into the pipe to achieve the desired bend radius with minimum distortion. The pipe ends should be capped or plugged and the filling medium compacted as much as possible to remove any all pockets prior to heating. Once the bend is formed and cooled, the sand is emptied from the pipe and any remaining particles can be easily removed by rinsing with water.

To provide fabrication consistency, standard pipe bending forms which provide the required radius and are sized (grooved) for the proper diameter can be used to bend plastic pipe. Plywood jigs have also been used successfully in many applications. The minimum radius at bend should not be less than five times the pipe outside diameter to prevent flattening. Due to the recovery characteristics of the material, the pipe should be bent slightly beyond the desired radius and allowed to spring back to the required angle once uniformly heated at the correct temperature. When the bend is obtained, the pipe should be held in place and cooled quickly using a wet sponge or other application of water.



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It should be noted that most bending procedures will induce stress into the pipe wall which can be retained in the material after the bend radius is formed. The amount of stress induced is dependent on the severity of the bend, the diameter and wall thickness of the pipe bent, and the bending method used. This residual stress will be added to the normal stresses created by internal pressure, installation procedures, and the effects of temperature. Therefore, pipe bending should be limited to applications for use at ambient temperatures or lower where maximum operating pressures are not utilized. It should also be noted that during the bending process of clear PVC-U pipe, the material will become cloudy during the heating process but will regain clarity when cooled, provided excessive bending stresses are not retained. The use of a filling medium during the bending process can also cause slight pitting and other interior surface blemishes depending on the method used.

Attempting to form bends in rigid thermoplastic piping at temperatures too low can induce excessive stress into the pipe, thereby jeopardizing its physical performance.

Note:

- Follow appropriate safety precautions prior to conducting any heat bending procedures.
- Bending procedures must be conducted in a well ventilated area, using protective clothing (gloves, apron etc.) to prevent damage or injury.
- Do not expose pipe to open flames or excessive temperatures.
- Bends greater than 30° require internal pipe support to prevent distortion.
- Compact filling medium prior to bending.
- Minimum radius at bend should not be less than 5 times the pipe OD to prevent kinking.
- Calculate required length of bend based on angle needed, and heat this entire area uniformly.
- Avoid overheating.
- Cool the bend with water to "set-up" desired angle.