

On riser runouts and radiator runouts the swing joint is used almost without exception. On high vertical risers the pipes may be reversed every five to ten stories; that is, the supply is carried over to the adjacent return riser location and the return riser is run over to the former supply riser location, thus making horizontal offsets in each line. Corrugated copper expansion joints also are used on risers but must be made accessible in case future replacement becomes necessary.

EXPANSION BENDS

The calculation of the distance required for offsets and the size of expansion bends necessary to absorb a given amount of expansion leads into complicated formulas and is a subject of controversy. It seems to have been demonstrated, however, that the shape of the bend, the radius used, the relative amounts of straight and curved pipe in a bend, and the

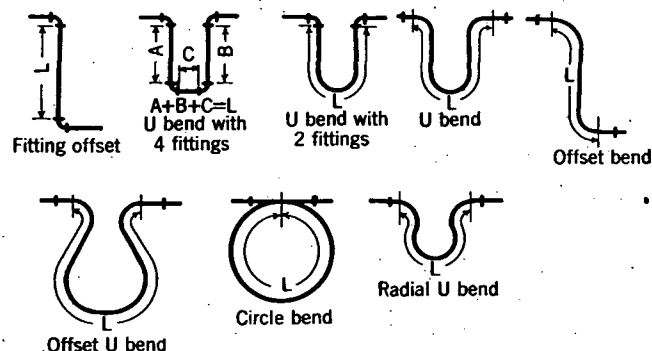


FIG. 3. MEASUREMENT OF L ON VARIOUS PIPE BENDS AND OFFSETS FOR ABSORBING EXPANSION

type of bend have little bearing on the amount of expansion for which they will safely provide. The size, weight and material of the pipe and the length of all of the pipe in the bend, or even in the offset, have a bearing on its capacity to absorb expansion without straining the pipe material beyond the safe working stress. In Fig. 3 typical pipe bends and offsets for absorbing expansion are shown. The lengths L are those which are used in determining the stress in the pipe.

Fig. 4 shows a set of curves for standard weight steel pipe bends from which the approximate amount of pipe L (Fig. 3) for each pipe size may be determined from the amount of expansion movement that must be absorbed. These curves are such that the maximum fiber stress in any part of the bend will not be over 16,000 lb per square inch. Since 12,000 lb per square inch is considered to be a maximum working fiber stress in wrought iron pipe, an additional 33 1/3 per cent must be added to the length of this type of pipe.

The amount of expansion can be doubled for a bend if the bend is cold sprung for one-half of the expansion movement. In other words, if the bend is erected with the main pipe cut short one-half of the expected expansion and the bend is then sprung open to meet the shortened pipe,

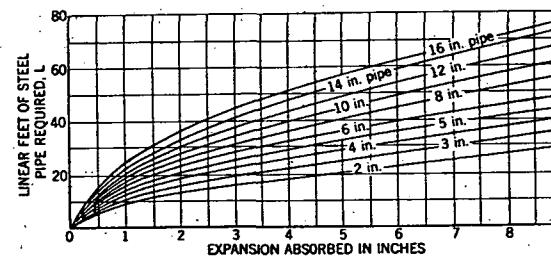


FIG. 4. CURVES GIVING LENGTH L OF BEND OF OFFSET NECESSARY TO ABSORB EXPANSION (WITHOUT COLD SPRING)

the expansion in the main will first allow the bend to go back to its neutral point and then will compress the bend an equal distance beyond the neutral point, thus securing a doubled capacity. Generally only a portion of the cold spring is considered as being effective owing to the difficulties of erecting the bends with sufficient exactitude in the length of the main line and the difficulty of cold springing.

PIPING CONNECTIONS AND DETAILS

Piping connections may be classified into two groups: *first*, those suitable for any system of steam heating; *second*, those devised for certain systems which cannot be satisfactorily applied to any other type. There are also various details that apply to piping on the steam side which cannot be used on the returns. An installation that is designed and sized correctly and installed with care may be rendered defective by the use of improper connections, such as runouts that do not allow for expansion, thermostatic traps unprotected from scale, pressure-reducing valves without strainers, and lack of drips at required points.

BOILER CONNECTIONS

Supply

Boiler headers and connections have the largest sizes of pipe used in a system. Cast-iron, horizontal-type, low pressure heating boilers usually have several tapped outlets in the top, the manufacturers recommending their use in order to reduce the velocity of the steam in the vertical uptakes from the boiler and to permit entrained water to return to the boiler instead of being carried over into the steam main where it must be cared for by dripping. Steel heating boilers usually are equipped with only one steam outlet but many engineers believe that better results are obtained by specifying that such boilers have two. The second outlet, usually located 3 or 4 ft back of the regular one, reduces the velocity 50 per cent in the steam uptake.

Fig. 5 shows a type of boiler connection that was used for many years and one with which some boilers are now piped. The uptakes are carried as high as possible, turned horizontally and run out to the side of the boiler and then are connected together into the main boiler runout which drops into the top of the boiler header through a boiler stop valve. No