Vertical May Not Describe Correct Hanger Orientation

The Force Is Vertical But The Hanger Is Not Always Vertical

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There is currently some misunderstanding regarding the orientation of the hanger rod. Vertical hangers may exist in fire sprinkler systems, however not all hangers are installed in this orientation. Vertical is defined as perpendicular to the floor and therefore is plumb. Most fire sprinkler installations have piping installed parallel to pitched roof structures. NFPA 13 text does not adequately describe its intent regarding proper hanger orientation. This issue as been complicated by an inaccuracy in the editorial portion of the Sprinkler Handbook for section 9.1.2.5.

Perpendicular is the correct descriptive term applicable to all hanger assemblies installed on branch lines, cross-mains and feed mains. It is not in reference to the floor, but is in relation to the system piping. Therefore, correct hanger orientation is perpendicular to the centerline plane of the pipe it supports which is 90° from the side view, and typically 0° from the end view. (see Figures 1 & 2)

Perpendicular orientation is important because it facilitates axial loading of the hanger assembly. The hanger assembly ideally should carry its load parallel to the axis of its hanger rod. Hanger assemblies using a single rod component should align through the rod bore of each upper and lower component. This properly positions each component respective to its design. Individual parts, usually top components, may have eccentricity unique to their design. For example, beam clamps have an eccentric load because one side is attached to the structure while the hanger rod is attached to the opposite side. The Listing for these components accounts for their eccentricity.

The issue of hanger orientation occurs for buildings with sloped ceilings/roofs. The angle or geometry of building elements may conflict with maintaining a perpendicular hanger orientation. NFPA 13 allows bending the hanger rod to facilitate allowing the correct orientation. Although not stated, it's best practice to bend the rod as close to the upper hanger component as possible. This keeps the leverage moment to a minimum. This rod bending can only occur in a non-threaded section. When all thread rod is used, a swivel assembly must be included to achieve the desired component orientation.

Figure 6 shows a fire sprinkler system branch line running up the slope of the building roof. "A" and "B" hangers are typical to this configuration of cross mains and branch lines. The "C" hanger is supporting gravitational load transferred through the "B" hangers down the branch lines due to the steep pitch of the roof slope.

Questions on hanger orientation may also occur with "Special Application" Hangers (see Figures 3, 4, & 5) which are still perpendicular in the side view but may not in the end view.

Figure 3, a U-hook, and Figure 4, a combined in-rack assembly, have two symmetrical legs that are not perpendicular from the pipe (as shown from the end view). The resultant force on the pipe though, is perpendicular as well as being at 0°. There are occasions when neither the hanger nor the resultant force is at 0° as shown in Figure 5. This installation, used as an in-rack hanger, is perpendicular to the pipe but is not at 0°. When this occurs, a horizontal force exists which must be addressed. In this case, the rack upright offsets the horizontal force. This fully meets the intent of NFPA 13 since the hanger holds the piping up and the combination of elements provides the necessary stability. Though special application hangers may vary from perpendicular in one aspect, this does not jeopardize their structural ability. The position, combination or design features of these special hangers offset any eccentric loading.

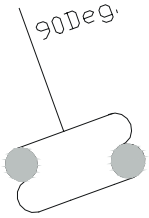

Fig. 1

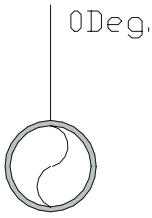

Fig. 2

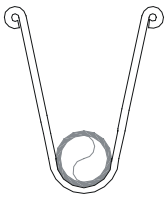

Fig. 3

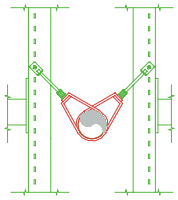

Fig. 4

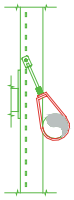

Fig. 5

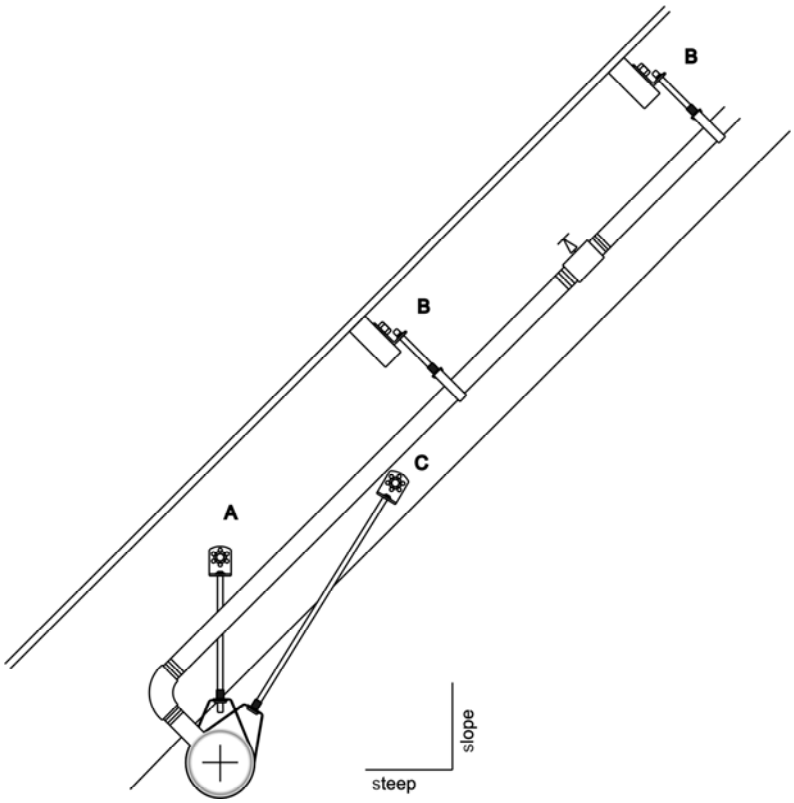

Fig. 6

I think that most AHJ's don't use the term vertical literally. This article should help clarify the intent of NFPA 13 to all concerned.