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**TO:** All Concerned

**FROM:** Jay Mundy, CIPE, CPD  
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**SUBJECT:** Drainage Fittings – Fixture Connections

Chapter 7 of the 2006 UPC makes a distinction between drainage fittings that are approvable for back-to-back *branch piping* connections [Section 706.0], and special fittings that are designed specifically for back-to-back *trap arm* connections [Section 704.0]. Section 704.0 references use of an “approved double-fixture fitting”, but offers no guidance regarding which fitting(s) would be approvable for back-to-back trap arm connections. Section 706.2 is more explicit in defining which fittings would be acceptable for joining back-to-back drainage *branches*, but fails to clarify that the sanitary cross (double sanitary tee), as described in 706.2, is *unacceptable* for connecting back-to-back fixtures. This lack of clarity has resulting in mis-application of sanitary crosses on a number of occasions. A “figure fitting” is required for connection of back-to-back fixtures on a single stack.

The difference in these applications has to do with flow velocity. Branch piping will typically have a stabilized flow velocity of 2 fps or less, which is too slow to jump the gap if the fitting barrel is two pipe sizes larger than either of the branch outlets [e.g., a sanitary cross with 2” branches and a 3” barrel]. Conversely, trap arm discharge velocities will be considerably higher than that of branch piping because head pressure (combination of tailpiece length and bowl depth) would result in an increased velocity at the trap arm outlet, thus increasing the potential to jump across the back-to-back fitting barrel and into the opposing trap arm. Consequently, a fitting of special design and purpose [figure 1 or figure 5] is required to prevent potential washing across the barrel from one trap arm to the one opposing it. A figure fitting provides an effective increase in span greater than two pipe sizes because the throat on each of its branch inlets is angled at 30 degrees from the vertical plane of the barrel. By design this fitting prevents creation of an “S” trap, while also providing the benefit of an increased span between branch inverts at their point of entrance into the barrel. The design features of a figure fitting are intended to prevent cross-flow while avoiding creation of a siphon. A double sanitary tee (sanitary cross) with an oversized barrel is considered acceptable *only* for connection of back-to-back branch piping, which is expected to have a low flow velocity discharge at the entrance to the barrel.

**The Section Titles and their separate locations within the Code book [(704.0) Fixture Connections – Drainage] and [(706.2) Changes in Direction of Drainage Flow] are an attempt to distinguish between the connection of fixture trap arms *to* the plumbing system, as opposed to branch connections made *within* the piping system. This distinction is evidently not as clear as it should be, thus this memorandum is an effort to clarify the intent and application of each of these Code Sections, and to distinguish which fittings are applicable in each case.**

**In summary, a sanitary cross is limited to connection of back-to-back horizontal drainage branches into a vertical stack, and even then *only* when the barrel of the sanitary cross is enlarged two pipe sizes greater than the largest branch inlet. Trap arm [fixture] connections may *not* be made back-to-back by using a sanitary cross (double sanitary tee), even when the barrel of the cross has been increased two pipe sizes. [NOTE: A figure fitting may be used to connect back-to-back drainage piping when the branches and the barrel are all of the same size [e.g., a 2"x2"x2"x2" figure fitting that would have no more than 8 fixture units on either horizontal branch, and a 2" vertical drainage stack that can accommodate up to 16 fixture units]. Also available are "extended" 2" figure fittings that have a 2" outlet with a 1 1/2" vent above the branch inlets. These pipe sizes will drain the maximum potential inlet flow (16 fixture units), and would also vent the maximum 16 fixture units of drainage. There are occasions when there is no need to increase the barrel size of a double sanitary tee other than to legally use a sanitary cross in compliance with the provisions of UPC Section 706.2. Use of a 2" figure fitting might be a desirable alternative to increasing the stack and horizontal drainline size (barrel two pipe sizes larger) in order to utilize a sanitary cross per Section 706.2. A sanitary cross is highly restricted in its utilization. A figure fitting is considerably more versatile regarding its potential applications.**