COPPER GAS PIPING – 2006 UPC

Section 1209.5.3.2 of the 2006 UPC allows either Type K or L copper (or brass tubing) to be utilized as a piping material to convey natural gas in systems where the natural gas has a hydrogen sulfide content no greater than 0.3 grains per 100 standard cubic feet. However, this is not the end of the story. These systems are to be assembled using *brazed* joints made with a brazing alloy that does not contain more than 0.05 percent phosphorous. The commonly used BCuP [copper(Cu) and phosphorous(P)] brazing material is unacceptable because of its phosphorous content. A BAg-5 or a BAg-7 alloy [high silver content with minimal cadmium] would be more appropriate, but the ultimate selection will be a decision for the specifying engineer to make. The matter of purging with nitrogen or argon during the brazing process is not addressed by the Plumbing Code, nor is it addressed by the International Fuel Gas Code (IFGC). Evidently any concern or resolution regarding oxidation during the brazing process [without a purge] has been deferred to the design engineer. Sections 1211.7 and 1212.7 of the 2006 UPC reference moisture and sediment traps that are to be installed "as close to the inlet of the equipment as practical at the time of equipment installation". It is likely that flakes of brazing oxidation traveling through the piping system would be collected at these traps and would not be carried into the burners. Nonetheless, purging would be advisable in order to minimize maintenance that might otherwise be necessary to remove oxidation flakes from fouled burners. NOTE: Gas provided by Southwest Gas is considered to be "dry" gas and would not otherwise require "drip legs".

Support data for copper natural gas piping (both horizontal and vertical) is found in Table 12-3. Also, protection for copper gas piping concealed within a structure (wall, floor, ceiling, etc.) is addressed by Section 404.5 of the 2006 IFGC. Gas piping that is inset less than 1 ½ inches from the face of any material it is passing through, or to which it may be attached, is required to be protected by installation of a 1/16 inch thick shield (plate) that extends no less than 4 inches either side of the pipe it is protecting.

Sizing of copper gas pipe is based upon Tables that were established using the inside diameter of Type K (smallest I.D.) as a base line dimension. These Tables were developed based upon a copper product that is described in these Tables as "semi-rigid copper". The Copper Development Association refers to copper as either hard-drawn or annealed; there is no reference to semi-rigid copper. However, when hard-drawn copper is brazed during jobsite assembly it becomes annealed at the brazed joints and could be considered non-rigid for purposes of establishing a "semi-rigid" designation. Presumably the reference to semi-rigid copper in Tables 12-12 through 12-18 (UPC) is a designation assigned to hard-drawn copper that has been "annealed" by being brazed. It is also notable that the baseline gas pressures assigned to these copper-pipe sizing Tables are typically either "5.0 psi", or "*less*

than 2.0 psi". There appear to be no low-pressure Tables (7"-8" water column) provided for copper pipe or any other gas piping material in the 2006 UPC.

Essentially, _all_ gas piping is sized based upon the pressure loss that will occur due to friction [as reflected on each of the numerous Tables], relative to the initial service pressure and the required residual pressure at the point of use [equipment served].

The Phoenix Service Representative for Southwest Gas [Jack Rankin] checked with Steve Frehse (Manager/Engineering Staff, Southwest Gas Corporation – (702) 364-3142) and provided me with an e-mail stating that the maximum hydrogen sulfide in the product Southwest Gas provides would not exceed .25 grains per 100 cubic feet of natural gas. Section 1209.5.3.1 of the UPC notes that gas containing 0.30 grains of hydrogen sulfide or less is deemed acceptable for use in copper pipe, therefore the product offered by Southwest Gas is well within the limit established by the 2006 UPC. Until recently it was believed that the hydrogen sulfide content in gas supplied by Southwest Gas made it unsuitable for use with copper pipe. It is strongly recommended that anyone contemplating the use of copper in a gas piping system re-establish the suitablility of gas available at that time prior to making the final decision.

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