USC
UNIVERSITY OF SOUTHERN CALIFORNIA
Foundation for Cross-Connection Control and Hydraulic Research

Protection for Post Mix Carbonators

One of the common questions received in the Foundation office has to do with the level of backflow protection needed on post mix soft drink carbonators. The post mix soft drink carbonator takes water and carbonates it using Carbon Dioxide (CO_2) from a refillable tank.
This carbonated water is then mixed with syrup to produce the soft drinks served and restaurants, movie theaters at other establishments. This type of system is illustrated in figure 1.

Initially one wonders whether any backflow protection is needed. After all, we drink the sodas don't we? What would be the problem if some soda got into the drinking water? Further investigation shows that the CO_2 is under pressure and could, thus, create backpressure into the drinking water system. In such a case when backpressure is present a minimum of a double check valve assembly is typically required. There would, however, seem to be no contaminants (i.e., health hazards) which would warrant a reduced pressure principle assembly.

Yet further investigation demonstrates that there is a potential for the CO_2 or carbonated water to backflow into the water supply copper piping. This is where the problem occurs. The acidic carbonated water or carbon dioxide may leach the copper out of the copper piping. This may be detected by the discoloration of the water (i.e., blue water), or air (i.e., carbon dioxide) coming out of nearby faucets, or an "off-taste" in the soft drink being served. Ingesting large amounts of copper can cause acute gastrointestinal distress, vomiting and diarrhea. Should a person have food in their stomach, the proteins in the food may minimize the irrating effects of the copper. Because of this possibility of the leaching of the copper piping, there has been concern with any copper alloy being exposed to the carbonated water or CO_2. Therefore, we now have reason to need a reduced pressure principle assembly. However, to complicate matters, the bronze materials from which most RPs (i.e., 2" and smaller) are constructed fall into the "copper alloy" category. This raises another issue of concern. To eliminate copper alloy in the water line to the carbonator, some jurisdictions have been requiring a stainless steel bodied RP as the backflow protection. However, it is the Foundation's position that an RP, bronze, plastic or stainless steel bodied, is acceptable with the following guidelines:

1. The carbonator pump does not exceed 175 psi, so that the RP is capable of handling the potential backpressure. (Of course the backpressure would only occur if the non-vented double ball checks at the carbonator pump fail. For the RP to be contacted by the carbonated water or CO_2, the second check of the RP would also have to fail so that the CO_2 could travel back towards the RP.)

2. Piping from the RP to the carbonator is not made of a copper alloy (i.e., copper tubing). Reinforced plastic or rubber, or stainless steel tubing is to be used.

3. RP is field-tested in-situ at least annually.

Post Mix Carbonated Beverege Mixers

4. RP is installed in compliance with local administrative authority requirements.

If these criteria are met there is no reason to require a stainless steel assembly. A bronze reduced pressure principle assembly should provide adequate backflow protection and the potential of carbonated water coming in contact with the assembly is minimal.

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