INTERPRETATIONS & PROCEDURES

FIRE PREVENTION DIVISION

SUBJECT: Secondary Water Supply- Storage Tank Volume		CODE SECTION(S): '07 IFC 903.3.5.2 '07 NFPA 20- 5.14.3.1-2
ISSUED BY		
NAME: Travis E. Allen, PE	SIGNATURE:	ISSUE DATE: September 5, 2007
TITLE: Assistant Fire Marshal – Plan Review		NUMBER: 2007-2

ATTACHMENTS **SUPERSEDES** _____

ISSUE / QUESTION:

How does the City of Bellevue determine the secondary water volume requirements of IFC 903.3.5.2, in particular when a storage tank and fire pump are utilized?

INTERPRETATION:

The storage tank volume must provide the net usable volume requirements of IFC 903.3.5.2 as amended by the City of Bellevue. The net usable volume is calculated based on delivering positive pressure at the pump suction flange for tanks located below the centerline of the pump or calculated based on delivering -3psi at the at the pump suction flange for tanks at or above the centerline of the pump, in accordance with NFPA 20-07, 5.14.3.1-2.

DISCUSSION:

IFC 2007 Section 903.3.5.2 Secondary Water Source, has been amended by the City of Bellevue to help clarify the volume requirements. Part of this clarification is the use of the term "*net usable volume*". This helps to ensure that the tank design provides the required volume in a usable manner to the pump, as opposed to merely being able to hold that amount of water.

Technically speaking, NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection does not directly address the concept of net usable volume. The only guidance provided under section 5.14.3 is that the water needs to arrive at the pump suction flange at a positive gage pressure when flowing 150% of the rated design flow (there is an exception that is covered further down in this document).

If the tank sits below the centerline of the pump, the water between the bottom of the tank and the centerline plane of the pump is not usable because this water can't leave the tank and rise to the level of the pump and still arrive at a positive pressure. In fact, the usable water will need to start higher than the centerline plane of the pump because the elevation pressure needs to

Bellevue Fire Department • PO Box 90012 • Bellevue, Washington 98009-9012
450 110th Avenue NE – Third Floor East
Phone: [425] 452-6892 • Fax: [425] 452-5287

overcome the friction loss in the suction pipe so that the water can still arrive at a positive gage pressure. For example, if the friction loss of water flowing (at 150% of rated flow) through the suction pipe is 5 psi, then the useable water in the tank starts 11.5 ft above the centerline of the horizontal pump. The elevation head of 11.5 ft of water is 5 psi (11.5 x 0.433 = 5), so the water needs to start at the suction piping at 5 psi, travel through the pipe and lose 5 psi of friction loss to arrive at the pump suction flange at a positive gage pressure. Any water below this 11.5 ft. plane does not count as usable since it will not arrive at the suction flange at a positive pressure.

If the bottom of the tank is on the same plane as the pump, or is above the level of the pump, then NFPA 20 allows the water to arrive at the pump suction flange at a pressure of -3 psi (see section 5.14.3.2). In this case, the standard is allowing friction loss of 3 psi in the piping. If the friction loss in the piping exceeds this, then the usable portion of the tank starts higher. For example, if there is 5 psi of friction loss in the suction pipe, then the usable water will start at the plane 4.6 ft above the centerline of the pump because the water in the tank needs to create an elevation pressure of 2 psi in order to still arrive at the suction flange at a gage pressure of -3 or better.

ADDITIONAL INFORMATION:

- Bellevue 2007 International Fire Code Amendments:
  http://www.bellevuewa.gov/bellcode/bellcc23.html#23.11.100

- Handbook for Stationary Fire Pumps, NFPA 20; 2007 Edition