Memo accompanying Rural Fire Demand Tech Bulletin

General

This memo is provided to support Technical Bulletin IWSTB-2024-05, regarding fire-fighting flow in the Rural area.

This bulletin clarifies the previous statement, found in IWSTB-2021-03, “the requirements for levels of fire protection on private property in rural areas are based on the Fire Underwriters Survey (FUS) method in all cases”.

There were some questions as to the applicability of the FUS, as amended, and that issue is addressed first; the City was of the opinion that it could ask for the FUS in Rural areas - regardless, the change in bulletin IWSTB-20204-05 establishes that it can, and does.

The definition of urban and rural herein is intended to only apply to the information carried herein and for Technical Bulletin IWSTB-2024-05 and is not intended for any other use.

The requirements of the Ontario Building Code (OBC), as amended OBC are found in Appendix A, Volume 2, of the OBC, as amended, section A-3.2.5.7 (page 44 of the 2024 version).

The references below are intended for buildings defined as Part 3 occupancies under the OBC (that is, applications that are applied for under Site Plan Control). Buildings defined as Part 9 occupancies under the OBC (that is applications that are applied for under residential Plan of Subdivision), generally do not apply for this criteria (except, possibly, exceptionally large dwellings). Residential Plans of Subdivision do not require fire-fighting review for the individual lots (again, except, very large dwellings), however, they may require a tank (or tanks) depending on several factors.

This memo makes no recommendations for changes around using FUS for watermain sizing.

Direction

For fire flow calculations only, Ottawa Fire Services (OFS) will define **Urban** to solely mean pressurized hydrant system available for firefighting that meets OBC requirements and is independent of location within the City as it pertains to firefighting force (i.e.: full-time vs paid on-call are equivalent)

Urban (Pressurized Hydrants)

For fire flow and water storage calculations (OBC Part 3 buildings), the following is required in Urban areas;

- OBC method for fire flows permitted until it reaches OBC maximum fire flow of 9000 L/min
- Once OBC maximum reached, applicant is to use FUS method for fire flow calculation

- Multi-hydrant approach as per the NRC method up to 150m (contained within the technical bulletin) is permitted to achieve required fire flows for both OBC or FUS method as required
- Confirmation that the water network is capable of delivering the required fire flows must be provided

Switching from the OBC to the FUS method at the 9,000 L/min threshold for an urban building design is necessary for several reasons. Once the building reaches a volume of Q > 270,000 L, the highest flow rate is 9,000 L/min (***Table 1***). Although this flow rate is difficult to achieve in fire area and vicinity, even a building 10 times larger would still be limited to 9,000 L/min. Therefore, it is essential to switch to the FUS method at this threshold for calculating fire flow. The FUS method is more conservative, requiring substantially more water for the same building, increasing the chances of a successful fire attack and better protection of surrounding properties. For both OBC and FUS methods, the NRC multi-hydrant approach can be used to achieve the required fire flows.

Rural (No Pressurized Hydrants Available)

For fire flow calculations only, OFS will define rural to solely mean that there is no pressurized hydrant system available for firefighting (This is independent of location within the city as it pertains to firefighting force). OFS is certified under FUS for Superior Tanker Shuttle and can deliver 1,900 L/min within 5 minutes of arrival (refer to Figure 1). The OBC minimum for water storage is for 30 minutes, so for buildings that qualify under FUS, are permitting up to 57,000 L (From 30 minutes x 1900 L/min) of storage reduction (See ***Sample Calculations*** for more information).

Rural firefighting has many considerations, but one of the most important aspects is the ability for a fire department to respond with its own continuous water supply. Under the FUS, OFS is certified to Superior Tanker Shuttle levels which means we can deliver a minimum of 1900 L/min (Refer to Figure 1), but to qualify the building must be within 5 km of a fire station and 2.5 km of an approved water supply (refer to Figure 2). We wanted to give some storage reduction credit for our ability to shuttle water, while still staying within the general confines of the OBC minimum storage which leads to a few different scenarios for required on-site water storage.

In Rural areas, for fire flow and water storage calculations (OBC Part 3 buildings), the following criteria is required.

If the building meets FUS Superior Tanker Shuttle distance requirements (≤ 5 km to fire station and ≤ 2.5 km to approved water supply):

- OBC method for fire flows permitted for all fire flows < 9,000 L/min
    - Storage Volume = Q – 57,000 L
- If calculated fire flow = 9,000 L/min, applicant is to use the FUS method for fire flow calculation
    - Storage Volume = (FUS fire flow x 30 minutes) – 57,000 L

If the building does **not** meet FUS Superior Tanker Shuttle distance requirements (≥ 5 km to fire station **and/or** ≥ 2.5 km to approved water supply):

- OBC method for fire flows permitted for all fire flows < 9,000 L/min
    - Storage Volume = Q calculated by OBC

- If calculated fire flow = 9,000 L/min, applicant is to provide calculations for FUS fire flows, NFPA 1142, and Q calculated by OBC
    - ***Storage Volume = Special Evaluation***

- Minimum storage tank volume permitted for firefighting is 38,000 L (Equates to 10,00 U.S. gallons)
- OFS maximum flow rate from a single draft point is approximately 4,500 L/min
    - OBC flow rates = 2,700 or, 3,600 or 4,500 L/min (and one draft point required)
    - OBC flow rates = 5,400 or 6300 L/min (by connected storage and two draft points)
    - OBC flow rate = 9,000 L/min change to FUS flow rate (by connected storage and two draft points)

The specifications and locations of storage and connection to be coordinated with OFS Engineer

Despite the foregoing criteria, an application may require additional water storage in excess of OBC calculation where, in the sole opinion of the OFS, additional protection is required – this is expected to be les than 10% of applications.

If there is a sprinkler system a special review will be required based upon NFPA 13.

Sample Calculations:

Example 1: For a proposed building that meets the distance requirements of FUS and has a calculated OBC fire flow < 9000 L/min, a reduction in the storage value (Q) down to the minimum storage tank size of 38000 L. Storage Volume = Q – 57,000 > 38000 L

Example 2: For a proposed building that does **not** meet the distance requirements of FUS and has a calculated OBC fire flow < 9,000 L/min, a reduction in the Q storage value is not permitted; Storage Volume = Q.

Example 3: For a proposed building that meets the distance requirements of FUS and has a calculated OBC fire flow = 9,000 L/min, there is a hybrid solution. The flow rate is increased by requiring FUS fire flows for 30 minutes and allow a reduction in the calculated total for tanker shuttle. Storage Volume = (FUS fire flow x 30 minutes) – 57,000 L

Example 4: For a proposed building that does **not** meet the distance requirements of FUS and has a calculated OBC fire flow = 9,000 L/min, allow a reduction in the Q storage value is not permitted and will require an increase. Storage Volume = Special Calculation (possibly NFPA 1142 or FUS – to be discussed with OFS and Development Review).

Please refer to Table 2 for examples of calculating storage volumes

Table 1: OBC Fire Flows

Part 3 Building under the Building Code	Required Minimum Water Supply Flow Rate, L/min
One-storey building with building area not exceeding 600 m^2	1,800
All other buildings	2,700 (if Q ≤ 108,000 L) 3,600 (if Q > 108,000 L and ≤ 135,000 L) 4,500 (if Q > 135,000 L and ≤ 162,000 L) 5,400 (if Q > 162,000 L and ≤ 190,000 L) 6,300 (if Q > 190,000 L and ≤ 270,000 L) 9,000 (if Q > 270,000 L)

For commercial lines insurance, the Fire Department must be able to deliver a flow rate of not less than 1900 LPM (400 IGPM) within 5 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).

Figure 1. *Superior Tanker Shuttle – Commercial Flow Rate*

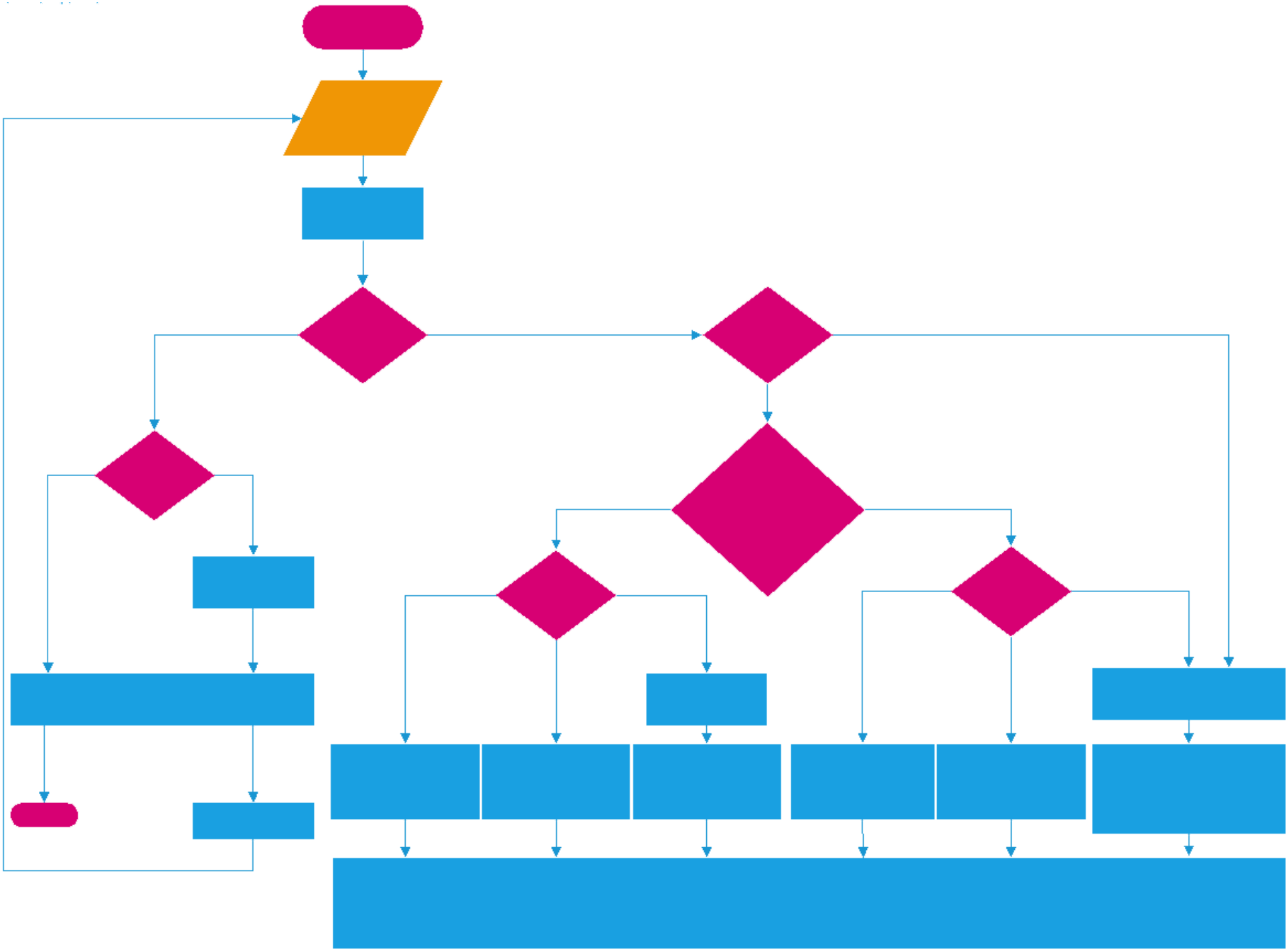
To be recognized for fire insurance grading purposes, the protected property must be located within;

- Commercial Lines (PFPC) – 5 km of a fire station AND 2.5 km of an approved water supply point
- Personal Lines (DPG) – 8 km of a fire station AND 5 km of an approved supply point

Figure 2. *Superior Tanker Shuttle – Distances*

Table 2 - Storage Calculation Examples

Calculated Q (L)	Meets Superior Tanker		Min OBC flow rate from table based on Q (L/min)	Required Storage Volume (L)	
	Fire Station within 5km	Approved Water Source within 2.5km		Q-57000 (min 38000)	Q or Special
85000	Yes	Yes	2700	28000 → 38000	85000
85000	Yes	No	2700	28000 → 38000	85000
121000	Yes	Yes	3600	64000	121000
121000	No	Yes	3600	108000	121000
255000	Yes	Yes	6300	198000	255000
255000	Yes	No	6300	189000	255000
325000	Yes	Yes	9000	270000	(FUS x 30)-57000
325000	No	Yes	9000	270000	Special



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Definition of Acronyms and Terms:

OFS – Ottawa Fire Services

OBC – Ontario Building Code

NFPA – National Fire Protection Association (www.nfpa.org)

FUS – Fire Underwriter Survey (www.fireunderwriters.ca)

FF = fire flow

PFPC – Public Fire Protection Classification – a part of FUS and Insurance Ratings

DPG = Dwelling Protection Grade – a part of FUS and Insurance Ratings

From the Ontario Building Code Appendix, A-3.2.5.7. Water Supply:

The designer needs to demonstrate choice/support/rationale for all parameters applied/selected.

$$Q = K \; x \; V \; x \; S_{tot} = Minimum \; supply \; of \; water \; in \; litres$$

where,

K = Water supply coefficient

V = Total building volume in m^3

S_{tot} = Total of spatial coefficient values from property line exposures on all sides as obtained from the formula $S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \ldots etc]$.