Annex X. Geospatial Support for Water Supply Planning

X.1 General.

A geospatial (or geographic) information system (GIS) is an integrated set of software and hardware for the collection, management and analysis of data with a spatial (locational) component. GIS technology allows different sets of data (“layers”) to be overlaid spatially in order to perform comparative and relational analysis. GIS is often associated strictly with its mapping aspects, but equally important is its ability to manage large amounts of information about features. For example, the GIS records for a dry hydrant could include not only its physical location, but also data on its elevation, rate of flow, thread type, records of testing, accessibility, and any other information that could be of value in the planning process.

The use of a GIS in support of rural water supply planning offers great benefits to water supply officers and other fire protection planners. Many of the key elements of a rural water supply system must be spatially located and analyzed as part of the planning process: Water sources, supply routes, and values-at-risk. Using a GIS to manage locations and data associated with these elements, and to geospatially analyze the relationships among them, facilitates the development of effective and efficient water supply networks.

While a fire department may not have an in-house GIS capability, there are many potential partner agencies that do. Most counties and many municipalities have at least some dedicated GIS staff, and many colleges and universities have GIS faculty. Federal, state and local conservation agencies have in-house GIS capabilities, and many of these agencies will have an overlapping interest in developing fire protection water supplies. Although less capable than commercial GIS software, there are a number of free GIS packages available that could be adopted by a fire department. A notable example of this is the MARPLOT component of the CAMEO Suite software package used by the hazardous materials community that is freely available for download from the U.S. Environmental Protection Agency.

X.2 Water Supply Network Assessment.

Use of GIS in the water supply planning process allows the whole system to be analyzed as a network. Using a GIS, the water supply planner can readily determine coverage areas for a given water source, in terms of both distance and travel time.
Without GIS, water supply planners often attempt to estimate coverage areas by drawing concentric circles around water sources at one-mile intervals (or similar distances). This technique, while providing a rough estimate, does not take into account actual road travel distances, potential obstacles (such as railroad crossings), and tends to overestimate the coverage areas for water sources.

Use of a GIS with a network analysis capability can provide a truer estimate of coverage areas by modeling the road network as traveled by fire apparatus, and can provide coverage estimates in terms of both distance and travel time. A similar assessment can theoretically be made manually, but only with painstaking effort, and the results are likely to be less accurate.

In order to conduct a network assessment, the planner will need to obtain access to a GIS software package with the ability to conduct a network analysis. These types of analyses are commonly used in the shipping industry to model the actual travel of vehicles along a road network, and can be readily adapted to fire service planning purposes.

Using GIS network analysis techniques, planners can assess the current state of the water supply system, generating mathematical polygons that show the true coverage area of existing water sources, and reveal areas of weak or non-existent coverage. With detailed address or parcel data, the travel distance to all water sources for each address in a fire protection area can be rapidly estimated using GIS network analysis techniques. Factors hindering, or potentially hindering, travel of fire apparatus, such as steep slopes, difficult curves, bridge weight restrictions, and rail crossings can all be factored into the model, providing an accurate picture of the water supply network.

Once areas of inadequate water supply are determined, planners begin the search for potential water supply sources to improve the coverage network, with the search effort focused on identified areas of weakness. Use of GIS tools can be of great assistance in this process, with numerous potential sources of data available to assist in the search. Once candidate supply sites have been identified, planners can iteratively re-run the network analysis with the hypothetical sites included in order to determine the most effective configuration of the water supply network. The results of these hypothetical analyses can then be used to prioritize supply sites for development.

X.3 Stream Assessment.

When assessing a site along a flowing stream as a potential fire protection water supply source, knowledge of basic hydrologic concepts will assist the planner in understanding the characteristics of
the site. The following definitions, adapted from the U.S. Geological Survey, apply to this section.

1. **Drainage Basin.** A part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water. Colloquially, the term “watershed” is used interchangeably with this term.

2. **Stream.** A general term for a body of flowing water. In hydrology the term is generally applied to the water flowing in a natural channel as distinct from a canal. More generally as in the term stream gaging, it is applied to the water flowing in any channel, natural or artificial.

3. **Streamflow.** The discharge that occurs in a natural channel. Although the term discharge can be applied to the flow of a canal, the word streamflow uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than runoff, as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

4. **Stream Gaging Station.** A gaging station where a record of discharge of a stream is obtained. Within the U.S. Geological Survey this term is used only for those gaging stations where a continuous record of discharge is obtained.

5. **Watershed.** Technically speaking, “watershed” refers to the divide separating one drainage basin from another and in the past has been generally used to convey this meaning. However, over the years, use of the term to signify drainage basin or catchment area has come to predominate. “Drainage divide,” or just “divide,” is used to denote the boundary between one drainage area and another.

Hydrologists divide and sub-divide the United States into standardized, successively smaller drainage basins, known as “hydrologic units.” Each hydrologic unit is uniquely identified by a code consisting of an even number of digits, known as the “hydrologic unit code” or HUC. This system applies from the largest drainage systems (e.g. the Mississippi River Basin) down to the smallest streams in a nested fashion. For example:

<table>
<thead>
<tr>
<th>Hydrologic Unit Level</th>
<th>Hydrologic Unit Code (HUC)</th>
<th>Drainage Basin Name</th>
<th>Drainage Basin Area (square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-digit</td>
<td>05</td>
<td>Ohio River basin</td>
<td>189,422</td>
</tr>
<tr>
<td>4-digit</td>
<td>0508</td>
<td>Great Miami</td>
<td>5,368</td>
</tr>
</tbody>
</table>
Supplemental to the techniques presented in section B.3.1 (Natural Water Sources – Streams) of this document, water supply planners may be able to take advantage of several resources that may be useful in assessing flowing streams as potential sources of fire protection water supply.

(1) **StreamStats.** The U.S. Geological Survey, in cooperation with state and local agencies, provides the StreamStats tool as a freely-available, web-based tool to estimate stream flows in many parts of the United States. StreamStats uses hydrologic modeling to estimate streamflow for both gaged and ungaged streams, and is considered by hydrologists to provide very accurate estimates. The availability of StreamStats varies by state, as do the model outputs available. In some states, StreamStats provides low-flow estimates by month -- data that will be immensely useful in water supply planning. For other states, however, StreamStats outputs are limited to peak flows, which will not be particularly useful for these purposes. The functionality of StreamStats is continually upgraded, state by state. Water supply planners in states without low-flow modeling capabilities should monitor the status of StreamStats for their state for upgrades, and consider engaging the local U.S. Geological Survey point of contact about getting the necessary functionality for their state. StreamStats may be accessed at [http://streamstats.usgs.gov](http://streamstats.usgs.gov).

(2) **Cooperative Stream Gage Network.** The U.S. Geological Survey, in cooperation with state and local agencies, manages a nationwide network of more than 7000 automated stream gages located at strategic locations along the country’s waterways. Most of these gaging stations report streamflow data in near-real-time, and this data can be accessed via the National Streamflow Information Program (NSIP) website at [http://water.usgs.gov/nsip](http://water.usgs.gov/nsip). Many of the gaging stations in the network have compiled several...
decades’ worth of streamflow data at their location. Even in cases where the stream under consideration is not gaged, planners should examine flow data from gaging stations in the immediate vicinity in order to understand seasonal hydrologic trends for the region. This will provide an idea of when low-flow conditions are likely to occur, and thus allow manual streamflow determinations (as described in section B.3.1) to be conducted at the appropriate times to capture low-flow conditions.

(3) State Environmental Protection Agencies. State-level environmental protection agencies concerned with water quality monitoring often determine low-flow estimates for streams at the 12-digit hydrologic unit level. While data for every watershed will not be available, water supply planners should consider inquiring with their state’s environmental protection agency to determine whether low-flow data may be available for the watershed containing any potential water supply site being considered for further development.

Water supply planners should note that streamflow information from the U.S. Geological Survey and allied state and local agencies is often provided in cubic feet per second (cfs). These data can be converted to gallons per minute (gpm) for fire planning purposes by use of a conversion factor:

\[ Q_{\text{gpm}} = Q_{\text{cfs}} \times 448.831169 \]

Where \( Q_{\text{gpm}} \) is flow in gallons per minute, and \( Q_{\text{cfs}} \) is flow in cubic feet per second.

Water supply planners should be careful to differentiate between total estimated streamflow, and the proportion of that flow that can be captured and exploited for water supply purposes. Unless a stream is to be fully impounded, only a fraction of the total estimated flow will be exploitable, with the amount dependent on streambed characteristics and fire department drafting equipment capabilities. Methods described in this document yield total flow estimates, including, in some cases, flow occurring below the surface of the streambed. Further study of proposed drafting sites will be necessary to determine whether the site is truly suitable as a fire protection water supply source.

X.4 Pond Assessment.

There are many manual techniques for estimating the depth and volume of water in ponds, lakes and similar water bodies. These manual methods have the disadvantage of providing generalized estimates for the entire water body, rather than detailed depth profile information. Using GIS when assessing ponds as potential water supply sources can yield detailed volume estimates as well as detailed depth profiles that can assist in locating dry hydrant placement sites.
The depth and volume of ponds and lakes tend to fluctuate seasonally within the year, as well as varying from one year to the next. For fire protection water supply planning purposes, it is important to collect depth and volume data representative of low-water (drought) conditions, when volumes are expected to be at their minimum. In order to most accurately reflect low-volume conditions, depth soundings should generally be collected when the pond or lake is at its seasonal low depth. Accessing U.S. Geological Survey streamflow data from gaging stations in the vicinity of the pond can help the planner to understand the seasonal hydrologic fluctuations affecting the region, and help plan the appropriate time to take soundings. Generally, when local streams are at their lowest seasonal flows, local ponds are lakes are also likely to be at their lowest levels.

When pond depth soundings are collected in conjunction with a geospatial position system (GPS) unit, the data (latitude, longitude, and depth) can be analyzed in any GIS system with a three-dimensional analysis capability to yield detailed volume estimates and depth contours (bathymetry). The depth contours developed with these tools can be used to guide placement of dry hydrants and other drafting facilitation devices.

While depth soundings have traditionally been collected manually using plumb lines or poles, these methods are inefficient, requiring considerable time to collect relatively few readings. Use of a portable recreational sonar unit (“fish finder”) on a small watercraft, especially when combined with a GPS unit, can yield many more soundings, of equal quality, in a shorter period of time. With practice, more than 100 soundings per hour can be collected using this method. This is an important consideration when using a GIS system to develop bathymetry data for the pond. The more data collected in the field, the more accurate the resulting GIS-generated estimates will be.

X.5 Planning for Water Supply.

X.5.1 Water Supply Zones. The establishment of water supply zones (WSZ), driven by geography, needed fire flow (NFF) estimates, and water supply source capabilities, provides a framework for water supply planning, and will be greatly facilitated by the use of GIS tools. Once NFF have been estimated for the planning area, properties can be grouped according to location and NFF requirements, and water supply can then be planned for the group. Properties with exceptionally high NFF requirements may be identified as target hazards and receive individual water supply planning attention, rather than attempting to plan fire protection for a larger area based on a single high-demand property.

X.5.2. Water Shuttle Routes. On rural road networks, it is beneficial to establish mobile water supply apparatus (tanker/tender) shuttle routes
with one-way traffic flow when possible, thereby avoiding the need for fire apparatus to pass one another on narrow roadways. Shuttle routes can be readily pre-planned using a GIS, ensuring that all properties in a fire protection area are linked to an established water supply source by a designated shuttle route. Generally, shuttle routes should be in the form of a loop beginning and ending at the water supply source, although out-and-back routes with two-way traffic flow may be unavoidable in some areas. Pre-designated water shuttle routes may also form the basis for planning water supply zones, with all properties bordering a pre-planned shuttle route grouped together in a zone.

X.5.3 Water Supply Designations. For every water supply zone (WSZ) or target hazard in a fire protection area, planners should consider designating associated water supply sources as follows:

(1) **Primary Water Source.** This is the principal source expected to meet the estimated NFF requirements of the WSZ or target hazard. In most cases, this will be the closest developed water supply source to the WSZ, although in the case of target hazards with high NFF requirements, closer sources may be bypassed in favor of a more distant source with higher capacity. Primary sources should have no seasonal or access restrictions, and should be designed with sufficient capacity to meet all NFF requirements of their assigned WSZ or target hazard. A given source may serve as the primary supply source for more than one WSZ. Primary supply sources should have the highest priority for allocation of water supply development effort and funding.

(2) **Secondary Water Source.** For each WSZ, one or more secondary water supply sources should be identified in addition to the primary source. Secondary sources, alone or in combination, should be able to meet the NFF requirements of the WSZ or target hazard. Secondary sources should be as reliable as primary sources, but may be less favorable due to distance, or the need to combine multiple secondary sources to achieve the NFF requirement. Secondary sources serve as a back-up to the primary source, in the event that it is unavailable, and provide additional supply when needed. Secondary sources for one WSZ may serve as the primary source for a different WSZ or target hazard.

(3) **Supplemental Water Source.** Potentially usable water supply sources that do not meet the capacity or accessibility requirements to be designated as primary or secondary sources should still be assessed and planned as potential supplemental sources of supply. These sources may have seasonal limitations due to drought or freezing, have unacceptable volume or flow, or suffer from other limitations. Planners should not overlook the
potential of these sources, under certain circumstances, to augment other water supplies or serve as an initial attack resource.

X.5.4 Water Supply Facilities. In addition to the development necessary at water supply sources to support access and stationary drafting, planners should also consider needs at the point of water delivery, commonly referred to as the dump site. For each water supply zone (WSZ), it may be beneficial to pre-identify areas with sufficient space to accommodate the portable tanks, drafting engines, and apparatus maneuver area necessary to support delivery of water at the dump site. Construction or expansion of hard surface areas for dump site operations may be necessary to support safe and effective dump site operations. Establishment of pre-designated dump sites for a WSZ, with provisions for attack engine supply via a large-diameter hose (LDH) lay, may be a better option than attempting operations closer to an incident scene where there is limited space for portable tanks and apparatus maneuvering. Planning locations for these sites, along with estimates of needed LDH lays, will be greatly facilitated with the use of GIS tools.


X.6.1. National-Level Geospatial Data Sources. The following geospatial data sets are in the public domain, are freely available for download, and are in file formats usable by all major GIS software systems. These data sets are maintained at the national level by federal agencies, but users may download smaller subsets for their area of interest.

(1) National Hydrography Dataset (NHD). A networked dataset of all known stream features, covering the entire United States. In addition to stream features, lakes, springs, wetlands, gages, dams and other hydrologic features are included, although these data are less comprehensive than the stream data. The NHD can assist the planner in locating streams and understanding the local hydrologic environment. Further information and data downloads at http://nhd.usgs.gov/

(2) Watershed Boundary Dataset (WBD). A seamless data set containing all hydrologic units (drainage basins), at all hierarchical levels (HUC-2 through HUC-12) for the United States. The WBD is maintained by the U.S. Geological Survey, and data are available for download in pre-configured sets by region or state. The WBD can assist the planner in understanding the local hydrologic environment, and in determining which drainage basins for which additional information on streamflow will be required. Further information and data downloads at http://nhd.usgs.gov/wbd.html

(3) National Wetlands Inventory (NWI). The U.S. Fish and Wildlife Service maintains the interagency National Wetlands Inventory
(NWI) for the United States, which can also be of assistance in locating potential water supply sources. Not all identified wetlands will be suitable for development as water supply sources, but many are associated with ponds or other deep water bodies that may be suitable. In the near future, the NWI will be superseded by the Surface Waters Inventory (SWI), an improved system with expanded data. The NWI is accessible online at http://www.fws.gov/wetlands/

(4) National Agriculture Imagery Program (NAIP). Under this program, the U.S. Department of Agriculture collects full-color aerial photography during the peak growing season (“leaf-on”) at one-meter resolution, for purposes of conservation planning and program compliance monitoring. Imagery is collected on a state-by-state basis, with a new set collected every two to three years, generally. This imagery will be of assistance in locating potential water supply sources that are not visible from ground level when obscured by vegetation or topography. NAIP imagery is provided as county-level mosaic files, and may be downloaded at http://datagateway.nrcs.usda.gov/

(5) Land Cover Datasets. Both the U.S. Department of Agriculture (USDA) and U.S. Geological Survey (USGS) maintain national land cover datasets derived from satellite imagery. The two datasets are complementary, with each emphasizing different land cover types. Both datasets contain information on water bodies, and can be used to locate potential water supply sources not visible from ground level. The USDA National Agricultural Statistics Service CropScape data set can be accessed at: http://nassgeodata.gmu.edu/CropScape/ and the USGS National Land Cover Dataset (NLCD) can be accessed at: http://landcover.usgs.gov/

(5) TIGER Files. The U.S. Census Bureau maintains the TIGER (topologically integrated geographic encoding and referencing) files. TIGER is a comprehensive set of geospatial data covering all political boundaries, roads, census data collection units (tracts, blocks, etc.), landmarks, and other features in the United States. In many cases, TIGER geodata are not perfectly accurate when compared to more detailed local sources or aerial photos. However, where higher resolution data are not available, TIGER geodata will yield very acceptable results. TIGER data sets also have the advantage of being topologically integrated across political boundaries, making the roads data especially well-suited for network analysis purposes. TIGER files are available for download at http://www.census.gov/geo/maps-data/data/tiger-line.html
X.6.2. Local Geospatial Data Sources. The type and quality of geospatial data sets available from state, county, municipal and private sector sources is widely variable in terms of content and quality, yet in many cases these data sources will prove to be very valuable for the planning effort. Common local sources of geospatial data include, but are not limited to, the following:

(1) Dispatch Centers. Computer assisted dispatch (CAD) systems are based on various GIS software platforms, and local dispatch centers generally have access to some of the most accurate road and addressing data available. These centers may be able to provide their geospatial data to water supply planners in exportable file formats for use in other GIS systems.

(2) Engineering and Transportation Agencies. State departments of transportation and county-level engineer offices often have extensive data sets regarding road networks, bridges, rail crossings and other transportation network items.

(3) Property Taxation Agency. The local agency responsible for property tax valuation may be a source of detailed parcel and improvements data for use in GIS, data sources that can assist the planner in assessing the effectiveness of the water supply network. Additionally, these agencies often purchase high-resolution aerial photography of their jurisdiction to assist in property valuation, sometimes including oblique-angle imagery. In many cases, imagery acquired for these agencies will be among the highest quality and most current of all available sources.

(4) Water Utilities. Local and regional water utilities often maintain geospatial data sets on water mains, hydrants, and other water supply items.

X.6.3. Conservation Agencies. For planning rural water supply networks, conservation, natural resources, and environmental agencies at all levels of government can be of great assistance. These agencies have an interest in water resources, and generally have a high degree of expertise on the subject, although agency staff may not be specifically versed in fire protection needs. Additionally, these agencies tend to have GIS expertise within their staffs, and may be able to provide technical support. Water supply planners should make contact with the local representatives of these agencies early in the planning process to determine what data and technical assistance may be available.

(1) Federal Agencies. The most ubiquitous federal agency with regard to water supply planning is the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The NRCS has a presence in nearly every county, and
the agency has deep expertise in hydrology, water source development, engineering, and GIS. Normally, NRCS offices are co-located with local conservation districts (discussed below), with staff of the various agencies working cooperatively on conservation planning and related efforts. Other federal agencies that may be locally important include the USDA Forest Service, the land management agencies of the U.S. Department of the Interior (Bureau of Land Management, National Park Service, Fish and Wildlife Service, and Bureau of Indian Affairs), Department of Defense military installations, and others depending on the specific location.

(2) State Agencies. The state-level natural resources and environmental quality agencies can be a potential source of geospatial data and technical support, although capabilities and interests vary widely across the country. Water supply planners should familiarize themselves with their state’s agencies and make contact to determine what assistance may be available.

(3) Conservation Districts. The more than 3,000 conservation districts in the United States are organized along county or watershed boundaries, and provide local-level support to agricultural and natural resources conservation efforts in cooperation with NRCS and state agencies. Technicians and specialists working for these agencies are generally very well versed in water source development, and can be of great assistance in the development of water supply networks. The specific names for conservation districts vary from state to state, but planners may determine their local district at the following site: http://www.nacd.net/about/districts/directory

(4) Non-Governmental Organizations (NGOs). Certain conservation-oriented NGOs may be locally important to the water supply planning process, as some of these organizations have expertise in hydrology, wildland fire management and GIS. Planners should familiarize themselves with locally active conservation NGOs, particularly those managing nature preserves and other protected lands, to determine what assistance they may be able to offer.

Statement of Problem and Substantiation for Public Input

Inclusion of this proposed geospatial information systems (GIS) support annex provides amplifying material for water supply planners regarding the use of GIS tools to assist in the effective implementation of the NFPA 1142 standard.

Submitter Information Verification

Submitter Full Name: JEREMY KELLER
Committee Statement

Resolution: FR-18-NFPA 1142-2014
Statement: Add new Annex J Geospatial Support for Water Supply Planning and rename following annexes accordingly. The addition of this new geospatial information systems (GIS) support annex provides amplifying material for water supply planners regarding the use of GIS tools to assist in the effective implementation of NFPA 1142.

Public Input No. 10-NFPA 1142-2013 [ Section No. 1.1.2 ]

1.1.2
An adequate and reliable municipal-type water supply is one that is sufficient every day of the year to control and extinguish anticipated fires in the municipality, particular building, or building group served by the water supply that meets the jurisdiction’s adopted design and fire flow criteria.

Statement of Problem and Substantiation for Public Input

The wording “control and extinguish..” is an unreasonable performance standard. The fire flow required to “control and extinguish” is highly dependent on the fire growth rate and delay in alarm. There are many situations where a fire will progress beyond the capability of the water system to extinguish a fire. Fire flow formula’s establish reasonable fire flow delivery rates based on a risk assessment. Utilizing these fire flow formulas should be the basis to determining if an adequate and reliable delivery system exists. The new annex text references the normally accepted fire flow formulas.

Submitter Information Verification

Submitter Full Name: Bill Galloway
Organization: Southern Regional Fire Code De
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Oct 30 13:47:28 EDT 2013
Committee Statement

Resolution: FR-1-NFPA 1142-2014
Statement: The term "municipality" is specific to a City. It would not include a county, district or other form of government. Jurisdiction is more encompassing.

Public Input No. 45-NFPA 1142-2013 [ Section No. 1.1.2 ]

1.1.2
An adequate and reliable municipal-type water supply is one that is sufficient every day of the year to control and extinguish anticipated fires in the municipality, particular building, or building group served by the water supply provides the required fire flow from the municipal-type water system in accordance with AWWA M31 Distribution System Requirements for Fire Protection.

Statement of Problem and Substantiation for Public Input

It is unreasonable to expect that a municipal type water system can be "sufficient every day of the year to control and extinguish anticipated fires in the municipality, particular building, or building group." There are many fire scenarios that will extend beyond the capability of the municipal type water system to extinguish a fire even in a well served suburban setting. The inclusion of the M31 standard provides a reasonable set of criteria to evaluate the system to see if it is adequate and reliable. The M31 standard is referenced by 1141 and is appropriate as a standard to be referenced here.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Dec 30 14:05:54 EST 2013

Committee Statement

Resolution: FR-1-NFPA 1142-2014
Statement: The term "municipality" is specific to a City. It would not include a county, district or other form of government. Jurisdiction is more encompassing.
1.1.2
An adequate and reliable municipal-type water supply is one that is: A municipal-type water supply that is sufficient every day of the year to control and extinguish anticipated fires in the municipality, particular building, or building group served by the water supply.

Statement of Problem and Substantiation for Public Input

Revise and relocate this section to chapter 3 definitions. As currently written, section 1.1.2 is really a definition in the Scope section. It is more appropriate as a defined term in chapter 3.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address: 
City:
State:
Zip:
Submittal Date: Mon Dec 30 14:16:31 EST 2013

Committee Statement

Resolution: FR-1-NFPA 1142-2014
Statement: The term “municipality” is specific to a City. It would not include a county, district or other form of government. Jurisdiction is more encompassing.

The term “municipality” is specific to a City. It would not include a county, district or other form of government. Jurisdiction is more encompassing.
Committee Statement

Resolution: FR-1-NFPA 1142-2014

Statement: The term “municipality” is specific to a City. It would not include a county, district or other form of government. Jurisdiction is more encompassing.

Public Input No. 31-NFPA 1142-2013 [New Section after 1.3.3]

Retroactivity

1.4 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

Statement of Problem and Substantiation for Public Input

Insert the standard retroactivity provisions from the NFPA Manual of Style. This provides guidance to the AHJ to the proper application of the standard in existing installations.
Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Nov 21 19:48:25 EST 2013

Committee Statement
Resolution: This language is inconsistent and the AHJ has the ability to apply this standard retroactively as deemed necessary.

Public Input No. 32-NFPA 1142-2013 [ New Section after 1.4 ]

1.6 Units and Formulas
(Insert the standard "Units and Formulas" language from the NFPA Manual of Style.)

Statement of Problem and Substantiation for Public Input
Insert the standard Units and Formulas language from the NFPA Manual of Style. This will include units, symbols and conversion factors to address the metric units.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Nov 21 20:17:34 EST 2013

Committee Statement
Resolution: FR-2-NFPA 1142-2014
Statement: Inserting language for units and formulas consistent with the NFPA manual of style, and adding statements on alternative and modifications.
Chapter 2. Referenced Publications

2.1 General.
The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.
National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

2.3 Other Publications.

2.4 References for Extracts in Mandatory Sections.

Statement of Problem and Substantiation for Public Input
Updated to current editions.
Public Input No. 57-NFPA 1142-2014 [Chapter J]

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [ Not Specified ]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 10 00:22:08 EDT 2014

Committee Statement

Resolution: FR-5-NFPA 1142-2014
Statement: Updating references.


Public Input No. 16-NFPA 1142-2013 [ New Section after 4.1.1.1 ]

4.1.1.1.1 The plans shall specify how the minimum required water supply is being provided including all alternative water supply sources and their design specifications.

4.1.1.1.2 Construction shall not commence until the AHJ has approved the alternative water supply design.

Statement of Problem and Substantiation for Public Input

The current language in 4.1.1.1 only specifies that plans shall be submitted to the AHJ in order to calculate the required water supply. However, the current language does not address the need for the AHJ to see how the alternative water supply is intended to be provided. This is just as important, if not more important, than the initial calculation. In addition, construction should not proceed until there is an approved design to meet the requirements of this standard.

Submitter Information Verification

Submitter Full Name: Bill Galloway
Organization: Southern Regional Fire Code De
Street Address:
City:
Committee Statement

Resolution: FR-3-NFPA 1142-2014
Statement: This change addresses the timing of the availability of the water supply. The water supply should be available on-site when the potential need for a fire protection water supply exists. This is usually at the time of construction activity beginning and combustibles being brought on-site.

Public Input No. 47-NFPA 1142-2013 [ New Section after 4.1.1.1 ]

4.1.1.1.1 The property owner shall be responsible for submitting to the AHJ how the minimum water supply shall be provided prior to the approval of new construction.

Statement of Problem and Substantiation for Public Input

The current 4.1.1.1 indicates that the property owner is responsible for submitting plans so the minimum water supply can be calculated. However, there is no requirement that the property owner provide any documentation as to how the minimum water supply will be provided. This should be a basic submittal requirement to the AHJ so that that AHJ can review and approve the method of supply prior to new construction.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 30 14:31:54 EST 2013

Committee Statement

Resolution: This is already addressed by section 4.1.4
4.1.1.1 The minimum water supply shall be available prior to combustibles being brought on-site.

Statement of Problem and Substantiation for Public Input

This PI addresses the timing of the availability of the water supply. The water supply should be available on-site when the potential need for a fire protection water supply exists. This is usually at the time of construction activity beginning and combustibles being brought on-site.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 30 14:32:56 EST 2013

Committee Statement

Resolution: FR-3-NFPA 1142-2014
Statement: This change addresses the timing of the availability of the water supply. The water supply should be available on-site when the potential need for a fire protection water supply exists. This is usually at the time of construction activity beginning and combustibles being brought on-site.
Public Input No. 50-NFPA 1142-2013 [ New Section after 4.1.1.2 ]

4.1.1.2.1 The minimum water supply shall be available prior to the structural, design or occupancy change of an existing building.

Statement of Problem and Substantiation for Public Input

As in the PI to 4.1.1.1, the water supply should be available on site prior to the change being implemented that is proposed by the property owner. The owner should ensure those improvements, if any, are in place prior to on-site hazard increase occurring.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
  City:
  State:
  Zip:
Submittal Date: Mon Dec 30 14:38:14 EST 2013

Committee Statement

Resolution: This is already addressed by Section 4.1.4
4.1.5 The AHJ shall be permitted to specify the rate that the required water supply shall be delivered from the alternative water sources.

**Statement of Problem and Substantiation for Public Input**

Section 4.6 appears to provide a specification that requires the Fire Department to perform with respect to the rate of water supply delivery. However, there appears to be no language in the standard that addresses the minimum performance for rate of delivery for alternative water supply sources. As an example, it would make no sense for the standard to require 200,000 gallons of stored water but the ability to utilize that water supply source was only limited to 250GPM. This proposed language clarifies that the AHJ can specify the rate of delivery of the water supply source.

**Submitter Information Verification**

**Submitter Full Name:** Bill Galloway  
**Organization:** Southern Regional Fire Code De  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Oct 30 13:53:15 EDT 2013

**Committee Statement**

**Resolution:** FR-6-NFPA 1142-2014  
**Statement:** The requirements within 4.6 have been updated and table 4.6.1 has been revised. Table 4.6.1 250 gpm was removed as this is not an adequate delivery rate, 750 gpm was removed as it is not a common design threshold.
**Total Water Supply Required** | **Rate Water Is Available at the Incident**
---|---
<2,500 | 9.459 | 250 | 950
2,500–9,999 | 9,460–37,849 | 500 | 1,900
10,000–19,999 | 37,850–75,699 | 750 | 2,860
≥20,000 | ≥75,700 | 1,000 | 3,800

Revise table 4.6.1 to provide for “Rate Water Is Available at the Incident” with increments greater than 1,000 GPM. Example...1,500, 2,000, etc.

### Statement of Problem and Substantiation for Public Input

Table 4.6.1 currently tops out at >=20,000 gallons and 1,000 gpm. There are numerous situations where the “Total Water Supply Required” will vastly exceed the 20,000 gallon mark and move into 50,000, 100,000 or even 200,000 gallons of water required. These greater demands in available water should also translate into greater rates of water delivery escalating with the table. If the water cannot be delivered at a rate needed to check the fire growth rate, the volume of water available become immaterial.

### Submitter Information Verification

**Submitter Full Name:** Bill Galloway  
**Organization:** Southern Regional Fire Code De  
**Street Address:**  
City:  
State:  
Zip:  
**Submittal Date:** Wed Oct 30 13:49:55 EDT 2013

### Committee Statement

**Resolution:** FR-6-NFPA 1142-2014  
**Statement:** The requirements within 4.6 have been updated and table 4.6.1 has been revised. Table 4.6.1 250 gpm was removed as this is not an adequate delivery rate, 750 gpm was removed as it is not a common design threshold.

### Public Input No. 12-NFPA 1142-2013 [ Section No. 4.6.1 ]

4.6.1  
The fire department shall develop the capability to deliver the amount of water determined in accordance with Sections 4.2 through 4.5 to the incident scene at the rate shown in Table 4.6.1.

Table 4.6.1 Minimum Capability of Fire Department to Deliver Water
Reconcile the language in 1.3.1 and the Table 4.6.1. These two sections appear to provide conflicting direction.

Statement of Problem and Substantiation for Public Input

Section 1.3.1 states that the standard is not intended to address fireground operational procedures. However, Table 4.6.1 specifically creates a fireground operational constraint on the FD with a minimum capability of the fire department to deliver water. These two sections appear to conflict in both addressing a fireground operational expectation/procedure.

Submitter Information Verification

Submitter Full Name: Bill Galloway
Organization: Southern Regional Fire Code De
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Oct 30 13:51:30 EDT 2013

Committee Statement

Resolution: FR-6-NFPA 1142-2014
Statement: The requirements within 4.6 have been updated and table 4.6.1 has been revised. Table 4.6.1 250 gpm was removed as this is not an adequate delivery rate, 750 gpm was removed as it is not a common design threshold.

Public Input No. 43-NFPA 1142-2013 [ Section No. 4.6.1 ]

4.6.1
The fire department shall develop the capability to deliver the alternative water supply shall be capable of supplying the amount of water determined in accordance with Sections 4.2 through 4.5 to the incident scene at the rate shown in Table 4.6.1.

Table 4.6.1 Minimum Capability of Fire Department Alternative Water Supply to Deliver Water
Statement of Problem and Substantiation for Public Input

The current language in 4.6.1 appears to conflict with section 1.3.1. Section 1.3.1 states that the standard does not address fireground operational procedures such as rate of water application. However, section 4.6.1 has a specific mandate on the Fire Department to deliver water. This is clearly an operational procedural issue. In addition, the true intent of 4.6.1 should be to require a water supply rate at the fireground. How and who develops that water supply is not material as long as it is in accordance with the standard.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
   City:
   State:
   Zip:
Submittal Date: Mon Dec 30 11:11:16 EST 2013

Committee Statement

Resolution: FR-6-NFPA 1142-2014
Statement: The requirements within 4.6 have been updated and table 4.6.1 has been revised. Table 4.6.1 250 gpm was removed as this is not an adequate delivery rate, 750 gpm was removed as it is not a common design threshold.

Public Input No. 44-NFPA 1142-2013 [ Section No. 4.6.1 ]

4.6.1
The fire department shall develop the capability to deliver the amount of water determined in accordance with Sections 4.2 through 4.5 to the incident scene at the rate shown in Table 4.6.1.

Table 4.6.1 Minimum Capability of Fire Department to Deliver Water
<table>
<thead>
<tr>
<th>Total Water Supply Required</th>
<th>Rate Water Is Available at the Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>gal</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>gpm</td>
</tr>
<tr>
<td></td>
<td>L/min</td>
</tr>
<tr>
<td>&lt;2,500</td>
<td>9,459</td>
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<tr>
<td>2,500–9,999</td>
<td>9,460–37,849</td>
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<td>10,000–19,999</td>
<td>37,850–75,699</td>
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<td>≥20</td>
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<td>20,000-29,999</td>
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<td>≥75,700-99,999</td>
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<td>30,000-39,999</td>
<td>75,700-113,559</td>
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<td>40,000-49,999</td>
<td>113,560-151,412</td>
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<tr>
<td>50,000-59,999</td>
<td>151,413-189,270</td>
</tr>
<tr>
<td>≥60,000</td>
<td>189,271-227,120</td>
</tr>
<tr>
<td></td>
<td>≥227,121</td>
</tr>
<tr>
<td></td>
<td>75,700-113,559</td>
</tr>
<tr>
<td></td>
<td>113,560-151,412</td>
</tr>
<tr>
<td></td>
<td>151,413-189,270</td>
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<tr>
<td></td>
<td>189,271-227,120</td>
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<tr>
<td></td>
<td>75,700-113,559</td>
</tr>
<tr>
<td></td>
<td>113,560-151,412</td>
</tr>
<tr>
<td></td>
<td>151,413-189,270</td>
</tr>
<tr>
<td></td>
<td>189,271-227,120</td>
</tr>
</tbody>
</table>

**Statement of Problem and Substantiation for Public Input**

Table 2.6.1 currently caps at 1,000 gpm. Rates of delivery greater than 1,000 gpm should be provided when the total water supply increases above the 20,000 gallon demand. The PI proposes to add additional 250 GPM increments up to the 2,000 GPM level using the same steps currently in the Total Water Supply Required column. There are many fire scenarios where delivery rates greater than 1,000 GPM are necessary and should be taken into consideration by the standard.

**Submitter Information Verification**

Submitter Full Name: Anthony Apfelbeck  
Organization: Altamonte Springs Building/Fire Safety Division  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Dec 30 11:29:16 EST 2013

**Committee Statement**

Resolution: FR-6-NFPA 1142-2014  
Statement: The requirements within 4.6 have been updated and table 4.6.1 has been revised. Table 4.6.1 250 gpm was removed as this is not an adequate delivery rate, 750 gpm was removed as it is not a common design threshold.
7.1.3 Water Storage Tanks shall be inspected, tested and maintained in accordance with NFPA 25, Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

Statement of Problem and Substantiation for Public Input

It is possible that some of the alternative water supplies shall be provided via water storage tanks. Those water storage tanks should be inspected, tested and maintained in accordance with the applicable NFPA standard.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Dec 30 15:29:34 EST 2013

Committee Statement

Resolution: FR-4-NFPA 1142-2014
Statement: It is possible that some of the alternative water supplies shall be provided via water storage tanks. Those water storage tanks should be inspected, tested and maintained in accordance with the applicable NFPA standard.

Statement of Problem and Substantiation for Public Input

The current language is somewhat questionable as to intent. It appear that the “and where additional fire protection is needed” is unnecessary. The 1142 standard itself establishes when fire protection water supply is necessary and should be provided. The current language appears to infer that this is an AHJ determination. Deleting this text will bring clarity to the provision.
Committee Statement

Resolution: The committee believes that the current language is adequate and the term fire reinforces why the water is needed.

Public Input No. 30-NFPA 1142-2013 [ New Section after 7.1.5 ]

7.1.5.1 The AHJ is authorized to require certification of compliance with 7.1.5 by a Civil Engineer.

Statement of Problem and Substantiation for Public Input

In many cases, the AHJ will not know if the 50 year drought requirement is complied with by the AHJ assessing the site. A civil engineer will most likely be required to provide that type of evaluation.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
   City:
   State:
   Zip:
Submittal Date: Thu Nov 21 19:31:14 EST 2013

Committee Statement

Resolution: The AHJ has the authority to require certification in accordance with 7.1.1 and 7.1.5.
7.4  Fire Department Water Supply Hose Connections.

Any fitting provided at a water source to permit a fire apparatus to connect to the water source shall be approved by the AHJ and shall conform to NFPA 1963, Standard for Fire Hose Connections.

Statement of Problem and Substantiation for Public Input

The title revision better reflects the intent of the section. The existing title "Fire Department Connections" infers to the user an FDC supplying a fire sprinkler system or standpipe system. In addition, section 3.8.1.4 of NFPA 13 defines Fire Department Connection as a connection which the "....fire department can pump supplemental water into the sprinkler system...."

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Nov 21 19:13:42 EST 2013

Committee Statement

Resolution: FR-7-NFPA 1142-2014
Statement: The title revision better reflects the intent of the section. The existing title "Fire Department Connections" infers to the user an FDC supplying a fire sprinkler system or standpipe system.

7.5* Access to Water Sources.

Roads providing a means of access to any required water supply shall be constructed and maintained in accordance with the following:

(1) Roadways shall have a minimum clear width of 12 ft (3.7 m) for each lane of travel.
(2) Turns shall be constructed with a minimum radius of 100 ft (30.5 m) to the centerline.
(3) The maximum sustained grade shall not exceed a slope of 1-inch in 1-foot (8 percent).
(4) All cut-and-fill slopes shall be stable for the soil involved.
Bridges, culverts, or grade dips shall be provided at all drainageway crossings; roadside ditches shall be deep enough to provide drainage with special drainage facilities (tile, etc.) at all seep areas and high water-table areas.

The surface shall be treated as required for year-round travel.

Erosion control measures shall be used as needed to protect road ditches, cross drains, and cut-and-fill slopes.

* Where turnarounds are utilized during fire-fighting operations, they shall be designed with a diameter of 120 ft (36.5 m) or larger, as required, to accommodate the equipment of the responding fire department.

Load-carrying capacity shall be adequate to carry the maximum vehicle load expected.

The road shall be suitable for all-weather use.

When a bridge is required to be used as part of a fire department access road, it shall be constructed and maintained in accordance with nationally recognized standards.

The bridge shall be designed for a live load sufficient to carry the imposed loads of fire apparatus.

Vehicle load limits shall be posted at both entrances to bridges where required by the AHJ.

Statement of Problem and Substantiation for Public Input

Slope is more conventionally expressed in the number of inches of rise (or drop) per foot of run.

Submitter Information Verification

Submitter Full Name: John Chartier
Organization: Northeastern Regional Fire Cod
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 08 08:01:58 EST 2013

Committee Statement

Resolution: The percent slope is adequate.

Public Input No. 40-NFPA 1142-2013 [ Section No. 8.3 ]

8.3* Dry Hydrant Design and Location.
8.3.1*
The AHJ shall approve all aspects of the dry hydrant design and construction, including the type of materials, pipe size, and system fittings to be used.

8.3.2*
As a minimum, Schedule 40 pipe and component fittings shall be used.

8.3.3*
All dry hydrant systems shall be designed and constructed to provide a minimum flow of 1000 gpm (3800 L/min) at draft.

8.3.4*
The water supply source for the dry hydrant shall provide, on a year-round basis, the required quantity of water, as determined in Chapter 4, and the minimum flow as required in 8.3.3.

8.3.5*
Dry hydrant systems shall be designed and constructed so that slope and piping configurations do not impede drafting capability.

8.3.6*
All exposed surfaces and all underground metal surfaces shall be protected to prevent deterioration.

8.3.7*
A minimum number of elbows shall be used in the piping system.

8.3.8
Suction hose connection(s) shall be compatible with the fire department's hard suction hose size and shall conform to NFPA 1963, *Standard for Fire Hose Connections*. The connection(s) shall include a protective cap. The cap and adapter shall be of materials that minimize rust and galvanic corrosion.

8.3.9
Dry hydrant system piping shall be supported and/or stabilized using approved engineering design practices.

8.3.10
Stabilization or equivalent protection shall be employed at elbows and other system stress points.

8.3.11
In addition to strength of materials and structural support criteria, design shall specify appropriate aggregates and soil materials to be used to backfill/cover piping during installation.

8.3.12
All connections shall be clean, and the appropriate sealing materials shall be used according to manufacturer's specifications so as to ensure that all joints are airtight.

8.3.13*
System strainers shall be constructed to permit required fire flow.

---

Statement of Problem and Substantiation for Public Input
The title of sections 8.3 and 8.4 both have the term "location" used in the titles. A review of the content of 8.3 indicates that it is more focused on design rather than location issues. Section 8.4 is more focused on location. Therefore, this PI has proposed to strike "location" from the title of 8.3 as two sections should not have the same title and 8.3 does not contain location specifications.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck  
Organization: Altamonte Springs Building/Fire Safety Division  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Thu Dec 26 09:59:47 EST 2013

Committee Statement

Resolution: FR-14-NFPA 1142-2014  
Statement: The title of sections 8.3 and 8.4 both have the term "location" used in the titles, and this section focuses on design.

Public Input No. 41-NFPA 1142-2013 [ Section No. 8.4.1 ]

A minimum of 3 ft (0.9144 m) clear, unobstructed space shall be provided around the dry hydrant.

Statement of Problem and Substantiation for Public Input

The current language of "3 ft." is vague and does not specify intent of the distance requirement. The proposed PI adds clarification to the intent of the 3' requirement to ensure no obstructions are placed within the parameters of fire department access.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck  
Organization: Altamonte Springs Building/Fire Safety Division  
Street Address:  
City:  
State:  
Zip:
Committee Statement

Resolution: FR-8-NFPA 1142-2014
Statement: The current language of "3 ft." is vague and does not specify intent of the distance requirement. This change adds clarification to the intent of the 3' requirement to ensure no obstructions are placed within the parameters of fire department access.

Submittal Date: Thu Dec 26 10:08:51 EST 2013

Public Input No. 42-NFPA 1142-2013 [ Section No. 8.4.1 ]

8.4.1
A minimum of 3 ft (0.9144 m) shall be provided around the dry hydrant. Exception: These dimensions may be reduced by approval of the fire official.

Statement of Problem and Substantiation for Public Input
The current text in section 8.4.1 does not mirror the language in NFPA 1, chapter 18.3.4.1. This could present design problems as the two code sections conflict. Both codes should have the same clearance dimensions.

Submitter Information Verification

Submitter Full Name: Janet Baker
Organization: City of Hollywood Fire Rescue and Beach Safety
Street Address:
    City:
    State:
    Zip:
Submittal Date: Sun Dec 29 10:34:51 EST 2013

Committee Statement

Resolution: FR-8-NFPA 1142-2014
Statement: The current language of "3 ft." is vague and does not specify intent of the distance requirement. This change adds clarification to the intent of the 3' requirement to ensure no obstructions are placed within the parameters of fire department access.
Public Input No. 36-NFPA 1142-2013 [ Section No. 8.6 ]

8.6* Installation Procedure for Dry Hydrant System.

8.6.1 The AHJ shall ensure that the installation meets all design criteria.

8.6.2 The dry hydrant system shall be flow tested at full capacity prior to acceptance.

Statement of Problem and Substantiation for Public Input

The proposed PI ensures that dry hydrant systems are tested and operational prior to acceptance by the AHJ. There is currently no requirement in NFPA 1142 for a final acceptance test or inspection by the AHJ. The only inspection and testing requirements are those that are in place once the system is installed.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: City of Altamonte Springs Building/Fire Safety Division
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 24 14:36:29 EST 2013

Committee Statement

Resolution: The AHJ already has the authority to require a flow test.

Public Input No. 38-NFPA 1142-2013 [ Section No. 8.7.3 ]

8.7.3 Grass, brush, and other vegetation shall be kept trimmed and neat. Vegetation shall be cleared for a minimum 3 ft (0.9 m) radius from around hydrants.

Statement of Problem and Substantiation for Public Input

The first sentence in this section provides no value and even appear to conflict with the second. Is it intended to be a modifier outside of the 3 ft clearance requirement of the second sentence? If it is then it should have a specific distance or sight visibility modifier attached to trimming requirement.

Submitter Information Verification
Committee Statement

Resolution: FR-9-NFPA 1142-2014
Statement: This language is being removed as it is redundant.

Public Input No. 39-NFPA 1142-2013 [ Section No. 8.7.3 ]

8.7.3
Grass, brush, and other vegetation shall be kept trimmed and neat. Vegetation shall be cleared for a minimum 3 ft (0.9 m) radius from around back and sides of hydrants. Vegetation shall be cleared in front of the hydrant so that it is visible and accessible to responding fire department personnel.

Statement of Problem and Substantiation for Public Input

A 3 ft clearance may not be sufficient in front of a hydrant. If a line of bushes is placed 4 ft in front of a hydrant, it would not be accessible nor visible to responding fire personnel. However, it would also be in compliance with the current code language. This revision changes the front requirement to be performance based so the FD can both access and see the hydrant.

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address: City: State: Zip:
Submittal Date: Thu Dec 26 09:43:34 EST 2013

Committee Statement

Resolution: The visibility of the dry hydrant is addressed in 8.4.7.
8.7.4

The hydrants shall be marked, as needed, with reflective material to enhance their visibility during emergencies, reflective material marking the hydrant and signage shall be inspected at least annually to verify that it is being maintained in accordance with 8.4.7.

Statement of Problem and Substantiation for Public Input

As written, the requirement is redundant to that which appears in 8.4.7. Since section 8.7 addresses inspection and maintenance, the proposed text provides language that more appropriately speaks to inspection and maintenance functions.

Submitter Information Verification

Submitter Full Name: John Chartier
Organization: Northeastern Regional Fire Cod
Street Address:
City:  
State:  
Zip:  
Submittal Date: Fri Nov 08 08:03:03 EST 2013

Committee Statement

Resolution: FR-10-NFPA 1142-2014
Statement: This change provides language that more appropriately speaks to inspection and maintenance functions.

8.7.6*

The hydrants shall be flow tested at least annually with a fire department pump to an approved pump to ensure that the minimum design flow is maintained.

Statement of Problem and Substantiation for Public Input

In our area, the fire department does not own or maintain drafting hydrants. As currently worded, section 8.7.6 is easily read as "the fire department shall flow each hydrant annually." This reading puts a burden on the fire department’s already limited manpower and possibly exposes fire department apparatus to damage from unmaintained/compromised drafting hydrants. An example would be sucking rocks into the pump on a fire well (this has happened). During a fire, a fire department has to use what is available for a water supply, however it is not acceptable to risk damage to fire department apparatus testing someone else’s equipment.
Public Input No. 22-NFPA 1142-2013 [ New Section after 8.8 ]

Availability of Records
The owner of the drafting hydrant(s) shall, upon the request of the AHJ, make available for inspection all records required by 8.8

Statement of Problem and Substantiation for Public Input
Since the owner of the drafting hydrants should be responsible for maintaining all records they should be available to the AHJ upon request.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 21-NFPA 1142-2013 [Section No. 8.8]</td>
<td>clarifies owner responsibility</td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: DOUG CARTER
Organization: BREVARD COUNTY FIRE RESCUE
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Nov 12 11:50:54 EST 2013
Committee Statement
Resolution: The current language is appropriate and is the responsibility of the AHJ

Public Input No. 21-NFPA 1142-2013 [Section No. 8.8]

8.8* Records for Dry Hydrants.
The AHJ-The owner shall maintain, in a safe location, maps and records of each dry hydrant installation and the subsequent tests, inspections, maintenance, and repairs to the dry hydrant.

Statement of Problem and Substantiation for Public Input
The onus for maintaining records should be on the owner of the drafting hydrants. Copies of the records should be available to the AHJ upon request.

Related Public Inputs for This Document
<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 20-NFPA 1142-2013 [Section No. 8.7.6]</td>
<td>Both suggestions shift responsibility from the fire department/AHJ to the owner of the drafting hydrants.</td>
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<tr>
<td>Public Input No. 22-NFPA 1142-2013 [New Section after 8.8]</td>
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</table>

Submitter Information Verification
Submitter Full Name: DOUG CARTER
Organization: BREVARD CNTY FIRE RESCUE
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 13:54:35 EST 2013

Committee Statement
A.4.4  

See NFPA 1, Fire Code, Section 18.4 for information on permitted reductions of fire flow and other fire flow provisions.

**One- and Two-Family Dwellings.** The minimum fire flow and flow duration requirements for one- and two-family dwellings having a fire flow area that does not exceed 5000 ft² (334.5 m²) should be at 1000 gpm (3785 L/min) or 500 gpm when an approved automatic sprinkler system is installed throughout and/or separated from other buildings by a minimum of 30 ft. (9.1 m). The minimum fire flow duration is for 1 hour.

A reduction in required fire flow of 50 percent is permitted when the building is provided with an approved automatic sprinkler system.

A reduction in the required fire flow of 25 percent is also permitted when the building is separated from other buildings by a minimum of 30 ft. (9.1 m).

The reduction for an approved automatic sprinkler system and/or separated from other buildings cannot reduce the required fire flow to less than 500 gpm (1900 L/min).

Fire flow and flow duration for dwellings having a fire flow area in excess of 5000 ft² (334.5 m²) cannot be less than that specified for Buildings Other Than One- and Two-Family Dwellings.

**Buildings Other Than One- and Two-Family Dwellings.** The minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall not be less than 1000 gpm (3785 L/min) or 600 gpm (2270 L/min) when the building is protected throughout by an approved automatic sprinkler system and quick response sprinklers are utilized throughout.

A reduction in the required fire flow of 75 percent is permitted when the building is protected throughout by an approved automatic sprinkler system.

A reduction in the required fire flow of 75 percent is permitted when the building is protected throughout by an approved automatic sprinkler system, which utilizes quick response sprinklers throughout. The resulting fire flow shall not be less than 600 gpm (2270 L/min).

**Statement of Problem and Substantiation for Public Input**

Annex note 4.4 refers the user to NFPA 1, Section 18.4, to determine adjustments to fire flow calculations. To make the document more complete with these references include in the annex note as to the adjustments allowed for in fire flow calculations when fire sprinkler systems are installed. Also this will allow the user the information and data needed to make these decisions for water supply requirements. Annex note 4.4 is modified by adding additional information to assist user further with determining fire flow requirements adjustments.

**Submitter Information Verification**

Submitter Full Name: Kelly Nicolello  
Organization: Western Regional Fire Code Dev
Committee Statement


Statement: Annex note 4.4 refers the user to NFPA 1, Section 18.4, to determine adjustments to fire flow calculations. These additions make the document more complete with these references included in the annex as to the adjustments allowed for in fire flow calculations when fire sprinkler systems are installed. Also this will provide the user with the information and data needed to make these decisions for water supply requirements.

Public Input No. 15-NFPA 1142-2013 [ Section No. A.6.3.1 ]

A.6.3.1

The types of construction include five basic types designated by roman numerals as Type I, Type II, Type III, Type IV, and Type V. This system of designating types of construction also includes a specific breakdown of the types of construction through the use of arabic numbers. These numbers follow the roman numeral notation where identifying a type of construction (e.g., Type I-442, Type II-111, Type III-200).

The arabic numbers following each basic type of construction (e.g., Type I, Type II) indicate the fire resistance rating requirements for certain structural elements as follows:

(1) First arabic number: Exterior bearing walls

(2) Second arabic number: Columns, beams, girders, trusses and arches, supporting bearing walls, columns, or loads from more than one floor

(3) Third arabic number: Floor construction

Specific fire resistance ratings are found in Table 6.3.1, and additional information is found in NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.

ADD TABLE FROM NFPA 101 HANDBOOK HERE THAT CORRELATES 220 WITH ICC CONSTRUCTION TYPES.

Statement of Problem and Substantiation for Public Input

The table can be found in the NFPA 101 Handbook and is a good guide for the user in dealing with quick conversions from ICC to NFPA construction types. Most jurisdictions in the US use the ICC buildings codes and attempting to determine a construction type conversion can be complicated and time consuming for the user.

Submitter Information Verification
Committee Statement

Resolution: The committee is not familiar with this table. Please provide suggested table with Public Comment.

Public Input No. 28-NFPA 1142-2013 [ Chapter B ]

### Annex B—Non-Municipal Type Water Supply Sources

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

#### B.1 General.

The fire department operating without a water system or with hydrants on a weak distribution system has the following three means of getting adequate water for fire fighting:

1. From supplies at or near the incident scene, which can be either constructed or natural supplies
2. From supplies transported to the scene
3. By relaying water from a source to the fire scene using large-diameter hose

#### B.2 Locating Water Sources.

Aircraft and aerial photographs can be very helpful in a survey of static water availability. Such photographs are usually available from the county agriculture department or the county office of planning and zoning. Up-to-date topographical maps from the United States Geological Survey also can be of value in surveying an area for available water sources. Once sites are located, they should be prepared for use according to the recommendations of this annex.

#### B.3 Natural Water Sources.

##### B.3.1 Streams.

Streams, including rivers, bays, creeks, and irrigation canals, can represent a continuously flowing source of substantial capacity. Where assessing water from flowing streams as potential water sources, the fire department should consider the following factors:

1. *Flowing Capacity.* The stream should deliver water in capacities compatible with those outlined in the water supply requirements of this standard. *(See Chapter 4.)*

Climatic Characteristics. Streams that deliver water throughout the year and are not susceptible to drought are desirable for fire protection. However, where such streams are not available, a combination of supplies might be necessary. In many sections of the country, streams cannot be relied on during drought seasons. If the stream is subject to flooding or freezing, special evolutions might be necessary to make the stream usable under such conditions. Similar circumstances might exist during wet periods or when the ground is covered with snow.

Accessibility. A river or other source of water might not be accessible to the fire department for use during a fire. Distance and terrain from the all-weather road to the source should be such as to make the water readily available. In some cases, special equipment might be needed to obtain the water. Where roadways are provided to the water source, they should be constructed in accordance with Section 7.5.

Calculating the Flow of a Stream. A simple method for estimating the flow of water in a stream is to measure the width and depth of the stream. Drop a cork or any light floating object into the water, and determine the time it takes the cork to travel 10 ft (3.1 m). To obtain complete accuracy, the sides of the stream should be perpendicular, the bottom flat, and the floating object should not be affected by the wind. Where the sides and bottom of the stream are not uniform, the width and depth can be averaged.

For example, in a stream that is 4 ft (1.2 m) wide and 6 in. (150 mm) deep, the flow of water is such that it takes 45 seconds for a cork to travel 10 ft (3.1 m). Therefore the following formula should be used:

\[ Q = \frac{W \times D \times TD}{60} \]

where:

- \( W \) = width of 4 ft (1.2 m)
- \( D \) = depth of 6 in. (150 mm) = \( \frac{1}{2} \) ft (0.15 m)
- \( TD \) = travel distance of 10 ft (3.1 m)

Calculate the flow of water as follows:

\[ 4 \text{ ft} \times \frac{1}{2} \text{ ft} \times 10 \text{ ft} = 20 \text{ ft}^3 (1.2 \text{ m} \times 0.15 \text{ m} \times 3.1 \text{ m} = 0.56 \text{ m}^3) \]

The cork takes 45 seconds to flow the 10 ft (3.1 m) distance. Divide the volume by the time as follows:

\[ 20 \text{ ft}^3 (0.56 \text{ m}^3)/45 \text{ sec} = 0.44 \text{ ft}^3/\text{sec} (0.0125 \text{ m}^3/\text{sec}) \]

Convert the flow from seconds to minutes:

\[ 0.444 \text{ ft}^3/\text{sec} (0.0125 \text{ m}^3/\text{sec}) \times 60 \text{ sec} = 26.64 \text{ ft}^3/\text{min} (0.75 \text{ m}^3/\text{min}) \]

Using conversion factors [1 ft³ = 7.48 gal (28.31 L); and 1 gal = 3.785 L], convert these values to gal/min (L/min):

\[ 26.64 \text{ ft}^3/\text{min} \times 7.48 = 199.27 \text{ gal/min} (754 \text{ L/min}) \]

For assistance in more accurately determining stream flow, contact the state department of natural resources, soil conservation service, county cooperative extension agents, or U.S. Geological Survey.

B.3.2 Ponds.

Ponds can include lakes or farm ponds used for watering livestock, irrigation, fish culture, recreation, or other purposes, while serving a secondary function for fire protection. Valuable information concerning the design of ponds can be obtained from county agricultural agents, cooperative extension offices, county engineers, and so forth. Most of the factors for
assessing water from streams are pertinent to ponds, with the following items to be considered:

1. Minimum annual level should be adequate to meet water supply needs of the fire potential the pond serves.

2. Freezing of a stationary water supply, contrasted with the flowing stream, presents a greater problem.

3. Silt and debris can accumulate in a pond or lake, reducing its actual capacity, while its surface area and level remain constant. These conditions can provide a deceptive impression of capacity and call for at least seasonal inspections. See Figure A.8.5(b) for an example of protective measures for silt and mud conditions.

B.3.3 Other Natural Sources.

Other natural sources might include springs and artesian wells. Individual springs and occasional artesian water supplies exist in some areas and, again, while generally of more limited capacity, they can be a useful water supply, subject to reasonable application of the factors listed for ponds and streams. In many cases, it might be necessary to create a temporary natural pool or pond with a salvage cover for the purpose of collecting enough water for the fire department’s use.

B.4 Cisterns.

B.4.1 General.

Cisterns are one of the oldest sources of emergency water supply, both for fire fighting and drought storage. They are very important sources of water for domestic consumption, as well as for fire fighting and drought storage in many rural and beach areas.

Cisterns should have a minimum usable volume as determined by the AHJ, based on the methods described in Chapter 4. There is no real limit to the maximum capacity. It is convenient for a cistern to be adjacent to a public right-of-way for winter maintenance and access. [See Figure B.4.1(a).] The dry hydrant associated with the cistern should be located at least 100 ft (30 m) from the closest structure.

Figure B.4.1(a) Cistern Site.

Figure B.4.1(b) Typical Cistern.

The water level of a cistern can be maintained by rainfall, water pumped from a well, water hauled by a mobile water supply apparatus, or the seasonal high water of a stream or river. The top of the cistern should be a minimum of 2 ft (0.6 m) below grade.

Cisterns should be capped for safety, but they should have openings to permit inspections and use of suction hose when needed. [See Figure B.4.1(b).]

B.4.2 Construction of Cisterns.

Construction of cisterns is governed by local conditions of soil and material availability. Some engineering considerations to be used in designing cisterns include the following:

1. The base, walls, and roof should be designed for highway loading and for the prevailing soil conditions.

2. If groundwater conditions are high, the cistern should not float when it is empty.

3. Suction piping should be designed to minimize whirlpooling.
(4) Vent piping should be of sufficient size to allow drafting from the cistern at the maximum capability permitted by the suction piping.

Maintenance factors to be considered by the fire department include the danger of silting, evaporation or other low water conditions, and the freezing problems discussed in B.3.2.

B.4.3 Cistern Specifications.

Some governing bodies require developers to provide cisterns with all subdivisions that are constructed, where on-site water systems are not available or adequate.

The following specifications for cistern design and construction are used by the New Boston Fire Department, New Boston, NH:

(1) Cisterns must be located no more than 2200 ft (671 m) truck travel distance from the nearest lot line of the furthest lot.

(2) The design of a cistern must be trouble-free and last a lifetime.

(3) The cistern capacity must be 30,000 gal (113,560 L) minimum, available through the suction piping system.

(4) The suction piping system must be capable of delivering 1000 gpm (3800 L/min).

(5) The design of the cistern must be submitted to the AHJ for approval prior to construction. All plans must be signed by a licensed/registered professional engineer.

(6) The entire cistern must be rated for highway loading, unless specifically exempted by the AHJ.

(7) Each cistern must be sited to the particular location by a registered engineer and approved by the AHJ.

(8) Cast-in-place concrete must achieve a 28-day strength of a gauge pressure of 3000 psi (20,700 kPa). It must be placed with a minimum of 4 in. (100 mm) slump and vibrated in a professional manner.

(9) The concrete must be mixed, placed, and cured without the use of calcium chloride. Winter placement and curing must follow the accepted American Concrete Institute (ACI) codes.

(10) All suction and fill piping must be ASTM International Schedule 40 steel. All vent piping must be ASTM Schedule 40 PVC.

(11) All PVC piping must have glued joints.

(12) Any reducing fittings used in the piping must be an eccentric reducer.

(13) The final suction connection must be 4 ½ in. (115 mm) male National Standard hose thread and must be capped.

(14) The filler pipe siamese must have 2 ½ in. (65 mm) female National Standard threads with plastic caps.

(15) The entire cistern must be completed and inspected before any backfilling is done.

(16) All backfill material must be screened gravel with no stones larger than 1 ½ in. (38 mm) and must be compacted to 95 percent in accordance with ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort [56,000 ft-lb/ft³ (2,700 kN·m/m³)].

(17) Bedding for the cistern must consist of a minimum of 12 in. (300 mm) of ³⁄₄ in. to 1 ⁴⁄₅ in. (20 mm to 40 mm) crushed, washed stone, compacted. No fill can be used under the stone.
The filler pipe siamese must be 36 in. (900 mm) above final backfill grade.

The suction pipe connection must be 20 in. to 24 in. (500 mm to 600 mm) above the level of the shoulder where vehicle wheels will be located when the cistern is in use.

The suction pipe must be supported either to the top of the tank or to a level below the frost line.

The base must be designed so that the cistern will not float when empty.

The perimeter of the cistern at floor/wall joint must be sealed with 8 in. (200 mm) PVC waterstop.

After backfilling, the cistern must be protected by fencing or large stones.

Backfill over the tank must have one of the following characteristics:

(a) 4 ft (1.2 m) of fill.

(b) The top and highest 2 ft (0.6 m) of sides of the cistern must be insulated with vermin-resistant foam insulation and 2 ft (0.6 m) of fill.

(c) All backfill must extend 10 ft (3.1 m) beyond the edge of the cistern, and have a maximum 3:1 slope, loamed and seeded.

The bottom of the suction pipe to the pumper connection must not exceed 14 ft (4.25 m) vertical distance.

The pitch of the shoulder and vehicle pad from the edge of the pavement to the pumper suction connection must be 1 percent to 6 percent downgrade.

The shoulder and vehicle pad must be of sufficient length to permit convenient access to suction connection when the pumper is set at 45 degrees to road.

All construction, backfill, and grading material must be in accordance with proper construction practices and acceptable to the AHJ.

The bottom of the cistern at floor/wall joint must be designed so that the cistern will not float when empty.

As an alternative where soil and groundwater level conditions permit, a properly designed well can be used to provide water. Figure B.4.3 illustrates a typical well with a dry hydrant installed. Local conditions must be considered in all cases. A high water table that allows a suction lift of not more than 10 ft (3 m) must be present. The well must be installed in gravel or sand, not clay.

The same design is suitable for a cistern if the bottom of the casing is not perforated.

Figure B.4.3 Typical Well or Cistern with Dry Hydrant Installed.


The following formula can also be used to calculate the usable amount of water in a round cistern with vertical sides:
where:

\[ D_f = \text{inside diameter of the cistern in feet, or } D_m = \text{inside diameter in meters} \]

\[ H_f = \text{usable depth of water in the cistern in feet, or } H_m = \text{usable depth of water in meters} \]

The following formula can be used to calculate the usable amount of water in a rectangular cistern:

\[ V = L_f \times W_f \times H_f \]

or

\[ V = L_m \times W_m \times H_m \]

where:

\[ L_f = \text{length in feet, or } L_m = \text{length in meters} \]

\[ W_f = \text{width in feet, or } W_m = \text{width in meters} \]

\[ H_f = \text{usable depth of water in feet, or } H_m = \text{usable depth of water in meters} \]

When reference is made to water depths in cisterns, swimming pools, streams, lakes, and other sources, it should always be remembered that the depth with which the fire fighter is concerned is the usable depth. In a cistern, a bottom bed of gravel protecting a dry hydrant inlet, for instance, reduces the usable depth of the area above the gravel.

B.5 Fiberglass Underground Storage Tanks.

Some fire departments are using new fiberglass underground storage tanks to store water for fire protection. This application is very similar to using a cistern, except that the tanks are manufactured off site whereas a cistern is built on site. These tanks are fitted with suction and fill piping and placed strategically around the community. (See Figure B.5.)

Figure B.5 Example of Construction of Water Cisterns Using an Underground Fiberglass Storage Tank.

B.6 Swimming Pools.

Swimming pools are an increasingly common source of water for fire protection. Even in some areas with normally adequate water supplies from hydrants, pools have been a factor in providing protection, such as where water demands have exceeded availability because of wildfires or natural disasters. Swimming pools provide an advantage in that they are sources of clean water, but a major drawback is their poor accessibility for large, heavy fire apparatus. There are some areas of the country in which there are more swimming pools than fire hydrants. If the fire department intends to use a swimming pool as a supply of water, it is a good practice to work with the pool owner and preplan how the water will be accessed.

B.6.1 Pool Accessibility.

If fire department accessibility is considered at the time the pool is designed, a usable water supply should be available to the fire department for directly supplying hose lines or filling mobile water supply apparatus. Most swimming pools are built in areas requiring security fencing or walls, and these can complicate accessibility. Fences and walls can be designed for fire department use or, depending on construction, can be entered forcibly. In most cases, a solution to the problem of accessibility can be achieved through preplanning. A solution might call for long lengths of suction hose, portable pumps, dry hydrants, siphon ejectors, or
properly spaced gates. Lightweight or flexible-type suction hose can be advantageous in these situations. Portable (or floating) pumps designed for large-volume delivery at limited pressures can deliver water to portable folding tanks or fire department pumpers and are frequently ideal where accessibility problems exist. (See Section E.3.)

A swimming pool located virtually under the eaves of a burning house can be a very poor location from which to pump if there is fire exposure to the work area. Pumping from a neighboring pool if it is close enough or using a water-hauling program is frequently preferable to pumping from a pool adjacent to the burning house.

B.6.2 Pool Capacity.

The following formula is a short-form method of estimating pool capacity:

\[ V = L \times W \times D \]

or

\[ V = L_m \times W_m \times D_m \]

where:

- \( L \) = length in feet or \( L_m \) = length in meters
- \( W \) = width in feet or \( W_m \) = width in meters
- \( D \) = estimated average depth from water line in feet or \( D_m \) = estimated average depth from water line in meters

Note that the dimensions used in the formula should be an average if the pool is of a stylized construction.

Consideration should be given for providing more suction hose on fire apparatus responding in areas dependent on swimming pools. Fast rigging of such suction hose demands special training. Using long lengths of hose over walls and other obstacles typical of areas around swimming pools demands techniques other than those used for drafting from ponds or streams. Adequate pre-fire planning will provide knowledge of individual pools so that the method of obtaining water at the property is known.

B.6.3 Care in Use of Pools.

Care has to be exercised to be sure structural damage will not be done to a pool and the surrounding area if the water is used for fire fighting. Lightly built cement, Gunite®, or poured concrete pools can present a danger of structural damage, cracking, or collapse when drained. If a pool is located in extremely wet soil, it will tend to float upwards when drained. In these cases, the pool should be refilled as soon as the fire is under control and mobile water supply apparatus can be released from fire duties.

Some pools are compacted earth covered by a plastic surfacing or light-gauge metal panels placed against such earth or a special fill. Such pools can collapse internally if emptied. It might be possible to use a limited portion of such water sources but not possible to use the entire depth apparently available. It might be prudent not to use these pools at all.

Another consideration is whether the ground surrounding a pool will support the weight of a fire department vehicle without collapsing. The fire department should consult with the builder or installer of any pool being considered as a water source to determine the various pool limitations.

B.7 Livestock Watering Ponds and Tanks.

Many farms have livestock water tanks and other similar water facilities. If the owner is made aware of the water needs for fire fighting on the farm, such tanks and ponds can be sized to
provide adequate volume for both farm and fire department use and located to be readily available to the fire department. Tanks should be placed on the edge of the barnyard where they are accessible for fire apparatus to take suction through a connection on the tank or with suction hose directly into the tank. These watering tanks and ponds are often filled and maintained full by a pump operated by a windmill or by an electric pump. Figure B.7 illustrates a dry hydrant system for holding tanks and procedures for successfully using the system as a water source.

**Figure B.7 Drafting Procedure for Farm Holding Tanks.**

B.8 Stored Water for Sprinkler Systems.

In some rural areas, the only large water supply might be the storage provided for the sprinkler system in a building. The supply might be from an underground water distribution system, a pond or suction tank with pumps, an elevated tank, or a combination of these. In many cases, pre-plan arrangements can be made to use some of the stored water for fire protection away from the property. This is particularly true if the property owner is contacted before installation of the sprinkler protection, as it might be necessary to increase the storage capacity or to install a hydrant that is accessible to the fire department and connected to the private yard distribution system.

Extreme care should be exercised in the use of water supplies provided for sprinkler protection. Unless the water supply has been specifically designed to provide water for fire protection away from the property, it should not be used. *(See Annex E for additional information on sprinkler systems.)*

B.9 Driven Wells.

Wells, well systems, and irrigation pumps are becoming increasingly popular as water supplies for fire-fighting purposes at industrial properties, shopping centers, subdivisions, and farmhouses located in rural areas beyond the reach of a municipal-type water distribution system.

In areas with suitable soil conditions such as those of a very sandy nature, it might be possible to use driven wells or water-jetted wells to obtain water for fire fighting. These wells are, in essence, pipes driven into the ground, usually with perforations about the base to permit entry of water. From the threaded pipe head (or a fitting attached to the body of the pipe), a pump connection can be made to draft water the same as from a well head hydrant. A high water table is a prerequisite to using this method. Fire-fighting units in areas where well head hydrants are available should have the necessary adapters to utilize such sites.

B.10 Pre-Fire Planning for Water Supply Operations.

Once the water supply requirements have been calculated and the water sources identified, the type and amount of fire equipment needed to respond on the first alarm to deliver that requirement should be determined. The objective should be to have the response of fire apparatus match the need to deliver a constant flow at least equal to the water flow requirements. The fire department should develop standard operating guidelines for hauling or relaying water to fires. The guidelines should be verified under training conditions prior to a fire emergency. Training exercises should include locating fire equipment at a fire scene to protect the fire property and the exposures, establishing operations at the water source to either fill water tanks on fire apparatus or pump into a relay, designating fire lanes or routes between the water source and the incident scene, and reviewing and modifying the operations to meet unusual conditions. Once implemented, the standard operating guidelines should be initiated for all reported structure fires, recognizing that they can be discontinued or canceled after the officer in charge has evaluated the fire and determined that additional water supply will not be needed.
Statement of Problem and Substantiation for Public Input

This PI change only proposes changing the title of this section from "Water Supply" to "Non-Municipal Type Water Supply Sources." The title change better conveys the content of the section. An option would be to use the term "Alternative Water Supply" as that term is already defined in this document.

Submitter Information Verification

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Street Address:
City:
State:
Zip:
Submittal Date: Thu Nov 21 19:04:15 EST 2013

Committee Statement

Resolution: FR-12-NFPA 1142-2014
Statement: Updating title of Annex B

Public Input No. 23-NFPA 1142-2013 [ Section No. F.3.1 ]

F.3.1 Installation of Water Supplies.

Water supplies for the automatic sprinkler system referred to in Section 4.4, which consist of pumps and tank combinations feeding yard mains and a hydrant system, should be installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, NFPA 24: Standard for the Installation of Private Fire Service Mains and their Appurtenances and NFPA 22, Standard for Water Tanks for Private Fire Protection.

Statement of Problem and Substantiation for Public Input

Yard mains and hydrants should be installed in accordance with NFPA 24. This PI provides that guidance to the user.

Submitter Information Verification

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City:
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Committee Statement

Resolution: FR-16-NFPA 1142-2014
Statement: The addition of NFPA 24 provides guidance to the use as yard mains and hydrants should be installed in accordance with NFPA 24.

Public Input No. 24-NFPA 1142-2013 [ Section No. F.3.3 ]

F.3.3 Use of Fire Department Connection.
The standard operating procedures (SOPs) of each rural fire department should require one of the first-response pumpers to pump to the fire department connection of the sprinkler system. In this way, water pressure and volume to the system can be increased, making the sprinklers more effective. Also, the fire department connection should tie into the system beyond all valves that might be shut off; therefore, even with the valve controlling the water supply to the sprinkler system shutoff, sprinkler heads can always be supplied with water through the fire department connection. After assessment by the officer in charge, a decision to charge the system might be warranted. The pressure available from the fire department pumper will not burst the piping or heads of the sprinkler system, as all parts of the system are designed and tested to withstand at least 200 psi (1380 kPa).

Statement of Problem and Substantiation for Public Input
The statement in this section is incorrect. NFPA 13 section 8.17.2.4.4 and 8.17.2.4.2 permits a number of arrangements were the fire department connection ties into the fire sprinkler system prior to the system control valves. Also see figure A.8.17.2.4.4(a) and figure A.8.17.2.4.4(b) of NFPA 13.

Submitter Information Verification
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Submittal Date: Thu Nov 21 18:42:19 EST 2013

Committee Statement
Resolution: FR-13-NFPA 1142-2014
Statement: This change clarifies that sprinkler heads could be supplied.

Public Input No. 25-NFPA 1142-2013 [Section No. F.3.3]

F.3.3 Use of Fire Department Connection.

The standard operating procedures (SOPs) of each rural fire department should require one of the first-response pumpers to pump to the fire department connection of the sprinkler system. In this way, water pressure and volume to the system can be increased, making the sprinklers more effective. Also, the fire department connection should tie into the system beyond all valves that might be shut off; therefore, even with the valve controlling the water supply to the sprinkler system shutoff, sprinkler heads can always be supplied with water through the fire department connection. After assessment by the officer in charge, a decision to charge the system might be warranted.

The supply line should be pumped and the line charged to a pressure of 10.0 bar (150 psi), unless the system is posted for a different pressure. The pressure available from the fire department pumper will not burst the piping or heads of the sprinkler system, as all parts of the system are designed and tested to withstand at least 200 psi (1380 kPa).

Statement of Problem and Substantiation for Public Input

Guidance should be provided to the user as to what is the appropriate pressure to utilize in charging the FDC. The proposed language is from section 4.3.4 of NFPA 13E.

Submitter Information Verification

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 Submittal Date: Thu Nov 21 18:52:07 EST 2013

Committee Statement

Resolution: Language is unnecessary as this is standard operating procedures for pump operations.

Public Input No. 26-NFPA 1142-2013 [Section No. F.3.4]

F.3.4 Shutting Off Sprinkler System After the Fire.
The sprinkler system should not be shut down until the officer in charge is convinced that the fire is extinguished or controlled and handlines are in place for overhauling operations.

A sprinkler system should not be shut down to improve visibility. Even then, the fire department pumper should not be disconnected from the fire department connection to the sprinkler system until the officer in charge is certain that the fire is out. A person should be stationed at the control valve of the sprinkler system, ready to reopen the valve in case of a flare-up during fire department mop-up operations.

Statement of Problem and Substantiation for Public Input

The proposed language is from NFPA 13E section 4.3.3 and provides added guidance to the user as to when the system should NOT be shut down.

Submitter Information Verification

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Submittal Date: Thu Nov 21 18:54:14 EST 2013

Committee Statement

Resolution: This direction is already provided.

Public Input No. 14-NFPA 1142-2013 [ Section No. G.1 ]

G.1 General.

The water supply for fire-fighting purposes, as specified in Chapter 4, is considered the minimum water supply necessary for basic fire fighting. It is assumed that the water is made available at the fire scene from a single water point such as a dry hydrant, often using a mobile water supply shuttle in conjunction with a portable folding tank(s) or a water supply relay.

The AHJ can determine that a municipal-type water system is warranted. This determination might be made as a result of an on-site survey of buildings by the fire department having jurisdiction or by review of architectural plans of proposed construction and planned development.

Statement of Problem and Substantiation for Public Input

Annex G appears to be based heavily on the ISO Guide for Determining Needed Fire Flow. This guide is in the process of being updated to be consistent with the ISO Fire Suppression Rating Schedule changes that were implemented in July 1st 2013 in most states. The FSRS
contained a number of changes to fire flow particularly dealing with 13R and 13D fire sprinkler protected properties and their fire flow. Annex G, including table G.4.4.5, should be reviewed in context with the FSRS and GDNFF updates.

Submitter Information Verification

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Submittal Date: Wed Oct 30 13:54:44 EDT 2013

Committee Statement

Resolution: The committee will be looking to correlate these items. The submitter should provide specific changes in the form of a Public Comment.

Public Input No. 27-NFPA 1142-2013 [Sections G.3, G.4, G.5, G.6]

Sections G.3, G.4, G.5, G.6
G.3 Developing Fire Flow Requirements for a Municipal-Type Water System.

The factors to be considered in developing the fire flow requirements for a building on a municipal-type water system are shown in G.3.1 through G.3.4.

G.3.1 Type of Construction (Ci).
Combustibility and fire resistance of the building itself greatly influence the development and spread of a fire and, to a large extent, determine the amount of water needed to control and extinguish a fire.

G.3.2 Size of Building (Ai).
The greater the building height and the larger the undivided floor area, without fire walls, division walls, or other fire separation, the greater the potential for a large fire, and the greater the fire flow requirement.

G.3.3 Occupancy (Oi).
A fire in a building having highly combustible contents will require a higher rate of water application than a fire in a building with contents of low combustibility. Examples are a wastepaper warehouse (highly combustible contents) and a steel pipe warehouse (contents with low combustibility), with many variations in between.

G.3.4 Exposures (Xi) and Communications (Pi).
In addition to the water needed for a fire in the building under consideration, additional water might be needed to prevent a fire from spreading to nearby buildings. The amount of this
extra water will depend on such factors as the distance between buildings and the type of construction and size of the exposed and communicating buildings.

The method of determining the fire flow requirement in this annex does not include details for calculating an adequate amount of water for large, special fire protection problems, such as lumberyards, petroleum storage, refineries, grain elevators, and large chemical plants. For suggested protection, see applicable NFPA standards.

G.4 Calculation of Fire Flow.

For calculating the fire flow requirement of a subject building in gallons per minute, the construction ($C_i$), occupancy ($O_i$), exposure ($X_i$), and communication ($P_i$) factors of the selected building or fire division are considered. Construction and occupancy hazard classification tables referenced in G.4.2 have been developed from equation information derived from the formula in G.4.1. Examples of actual calculations are included in Section G.5.

G.4.1 Construction Factor ($C_i$).

That portion of the fire flow requirement attributed to the type of construction and area of the selected building or fire division is determined by the following formula:

$$C_i = F \cdot A_i$$

where:
- $C_i$ = construction factor
- $F$ = coefficient related to the class of construction as follows:
  - 1.5 for wood frame construction
  - 1.0 for ordinary construction
  - 0.8 for noncombustible construction
  - 0.6 for fire-resistive construction
- $A_i$ = effective area in square feet

The effective area is the total floor area of the largest story in the building plus the following percentages of the other stories:

(1) For buildings of construction Types II, III, IV, and V, 50 percent of the total floor area of all other stories

(2) For buildings of construction Type I, either of the following two percentages as applicable:

- (a) If all vertical openings in the building have 1-hour or greater protection, 25 percent of the total floor area of the building not to exceed the floor area of the second- and third-largest stories
- (b) In other buildings, 50 percent of the total floor area of the building not to exceed the area of eight additional stories

If division walls are rated at 1 hour or more, with labeled Class B fire doors on openings, the story is to be considered subdivided. The maximum area on any one story used is the largest undivided area plus 50 percent of the second-largest undivided area on that story.

The floor area of basements and sub-basements that are vacant or are used for building maintenance, or that are occupied by light-hazard or low-hazard occupancies, are not to be included in the calculation of the effective area.

G.4.1.1 Calculating Predominant Construction.

In buildings of mixed construction types, the predominant construction class is determined as shown in G.4.1.1.1 through G.4.1.1.4.

G.4.1.1.1 Fire Resistive.

Any building with $66 \frac{2}{3}$ percent or more of the total wall area and $66 \frac{2}{3}$ percent or more of the total floor and roof area defined as construction Type I, is classified as fire resistive.

G.4.1.1.2 Noncombustible.
Any building with 66.3% or more of the total wall area and 66.3% or more of the total floor and roof area defined as construction Types II and IV, or any building not qualifying under G.4.1.1.1, with 66.3% or more of the total wall area and 66.3% or more of the total floor and roof area constructed in two or more of construction Types I, II, and IV, but with no single type itself equal to 66.3% or more of the total area, is classified as noncombustible.

G.4.1.1.3—Ordinary.

Any building not qualifying under G.4.1.1.1 or G.4.1.1.2, with 66.3% or more of the total wall area of construction Type III, or any building not qualifying under G.4.1.1.1 or G.4.1.1.2, with 66.3% or more of the total wall area and 66.3% or more of the total floor and roof area constructed in two or more of construction Types I, II, III, and IV, but with no single type itself equal to 66.3% or more of the total area, is classified as ordinary.

G.4.1.1.4—Frame.

Any building not qualifying under G.4.1.1.1 through G.4.1.1.3, or any building with over 33.3% percent of the total wall area of combustible construction, regardless of the type of construction of the balance of the building, is defined as construction Type V.

G.4.1.2—Limitations.

In the application of G.4.1.1.1 through G.4.1.1.4, basement walls and the lowest floor level should be disregarded.

The maximum value of \( C_i \) is limited by the following:

1. 8000 gpm (30,280 L/min) for wood frame and ordinary construction
2. 6000 gpm (22,710 L/min) for noncombustible and fire-resistive construction
3. 6000 gpm (22,710 L/min) for a one-story building of any type of construction

The minimum value of \( C_i \) is 250 gpm (950 L/min). The calculated value of \( C_i \) should be rounded to the nearest 250 gpm (950 L/min).

G.4.2—Occupancy Factor \( O_i \).

The occupancy factors shown in Table G.4.2(a) reflect the influence of the occupancy hazard in the selected building on the fire flow requirement.

Table G.4.2(a) Influence of Occupancy in Determining Fire Flow Requirement

<table>
<thead>
<tr>
<th>Occupancy Hazard Classification</th>
<th>Occupancy Factor ( O_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (light hazard)</td>
<td>0.75</td>
</tr>
<tr>
<td>6 (low hazard)</td>
<td>0.85</td>
</tr>
<tr>
<td>5 (moderate hazard)</td>
<td>1.00</td>
</tr>
<tr>
<td>4 (high hazard)</td>
<td>1.10</td>
</tr>
<tr>
<td>3 (severe hazard)</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Representative lists of occupancies by occupancy hazard classification number are located in Chapter 5.

Table G.4.2(b) through Table G.4.2(e) include the occupancy factors \( O_i \) applied for each type of construction.

Table G.4.2(b) Wood Frame Construction (\( F = 1.5 \)) and Occupancy Hazard Classification

<table>
<thead>
<tr>
<th>Occupancy Hazard Class</th>
<th>( O_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0.75</td>
</tr>
<tr>
<td>6</td>
<td>0.85</td>
</tr>
<tr>
<td>5</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>1.15</td>
</tr>
<tr>
<td>3</td>
<td>1.25</td>
</tr>
</tbody>
</table>
For SI units, 1 gpm = 0.093 ft².  

Table 4.2(c) Ordinary Construction (F = 1.0) and Occupancy Hazard Classification

<table>
<thead>
<tr>
<th>Occupancy Hazard Class</th>
<th>Area</th>
<th>0.25Effective Area (ft²)</th>
<th>Effective Area (ft²)</th>
<th>0.75Effective Area (ft²)</th>
<th>0.85Effective Area (ft²)</th>
<th>1.0Effective Area (ft²)</th>
<th>1.15Effective Area (ft²)</th>
<th>1.25Effective Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75Occupancy Hazard Class-6</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>0.85Occupancy Hazard Class-5</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>1.0Occupancy Hazard Class-4</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1.15Occupancy Hazard Class-3</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
</tr>
<tr>
<td>1.25Effective Area (ft²)</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Project Code</td>
<td>Description</td>
<td>Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1234567890</td>
<td>Building 1</td>
<td>1234567890</td>
<td>1234567890</td>
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<td></td>
<td></td>
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<tr>
<td>0123456789</td>
<td>Building 2</td>
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<td>0123456789</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9876543210</td>
<td>Building 3</td>
<td>9876543210</td>
<td>9876543210</td>
<td>9876543210</td>
<td>9876543210</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0987654321</td>
<td>Building 4</td>
<td>0987654321</td>
<td>0987654321</td>
<td>0987654321</td>
<td>0987654321</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For SI units, 1 gpm = 0.063 L/sec; 1 ft² = 0.093 m².
For SI units, 1 gpm = 0.0631 L/sec; 1 ft² = 0.093 m².

Table G.4.2(e) Fire-Resistive Construction (F = 0.6) and Occupancy Hazard Classification

<table>
<thead>
<tr>
<th>Occupancy Hazard Class</th>
<th>Q₁</th>
<th>Q₂</th>
<th>Q₃</th>
<th>Q₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 7</td>
<td>0.75 Occupancy Hazard Class 6</td>
<td>0.85 Occupancy Hazard Class 6</td>
<td>1.00 Occupancy Hazard Class 4</td>
<td>1.15 Occupancy Hazard Class 3</td>
</tr>
<tr>
<td>Class 8</td>
<td>1.25 Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
<td>Effective Area (ft²)</td>
</tr>
<tr>
<td>For SI units, 1 gpm = 0.0631 L/sec; 1 ft² = 0.093 m².</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

G.4.3 Exposure (X₁) and Communication (P₁) Factors.

The factors X₁ and P₁ reflect the influence of exposed and communicating buildings, respectively, on the fire flow requirement. A value of X₁ + P₁ should be developed for each side of the building. Where there is no exposure on any side, X₁ = 0.

G.4.3.1 Factor for Exposure (X₁).

The exposure factor applies to only one side of the subject building and is determined based on the construction and the length-height value (length of wall in feet times height in stories) of the exposed building, and the distance between the facing walls of the subject building and the exposed building. The factor for X₁ is selected from Table G.4.3.1.
Table G.4.3.1 Factor for Exposure (Xi)

<table>
<thead>
<tr>
<th>Construction of Facing Wall</th>
<th>Distance to the Exposed Building (ft)</th>
<th>Value of Facing Wall of Exposed Building</th>
<th>Construction Classes of Facing Wall of Exposed Building</th>
<th>Construction Class 1, 3</th>
<th>Construction Class 2, 4, 5, and 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame, metal, or masonry</td>
<td>with openings 0 = 101 - 200, 210, 160, 101 - 200, 230, 220, 170, 201 - 300, 240, 230, 180, 301 - 400, 250, 240, 190, 400, 250, 250, 200, 11 - 301 - 1000, 170, 150, 110, 101 - 200, 180, 160, 120, 201 - 300, 190, 180, 140, 301 - 400, 200, 190, 150, 400, 200, 190, 150, 301 - 601 - 1000, 120, 100, 0.7, 101 - 200, 130, 110, 0.8, 201 - 300, 140, 130, 100, 301 - 400, 150, 140, 110, 400, 150, 150, 120, 61 - 1001 - 1000, 0.8, 0.6, 0.4, 101 - 200, 0.8, 0.7, 0.5, 201 - 300, 0.9, 0.8, 0.6, 0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Face, blank masonry wall    | Where the facing wall of the exposed building is higher than the subject building, this Table G.4.3.1 except use only the length - height of the facing wall of the exposed building above the height of the facing wall of the subject building. Buildings five stories or over in height are considered five-story buildings. Where the height of the facing wall of the exposed building is the same or lower than the height of the facing wall of the subject building, Xi = 0.

For SI units, 1 ft = 0.305 m.

*Wiring glass or outside open sprinklers.*

The following buildings are not charged as exposures:

1. Buildings fully protected by automatic sprinklers
2. Buildings with a residential occupancy
3. Buildings that are Type I construction
4. Buildings with a blank masonry wall

Table G.4.3.2 Factor for Communication (Pi)

The factor for Pi depends on the protection for the communicating party wall openings and the length and construction of communications between fire divisions and is selected from Table G.4.3.2. Where more than one communication type exists in any one sidewalk, only the largest factor Pi applies for that side. Where there is no communication on any side, Pi = 0.

Table G.4.3.2 Factor for Communications (Pi)

| Fire-Resistive, Noncombustible, or Slow-Burning Communications (ft) | Description of Protection of Passageway Openings Any length ≤ 101 | 101 - 201 | 201 - 500 | 500 - 101 | 101 - 201 | 201 - 500 | 500 - 101 | 101 - 201 | 201 - 500 | 500 - 101 |
|---------------------------------------------------------------|--------------------------------|-----------|---------|--------|----|-----------|---------|--------|----|-----------|---------|
| Unprotected                                                  | 0.0                            | 0.1       | 0.3     | 0.6   | 1.0 | 0.3       | 0.6     | 1.0    | 0.3 | 0.6       | 1.0     |
| Enclose                                                      | 0.0                            | 0.1       | 0.3     | 0.6   | 1.0 | 0.3       | 0.6     | 1.0    | 0.3 | 0.6       | 1.0     |
| Single Class A fire door at one end of passageway 0.0 - 200  | 0.0                            | 0.1       | 0.3     | 0.6   | 1.0 | 0.3       | 0.6     | 1.0    | 0.3 | 0.6       | 1.0     |
| Single Class B fire door at one end of passageway 0.0 - 200  | 0.0                            | 0.1       | 0.3     | 0.6   | 1.0 | 0.3       | 0.6     | 1.0    | 0.3 | 0.6       | 1.0     |

For SI units, 1 ft = 0.305 m.

Notes:

1. Where a party wall has communicating openings protected by a single automatic- or self-closing Class B fire door, it qualifies as a division wall for reduction of area.
2. Where communications are protected by a recognized water curtain, the value of Pi = 0.
For over 50 ft, \( P = 0 \).

For unprotected passageways of this length, consider the two buildings as a single fire division.

**G.4.4 Calculation.**

The fire flow \((FF)\) for a municipal-type water system is calculated as follows:

\[
\text{FF} = C_i \times O_i \times X_i \times P_i
\]

where:

- \( C_i \) = construction factor
- \( O_i \) = occupancy factor
- \( X_i \) = exposure factor
- \( P_i \) = communication factor

**G.4.4.1**

Where wood shake shingles as a roof covering are permitted by the AHJ (on the building being considered or on the exposed buildings), 500 gpm (1900 L/min) is added to the fire flow requirements unless such shingles are listed as Class C or higher.

**G.4.4.2**

The fire flow should not exceed 12,000 gpm (45,420 L/min) or be less than 250 gpm (950 L/min).

**G.4.4.3**

The fire flow requirement should be rounded off to the nearest 250 gpm (950 L/min) if less than 2500 gpm (9500 L/min) and to the nearest 500 gpm (1900 L/min) if greater than 2500 gpm (9500 L/min).

**G.4.4.4**

When all buildings in a planned area are protected with approved automatic sprinkler systems installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, and have an acceptable inspection and maintenance program in place, the fire flow requirements can be reduced by 75 percent but not below 1000 gpm (3800 L/min).

**G.4.4.5**

For one- and two-family dwellings not exceeding two stories in height and 4300 ft\(^2\) (400 m\(^2\)) or less in effective area, Table G.4.4.5 should be used to determine the required fire flow from a municipal-type water system.

**Table G.4.4.5 Fire Flow for Residential Property**

<table>
<thead>
<tr>
<th>Distance Between Buildings</th>
<th>Fire Flow (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( &gt;10 )</td>
<td>( &gt;30 )</td>
</tr>
<tr>
<td>( 9.5 )</td>
<td>( 285 )</td>
</tr>
<tr>
<td>( 3.4 )</td>
<td>( 100 )</td>
</tr>
<tr>
<td>( \leq 3.3 )</td>
<td>( 315 )</td>
</tr>
</tbody>
</table>

**G.4.4.5.1**

For one- and two-family dwellings exceeding 4300 ft\(^2\) (400 m\(^2\)) in effective area, or over two stories in height, use the formula prescribed in G.4.4 to determine the fire flow requirement.

**G.4.4.5.2**

When all one- or two-family dwellings in a planned area consisting of only one- or two-family dwellings are protected with approved automatic sprinkler systems installed in accordance...
with NEPA 13, Standard for the Installation of Sprinkler Systems, NEPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, or NEPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, and have an acceptable inspection and maintenance program in place, the fire flow requirements may be reduced by 75 percent but not below 500 gpm (1900 L/min).

G.5. Examples of Calculating Fire Flow for a Municipal-Type Water System.

Seven examples of calculating fire flows for a municipal-type water system are shown in G.5.1 through G.5.7.

G.5.1. Example 1.

A three-story ordinary-construction building occupied as a moderate hazard with an unused basement has a ground floor area of 7300 ft² (678.2 m²). The effective area is as follows:

\[ 7300 + 0.5(7300 + 7300) = 14,600 \text{ ft}^2 (1356.3 \text{ m}^2) \]

In Table G.4.2(c), the area of 14,600 ft² is between 13,951 ft² and 17,400 ft² (1296 m² and 1616.5 m²); therefore, under occupancy hazard classification 5, the required water supply for the construction factor \((C)\) and occupancy factor \((O)\) is 2250 gpm (8500 L/min). There is no exposure or communication. The calculation of the fire flow \((FF)\), rounded to the nearest 250 gpm (950 L/min), is as follows:

\[ FF = (C)(O)[1.0 + (X + P)] \]

\[ FF = 2250 \text{ gpm} \times [1.0 + (0 + 0)] \]

\[ FF = 2250 \text{ gpm} \times (8500 \text{ L/min}) \]

G.5.2. Example 2.

A three-story wood-frame building with a ground floor area of 7300 ft² (678.2 m²) communicates through unprotected openings with a five-story, ordinary-construction building with a ground floor area of 9700 ft² (901.1 m²). Both buildings are operated as moderate hazard. The basements have light-hazard and low-hazard contents. The effective area for the building is as follows:

\[ 7300 + 9700 + 0.5(2(7300) + 4(9700)) = 43,700 \text{ ft}^2 (4059.7 \text{ m}^2) \]

The \((C)(O)\) for the building is based on the predominant construction class of the building. In this example, more than 66.66% percent of the total floor and roof area is of ordinary construction. The predominant construction class is ordinary construction. Therefore, under occupancy hazard classification 5, the value for \((C)(O)\) for an effective area of 43,700 ft² (4059.7 m²) is 3750 gpm (14,213 L/min).

G.5.3. Example 3.

A one-story, ordinary-construction building occupied as moderate hazard without a basement has an area of 210,000 ft² (19,509 m²). The effective total area is 210,000 ft² (19,509 m²). Table G.4.2(c) indicates a \((C)(O)\) of over 8000 gpm (30,280 L/min). However, as ordinary construction, the \((C)(O)\) maximum is 8000 gpm (30,280 L/min) [see G.4.1.2(1)]. In this example, the value for \((C)(O)\) is further reduced to 6000 gpm (22,710 L/min) as this is a one-story building [see G.4.1.2 (3)].

G.5.4. Example 4.

A two-story, wood-frame building occupied as moderate hazard has an area of 60,000 ft² (5574 m²) and communicates through unprotected openings to a one-story, noncombustible building with an area of 45,000 ft² (4180.5 m²). The effective area is 45,000 + 60,000 + 0.5(60,000) = 135,000 ft² (12,541.5 m²).
The \((C)/(O)\) for the building is based on the predominant construction class of the building. In this case, more than 33.3\% percent of the total wall area is of combustible construction. Therefore, the predominant construction class is wood-frame construction.

Therefore, under occupancy hazard classification 5, the value for \((C)/(O)\) for an effective area of 135,000 ft\(^2\) (12,541.5 m\(^2\)) = 8000 gpm (30,280 L/min).

**G.5.5 Example 5.**

The subject building, a two-story building of 175 ft \times 100 ft (53.3 m \times 30.5 m), is located 15 ft (4.6 m) east of an exposed building identical in construction and area. Both buildings have unprotected openings. The length–height value of the exposed building is \(2 \times 175\) ft = 350. From Table G.4.3.1, the exposure factor \((X)\) is 0.19, or 19 percent.

**G.5.6 Example 6.**

The subject building, a one-story wood-frame building of 75 ft \times 100 ft (22.9 m \times 30.5 m), communicates on the long side through an enclosed frame passageway 25 ft (7.6 m) in length, to an ordinary-construction building. Both buildings have unprotected window openings. The length–height value is \(1 \times 100 = 100\). The exposure factor \((X)\) for this side from Table G.4.3.1 is 0.15. The communication factor \((P)\) for this side from Table G.4.3.2 is 0.30. The exposure and communication factor for this side \((X) + (P)\) for the sum of 0.15 and 0.30 = 0.45.

**G.5.7 Example 7.**

The subject building is a one-story single-family residence with a 15 ft (5 m) side setback. The fire flow is 1000 gpm (3800 L/min) from G.4.4.5.

**G.6 Fire Flow Duration.**

The fire flow determined by G.4.4 should be able to be sustained for at least the amount of time shown in Table G.6.

<table>
<thead>
<tr>
<th>Fire Flow (gpm)</th>
<th>Duration (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;2,500)</td>
<td>(&lt;0,900)</td>
</tr>
<tr>
<td>(2,500)–(9,500)</td>
<td>(0,900)–(3,500)</td>
</tr>
<tr>
<td>(9,500)–(13,250)</td>
<td>(3,500)–(4,000)</td>
</tr>
<tr>
<td>(&gt;13,250)</td>
<td>(&gt;4,000)</td>
</tr>
</tbody>
</table>

**Statement of Problem and Substantiation for Public Input**

The fire flow calculation in G3, G4, G5 and G6 is different from that provided in the core text of Chapter 18 of NFPA 1. This has the potential to confuse the user as to what is the “correct” fire flow calculation to utilize. The provisions of G3, G4, G5 and G6 need to be correlated with the Fire Code Committee and the NFPA 1 provisions to ensure that a single fire flow methodology is promulgated within the NFPA codes and standards system.

**Submitter Information Verification**

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Submittal Date: Thu Nov 21 18:58:44 EST 2013
Committee Statement

Resolution: The committee is going work to revise annex G along with recommendations from ISO.

Annex J Informational References

J.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

J.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


J.1.2 Other Publications.

J.1.2.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort [56,000 ft-lbf/ft³ (2,700 kN-m/m³)], 2002 2012.

J.1.2.2 NASF Publications.
J.1.2.1 NDMC Publications.


J.1.2.4 U.S. Government Publications.

J.1.2.4.1 NRCS Publications.


J.1.2.4.2 USDA Forest Service Publications.

J.1.2.4.3 USGS Publications.


J.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

J.2.1 NFPA Publications.


J.2.2 Other Publications.


J.2.3 Other Resources.

J.2.3.1 Firewise Resources.

Using Water Effectively in the Wildland/Urban Interface (DVD or Video), 2004.

J.2.3.2 Wisconsin DNR Publications.

Statement of Problem and Substantiation for Public Input

Updated to current editions and updated address the National Drought Mitigation Center.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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</thead>
</table>

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Committee Statement

Resolution: FR-17-NFPA 1142-2014
Statement: Updating references.