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Water-Supply Evaluations

Forty percent of your community's Public Protection Classification (PPC™) grading is based on your water supply. ISO looks at whether you have sufficient water for fire suppression beyond your community's daily maximum consumption for other purposes.

Minimum criteria

For your community to be eligible for a PPC of Class 8 or better, your water supply system must be able to deliver at least 250 gpm for a period of two hours. That flow is in addition to the community's maximum daily rate of consumption for purposes other than firefighting.

If the fire department delivers the 250 gpm through tanker shuttle, large-diameter hose, or other [alternative water supply](#), the water must be available within five minutes of the arrival of the first-due apparatus, and the department must maintain the flow, without interruption, for the two-hour duration.

Class 8B

If a community has superior fire-protection services and fire-alarm facilities, but lacks the water supply required for a PPC of Class 8 or better, the community may be eligible for a Class 8B rating. For more information, see [Minimum Criteria for Class 8B](#).

Evaluation of systems that exceed the minimum requirement

If your water supply meets the 250-gpm minimum, ISO will evaluate your system — together with factors relating to your fire department and your fire-alarm and communications systems — to determine whether you qualify for a PPC of Class 8 or better.

Within the Fire Suppression Rating Schedule (FSRS), a section called "Needed Fire Flow" outlines the methodology for determining the amount of water necessary for providing fire protection at representative locations throughout the community. To evaluate your community's water supply ISO calculates the needed fire flow for selected locations. We then determine the water-flow capabilities at those locations and calculate a ratio considering the need (needed fire flow) and the availability (water-flow capability). We use that ratio in calculating the credit points identified in the FSRS.

ISO calculates the needed fire flow for an individual building based on the building's area, construction, occupancy, and exposure. To get full credit, the water supply must be able to deliver water, at 20 psi residual pressure and at the specified rate of flow, for a specified period of time. Needed fire flows for individual buildings range from a minimum of 500 gpm to a maximum of 12,000 gpm. For more information, see the Guide for Determination of Needed Fire Flow.

Residential areas

For residential areas with one- and two-family dwellings, ISO determines the needed fire flows by considering the distance between buildings:

Distance	Needed Fire Flow
more than 100 feet	500 gpm
31 to 100 feet	750 gpm
11 to 30 feet	1,000 gpm
10 feet or less	1,500 gpm

Buildings not considered in the community's PPC

For purposes of calculating your community's PPC, ISO does not normally consider

the needed fire flow at certain high-demand properties. Those properties include:

- buildings graded and coded by ISO as protected by an automatic sprinkler system meeting applicable National Fire Protection Association standards
- buildings with a needed fire flow in excess of 3,500 gpm

ISO individually grades the protection of buildings with a needed fire flow in excess of 3,500 gpm, and their PPC can differ from that of the community or district that provides their fire protection.

Evaluation method

ISO analyzes three primary factors in the evaluation of the water supply at each representative site in your community:

- capacity of the supply works
- capacity of the water mains or distribution system
- distribution of hydrants

We analyze each of those factors according to applicable standards of the National Fire Protection Association (NFPA) and the American Water Works Association (AWWA).

We determine the capacity of the supply works for each service (pressure) zone through an analysis of such factors as water source (wells, springs, impoundments, stream-flow diversions, and the like); treatment facilities; transmission facilities (suction storage, booster pumps, transmission mains, pressure-reducing valves, and the like); and gravity storage. We calculate the flow — sustainable for the needed duration — from both suction storage tanks and gravity storage tanks, based on the capacity of the tanks at their average daily minimum levels.

We determine supply-works capacity, in gpm, for a duration of 2 hours for needed fire flows less than 3,000 gpm; for a duration of 3 hours for needed fire flows of 3,000 gpm to 3,500 gpm; and for a duration of 4 hours for needed fire flows in excess of 3,500 gpm. We credit only supply-works capacity in excess of the maximum daily consumption rate, based on records for the last 3 years.

We determine capacity of the water mains or distribution system by observing actual hydrant flow tests at each representative location.

Those tests produce results calculated in gpm at a residual pressure of 20 psi. Under certain circumstances, ISO may accept tests witnessed by outside agencies, if conducted according to industry-accepted practices, or flows determined from a valid and balanced computer model.

ISO evaluates hydrant distribution by examining the number and type of hydrants within 1,000 feet of each representative building. We also look at the distance from each such hydrant to the subject building, measured as apparatus can lay hose.

Hydrants with at least one large pumper outlet may receive credit for up to 1,000 gpm. Hydrants with at least two hose outlets, but no pumper outlet, may receive credit for up to 750 gpm. And hydrants with only one hose outlet may receive credit for up to 500 gpm.

Hydrants within 300 feet of the subject building may receive credit for up to 1,000 gpm (but not more than the credit that would apply based on the number and type of outlets). Hydrants from 301 feet to 600 feet from the subject building may receive credit for up to 670 gpm (but not more than the credit that would apply based on the number and type of outlets). And hydrants from 601 feet to 1,000 feet from the subject building receive credit for 250 gpm. Under certain circumstances, when all fire department pumpers carry sufficient large-diameter hose, ISO may allow maximum credit for hydrants up to 1,000 feet from the subject building.

For each representative location, ISO credits the least of the rates of flow determined for supply-works capacity, water-main or distribution-system capacity, or hydrant distribution. (The credit rate of flow cannot exceed the needed fire flow for that location.)

To determine the grading points that go into the calculation of your community's PPC, ISO considers the percentage of the needed fire flows that the credited rates of flow can provide. You receive that percentage of the available grading points. For example, if your community's credited flow could supply 75 percent of the needed fire flows at the representative locations, you would receive 75 percent of the available credit points.

In addition, ISO evaluates the type and installation of hydrants and/or suction points throughout your community or district, along with any program of hydrant inspections and maintenance. You receive additional credit points based on that evaluation.

For more information . . .

. . . on any topic related to the PPC™ program or the Fire Suppression Rating Schedule, click [Talk to ISO Mitigation](#) or call the ISO mitigation specialists at 1-800-444-4554.



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Needed Fire Flow

Needed fire flow is the amount of water that should be available for providing fire protection at selected locations throughout a community. ISO has prepared a guide for estimating needed fire flow. The publication is only a guide and requires knowledge and experience in fire-protection engineering for its effective application.

You can download a copy of the [Guide for Determination of Needed Fire Flow](#). The document is a PDF file of approximately 90kB. You can view or print the file with a free [Adobe® Acrobat® Reader](#).

Customized reports

For information about your own community's public fire protection, a customized PPC™ report is available by mail from ISO. The report includes a list of the needed fire flows for all the commercial occupancies ISO has on file for your community, as well as details of the latest review of your community's fire protection services (that is, your PPC grading). The report is available only to your community's fire chief or chief administrative official. ISO does not charge communities for these reports.

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Response-Time Considerations

In evaluating a community's public fire protection, ISO considers the [distribution of fire companies](#). Generally, ISO's criteria say that a built-upon area of a community should have a first-due engine company within 1.5 road miles of the protected properties and a ladder-service company within 2.5 road miles.

Those benchmark criteria produce an expected response time of 3.2 minutes for an engine company and 4.9 minutes for a ladder-service company, based on a formula developed by the RAND Corporation.

RAND conducted extensive studies of fire department response times. They concluded that the average speed for a fire apparatus responding with emergency lights and siren is 35 mph. That speed considers average terrain, average traffic, weather, and slowing down for intersections.

Taking into account the average speed and the time required for an apparatus to accelerate from a stop to the travel speed, RAND developed the following equation for calculating the travel time:

$$T = 0.65 + 1.7D$$

where

T = time in minutes to the nearest 1/10 of a minute

0.65 = a vehicle-acceleration constant for the first 0.5 mile traveled

1.7 = a vehicle-speed constant validated for response distances ranging from 0.5 miles to 8.0 miles.

D = distance

ISO, working with several fire departments, recently conducted its own review of the formula and found the earlier RAND work still valid as a predictive tool.

In our analysis of company distribution, ISO does not measure or use actual historical response times of individual communities. Many fire departments lack accurate and reliable response-time information, and there is no standardized national recordkeeping system that would allow us to determine accurate departmental response times.

Also, it would be inappropriate to incite fire service personnel to push fire apparatus beyond a safe driving speed for the sake of faster response times, especially since U.S. Fire Administration statistics for 2005 indicate that 17 percent of firefighter on-duty fatalities resulted from responding to alarms.

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Engine-Company Equipment

Here's a list of the items ISO considers when evaluating an engine company. The table gives the [Fire Suppression Rating Schedule \(FSRS\)](#) credit points available for each item. You may substitute equivalent equipment for some of the items listed in the FSRS. See the [FSRS Equivalency list](#) for details.

Engine-Company Equipment and Hose	Needed	Points Credit/Unit	Total Points
Booster tank	300 gallons	1/10 gallons	30
Hose			
Booster	200 feet	3/50 feet	12
Extra preconnected 1-1/2" hose may substitute for booster hose.			
1-1/2" carried	400 feet	3/50 feet	24
spare (may also be carried)	200 feet	2/50 feet	8
2-1/2" spare (may also be carried)	200 feet	3/50 feet	12
Heavy-stream appliance (1,000 gpm)	1	100	100
A heavy-stream device is not needed for a Basic Fire Flow of less than 1,500 gpm.			
Distributing nozzle	1	1	5
Foam nozzle (1-1/2" minimum)	1	4	4
Foam			
Carried	10 gallons	3/5 gallons	6
Spare (may also be carried)	15 gallons	2/5 gallons	6
Nozzles			
2-1/2" straight stream with shutoff	2	20	40
2-1/2" combination with shutoff	2	30	60
1-1/2" combination with shutoff	2	10	20
SCBA equipment (30-minute minimum)	4	16	64
Extra cylinders (carried)	4	4	16
Salvage covers (12-ft. x 18-ft.)	2	2	4
Handlight (4V wet or 6V dry)	2	2	4
Hose clamp	1	4	4
Hydrant gate (2-1/2")	1	4	4
Burst hose jacket (2-1/2")	1	4	4
Gated wye (2-1/2" x 1-1/2" x 1-1/2")	1	4	4
Radio			
Mounted	1	32	32
Portable	1	16	16
Ladders			

12-ft. or 14-ft. roof	1	10	10
24-ft. extension	1	15	15
Annual tests			
Pumper (see table A, below)	1	100	100
Hose (see table B, below)	1	50	50
		Total:	654

The fire apparatus should also have supply hose and fire-fighting hose. For maximum credit, the engine company should carry 1,200 feet of hose. This can be 1,200 feet of 2-1/2" or larger supply hose or a combination of 2", 2-1/2", or 3" hose (up to 400 feet) and 2-1/2" or larger hose (up to 800 feet).

Table A
Pumper Service Tests

Average Interval between 3 Most Recent Tests	Maximum Points Credit
1 year	100
2 years	75
3 years	50
4 years	25
5 years	0

NFPA Standard 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*, describes pumper service tests. A pumper service test is similar to the certification test described in NFPA Standard 1901, except that the duration is reduced to 20 minutes at 150 psi, 10 minutes at 200 psi, and 10 minutes at 250 psi. The overload test is not a necessary part of the ISO review.

Table B
Hose Service Tests

Average Interval between 3 Most Recent Tests	Maximum Points Credit		
	250 psi	200 psi	150psi
1 year	50	37	28
2 years	37	27	18
3 years	25	18	12
4 years	12	9	6
5 years	0	0	0

NFPA Standard 1962, *Care, Maintenance and Use of Fire Hose*, describes fire hose tests.

When the hose-test frequency, pressure, or both vary for 2-1/2" and larger hose and for 1-1/2" hose, ISO prorates the credit using 65% for the 2-1/2" and larger hose and 35% for the 1-1/2" hose. Large-diameter hose (LDH) in excess of 3" in diameter should be tested in accordance with NFPA 1962. The highest test pressure needed for 3" diameter and smaller hose is 250 psi.

Note: If the community conducts tests but keeps no records of the tests, ISO will reduce the applicable points credit by 20% for Tables A and B.

Either the fire department or an independent testing agency can perform the tests. In either case, the tests should conform with the appropriate NFPA standard.

For information on how adding certain pieces of equipment will affect your community's preliminary FSRS score, see ISO's [relative-value tables](#).

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Maximum Age for Apparatus

The Fire Suppression Rating Schedule (FSRS) does not specify any maximum age for fire apparatus. ISO uses NFPA standards to define whether or not the apparatus meets general requirements. In addition, pumper apparatus must pass a pump test. ISO will credit a pumper with its capability (gallons per minute) at a net pump pressure of 150 psi. Aerial apparatus must also pass an annual service test (including a nondestructive test at least every five years).

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Training

Here's a summary of the items ISO considers when reviewing a community's training for firefighters.

Facilities and aids

Drill tower

Fire building (including smoke room)

Combustible-liquid pit

(In areas where federal, state, or local officials prohibit the use of combustible-liquid pits, credit may be available for a video depicting extinguishment of flammable-liquid fires.)

Library and training manuals

Slide or overhead projectors

Movie projector or VCR

Pump cutaway

Hydrant cutaway

Use

Half-day (3-hour) drills, 8 per year

Half-day (3-hour) multiple-company drills, 4 per year

Night drills (3-hour), 2 per year

Note: ISO may credit a single-company drill under the first and last of these items; ISO may credit multiple-company drills under all three.

Company training

Company training at fire stations, 20 hours per member per month

Classes for officers

2 days (6 hours each) per year for all officers

Driver and operator training

4 half-day (3-hour) sessions per year

New-driver and operator training

Classes for new drivers and operators, 40 hours

Training on radioactivity or hazardous materials

1 half-day (3-hour) session per member per year

Recruit training

240 hours per recruit

Prefire planning inspections

The community should run a prefire planning inspection of each commercial, industrial, institutional, and other similar structure twice a year for maximum credit in the FSRS. Records of the inspections should include complete and up-to-date notes and sketches.

Records

If the community's records are incomplete, ISO will reduce the total points credited for training by up to 20 points each for Items A through H.

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