



# Coffee Break Training - Fire Protection Series

## Access and Water Supplies: Fire Flow Formulas: Part 9: Insurance Services Office Needed Fire Flow Formula: Effective Area Calculation

No. FP-2013-44 October 29, 2013

**Learning Objective:** The student will be able to compute an example of the Insurance Services Office (ISO) “construction factor” subformula that is included in the Needed Fire Flow (NFF) formula.

The previous several Coffee Break Training items have explained “effective area” adjustments and exemptions that must be considered when calculating for the  $C_i$  variable that is used in the ISO NFF formula. Today, we will use a sample calculation for  $C_i$ :

$$C_i = 18F\sqrt{A_i}$$

Where:

- $C_i$  = construction factor
- $F$  = coefficient for the construction classification (see Coffee Break Training 2013-40)
- $A_i$  = effective area



This one-story, noncombustible building will have a “construction factor” coefficient of 0.8 in the Insurance Services Office (ISO) “effective area” subformula.

Given a one-story, noncombustible frame building (ISO Construction Class 3) that is 14,000 square feet (1,300 meters squared) of undivided space, to solve for  $C_i$ , substitute as follows:

$$C_i = 18 \times 0.8 \times \sqrt{(14,000)}$$

$$C_i = 18 \times 0.8 \times (118.3)$$

$$C_i = 1,703$$

In SI units:

$$C_i = 18 \times 0.8 \times \sqrt{(1,300)}$$

$$C_i = 18 \times 0.8 \times (36)$$

$$C_i = 518$$

Note that the construction factor,  $C_i$ , is dimensionless; it is not characterized as square feet (meters squared), it only serves as a variable that is inserted into the NFF formula:  $NFF_i = (C_i) (O_i) [1 + (X + P)]$ .

Next week’s Coffee Break Training will begin discussing the “occupancy factor” element,  $O_i$ , that is employed in the formula. The ISO “Guide for Determination of Needed Fire Flow” can be downloaded from [www.iso.com](http://www.iso.com).

For additional information and training on calculating water supply requirements for fire protection, visit the National Fire Academy online at <http://1.usa.gov/12JypCa> and register for the free classes “Alternative Water Supply: Planning and Implementing Programs” (Q0217) and “Testing and Evaluation of Water Supplies for Fire Protection” (Q0218).



Eligible for Continuing Education Units (CEUs)

at [www.usfa.fema.gov/nfaonline](http://www.usfa.fema.gov/nfaonline)

For archived downloads, go to:

[www.usfa.fema.gov/nfa/coffee-break/](http://www.usfa.fema.gov/nfa/coffee-break/)