



## CAMPUS FIRE SAFETY CODE TALK

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NFPA 30 and MAQs for Storage of Containers of Flammable / Combustible Liquids

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[This is the fourth in a series of articles dealing with flammable and combustible liquids and NFPA 30, *Flammable and Combustible Liquids Code*. Prior articles are: *Safety Cans* (August 2011); *Flammable Liquids Storage Cabinets* (November 2011); and *Safe Handling of Flammable and Combustible Liquids* (February 2014)]

The primary fire protection rules for flammable and combustible liquids are embodied in NFPA 30, *Flammable and Combustible Liquids Code*. The specific requirements that govern storage of containers of liquids can be found in Chapters 9 through 16 of the *Code*. However, the mere presence of minimal amounts of flammable or combustible liquids does not necessarily invoke NFPA 30's rules. The key here is what is known as the "maximum allowable quantity". The maximum allowable quantity, or MAQ, is a threshold amount of a liquid that marks the boundary between not applying the *Code* and applying it. Essentially, quantities up to the MAQ are below NFPA 30's radar; these quantities can be present without having to apply the provisions of the



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*Code.* (Although, presumably, the safe handling procedures described in the February 2014 article are used.).

The MAQs are given in two tables in Section 9.6 of NFPA 30: Table 9.6.1 for mercantile, industrial, and storage occupancies; and Table 9.6.2.1 for all other occupancies. Both are shown below. The tables give the MAQs for the several classes of flammable and combustible liquids. For simplicity's sake, the tables do not show sub-classes of Class I.

**Abridged Version of Table 9.6.1**

	Liquid Class	Flash Point Range	MAQ per Control Area
Flammable Liquids	I	below 100° F / 38° C	120 gal.
Combustible Liquids	II	100° F up to 140° F / 38° C to 60° C	120 gal.
	IIIA	140° F up to 200° F / 60° C to 93° C	330 gal.
	IIIB	200° F / 60° C and higher	13,200 gal.



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Table 9.6.2.1

Liquid Class	MAQ per Control Area
I and II	10 gal.
IIIA	60 gal.
IIIB	120 gal.

For Table 9.6.1, the following adjustments to the MAQs can be made:

- Each MAQ can be doubled if all liquids are stored in safety cans or in flammable liquids storage cabinets.
- Each MAQ can be doubled if the building is protected throughout with an automatic sprinkler system compliant with NFPA 13, *Standard for the Installation of Sprinkler Systems*.
- These two doubling factors can be applied accumulatively.

For Table 9.6.2.1, adjustments work differently:



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- The MAQs for Classes I and II liquids and for Class IIIA liquids can be increased if the liquids are stored in flammable liquids storage cabinets. However, the total aggregate amount cannot exceed 180 gallons.
- For ambulatory health care, day care, educational, and health care occupancies, the MAQ for Class IIIB liquids can be increased 100 percent, if the building is protected throughout with an automatic sprinkler system installed in accordance with NFPA 13.

Consider a maintenance building on a university campus. Such a building would be classified as an industrial occupancy and Table 9.6.1 would govern. The building is not attached to any other building and is not sprinklered, but the solvents, cleaning agents, paints, etc. are kept in flammable liquids storage cabinets, so the doubling factor is in play. Table 9.6.1, therefore, allows storage of 240 gallons each of Classes I and II liquids and 660 gallons of Class IIIA.

Now consider a single story administration building on the same campus. Table 9.6.2.1 above rather severely restricts the quantities of liquids, unless all are kept in flammable liquids storage cabinets. The difference between the two examples reflects two things: the maintenance building is a more controlled environment and



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has fewer occupants than is and does the administration building. Evacuating the former is not as great an issue as the latter. And, the personnel in the maintenance building are knowledgeable in the handling and use of the liquids therein. For these reasons, it is appropriate and reasonable that the more restrictive of the two tables applies to the administration building.

Note that the MAQs given in the tables above are for each individual *control area* of the building. In our examples above, each building is a single control area. A control area is a building or portion of a building that contains certain materials, like flammable and combustible liquids, in quantities that do not exceed the MAQ. Think of a control area as a special type of fire area. Section 9.7 of NFPA 30 sets the rules for applying the concept of control area to MAQs for liquids. It stipulates that each control area must be separated from adjacent areas by a fire barrier. The number of control areas allowed for each story of a building and the required hourly rating of the separating fire barriers are governed by Table 9.7.2 of the *Code*, which is identical to Table 34.2.5.1.1 of NFPA 5000™. The fire barrier is a complete envelope around the control area; it includes the walls and floor/ceiling assemblies. A variation of Table 9.7.2 is shown below.



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Abridged Version of Table 9.7.2

Floor Level	Percent of MAQ given in 9.6	Control Areas per Floor	Hourly Rating for Fire Barriers, hr.
>9	5	1	2
7 - 9	5	2	2
4 - 6	12.5	2	2
3	50	2	1
2	75	3	1
1 (grade)	100	4	1
(levels below grade)			
1		3	1
2		2	1

Class II and III liquids are prohibited from below grade levels lower than Level 2.

Flammable liquids are prohibited from any basement area. See Subsections 9.3.6, 9.3.7, and 9.3.8 of the *Code*.



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Let's return to our university campus and look at a six-story administration building, apply Tables 9.6.2.1 and 9.7.2, and create a *new* table that shows how much of each class of liquid is allowed in each control area. In the following table, the quantities for the classes of liquid are for a single control area. The "Total Quantity" is the aggregate gallons of *all* the liquids – all classes, all control areas.

Floor Level	Control Areas per Floor	Fire Separation, hrs.	No. of Control Areas	%age Factor	Quantity Classes I & II, gal.	Quantity Class IIIA, gal.	Quantity Class IIIB, gal.	Total Quantity on Floor, gal.
4 - 6	2	2	2	0.125	1.25	7.5	15	47.5
3	2	1	2	0.5	5	30	60	190
2	3	1	3	0.75	7.5	45	90	427.5
1	4	1	4	1.00	10	60	120	760

The arithmetic is straightforward. For floors 4 through 6, the total gallons allowed for each floor is the sum of the MAQs for each liquid class multiplied by the percentage factor multiplied by the number of control areas:



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$(10 + 60 + 120) \times 0.125 \times 2 = 47.5$  gallons

Although some of the numbers for total quantity look formidable, it is highly unlikely these limits would actually be required.

The concepts of the maximum allowable quantity and control areas were introduced with the 2008 edition of NFPA 30, with the objective of correlating with the use of these concepts in NFPA 1, *Fire Code*<sup>™</sup>, NFPA 5000<sup>™</sup>, *Building Construction and Safety Code*<sup>™</sup>, and other building and fire prevention codes.

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