

# New Construction Specification Guide

Prepared for:



**Version: 1.3**

February 2011

# Table of Contents

<b>1.0 OVERVIEW AND INTRODUCTION .....</b>	<b>2</b>
<b>2.0 PLAN REVIEW SUBMITTAL.....</b>	<b>2</b>
<b>3.0 CONSTRUCTION .....</b>	<b>3</b>
3.1 ROOF CONSTRUCTION .....	3
3.2 WALL CONSTRUCTION.....	3
3.3 GREEN / L.E.E.D. BUILDINGS.....	3
3.3.1 <i>Green Roof Systems</i> .....	3
<b>4.0 FIRE PROTECTION.....</b>	<b>4</b>
4.1 AUTOMATIC SPRINKLER REQUIREMENTS USING NON-STORAGE SPRINKLERS .....	4
4.2 EXTENDED COVERAGE SPRINKLER SYSTEMS .....	5
4.3 AUTOMATIC SPRINKLER PROTECTION FOR STORAGE OCCUPANCIES .....	5
<b>5.0 OCCUPANCY HAZARDS.....</b>	<b>6</b>
5.1 BACKUP/EMERGENCY POWER SYSTEMS.....	6
5.2 BOILERS AND HVAC SYSTEMS .....	6
5.3 KITCHENS .....	6
5.4 TECHNOLOGICAL STUDIES EXPOSURES .....	7
5.4.1 <i>Welding</i> .....	7
5.4.2 <i>Automotive</i> .....	7
5.4.3 <i>Woodworking</i> .....	7
5.4.2 <i>Chemical Laboratories</i> .....	7
<b>6.0 REFERENCES AND RESOURCES .....</b>	<b>8</b>

## 1.0 Overview and Introduction

This document is intended to provide information for designers, engineers, and contractors relating to the construction or renovation of schools insured by the Ontario School Board's Insurance Exchange (OSBIE) relating to FM Global's standards. The information contained within this document is summarized from FM Global's Data Sheets which are available for free online at [www.fmglobaldatasheets.com](http://www.fmglobaldatasheets.com).

Requested information including plans and calculations should still be submitted to FM Global's Plan review department.

## 2.0 Plan Review Submittal

The following information should be provided when submitting plans to FM Global's Plan Review department:

- **Construction Drawings**

Including:

- Roof Specifications (including Roof Nav Number)
- Wall Specifications
- Fire Rated Partitions
- Underground Mains for Fire Protection
- Specification Sheets on Materials Used Throughout Project
- Overall Square Footage

- **Fire Protection Drawings**

Including:

- As-calculated sprinkler drawings indicating design areas
- Hydraulic calculations
- Water Supply Information

- **Occupancy Drawings/Specifications**

Information on occupancies should be provided as mentioned within this document.

The number of drawings and calculations required by FM Global to review is one set, however individual school boards or governing agencies may require stamped copies to be returned. FM Global will need to be provided with as many copies as need to be returned, plus one additional copy to be kept on record.

## **3.0 Construction**

This section discusses construction items such as Roof Construction, Wall Construction, and Building Materials. Data Sheets in the 1 series will be the primary sources of information for this section.

### **3.1 Roof Construction**

Selection of an FM Approved Roofing System should be performed utilizing RoofNav software. A RoofNav Number should be submitted along with a list of which components are selected within the indicated RoofNav assembly. RoofNav can be accessed online at [www.RoofNav.com](http://www.RoofNav.com). Instructional media can also be found at this website.

Roof layer securement as well as decking securement should be provided as per Data Sheet 1-28 and 1-29. Special attention should be given to ensure that perimeter and corner securement configurations are adequate.

Where possible, an FM Approved flashing system should be utilized as per Data Sheet 1-49 ([www.fmglobaldatasheets.com](http://www.fmglobaldatasheets.com)).

### **3.2 Wall Construction**

Wall construction should be non-combustible. Where wall panels are utilized, they should be FM Approved or of non-combustible components.

If using an Exterior Insulation Finishing System (EIFS), a non-combustible insulation should be used.

Interior walls should also be non-combustible. Any fire rated walls should be identified on submitted plans.

Penetrations through fire-rated walls should be of an FM Approved fire-stop material or assembly, with a fire rating equal to that of the wall.

### **3.3 Green / L.E.E.D. Buildings**

When a new school is being built with “Green” features not typical to normal construction, or is to be certified as a LEED (Leadership in Energy and Environmental Design) building, FM Global should be notified with preliminary plans and construction details in advance to a typical submission. This will allow for plans to be reviewed as well as any changes to construction to be discussed in advance of the project.

#### **3.3.1 Green Roof Systems**

Although there are currently no complete green roof assemblies that are FM Approved, use an FM Approved roofing base assembly as part of the green roof system. The roof should be designed in accordance with Data Sheet 1-35.

## 4.0 Fire Protection

This section summarizes automatic sprinkler protection requirements which are taken primarily from Data Sheet 3-26, 2-0, and 8-9 as of January 2011.

### 4.1 Automatic Sprinkler Requirements Using Non-Storage Sprinklers

Table 1 provides sprinkler densities and operating areas for wet-pipe automatic sprinkler systems. Table 2 provides densities and areas for dry-pipe systems.

**Table 1: Typical Sprinkler Demands for Wet Sprinkler Systems**

Occupancy	Water Demand (gpm/ft <sup>2</sup> ) / ft <sup>2</sup>	Minimum K Factor	Hose Demand (gpm)	Duration (mins)
Atriums, Classrooms, Office Areas, Libraries & Gymnasiums (Ceilings up to 30 ft.)	0.10/1500	5.6 or 5.6EC	250	60
Auditoriums, Theaters, Machine Shops, Power House & Mechanical rooms (Ceilings up to 30 ft.)	0.2/2500 <sup>1</sup>	8.0	250	60
	0.3/1500 <sup>2</sup>	11.2EC		
	0.3/1000 <sup>2</sup>	14.0EC		
Auto Repair Shops (Ceilings up to 30 ft.)	0.3/2500	11.2	500	90
	0.3/1500 <sup>2</sup>	11.2EC		
	0.3/1000 <sup>2</sup>	14.0EC		

<sup>1</sup> Ceilings up to 60 ft.

<sup>2</sup> Sprinklers must be upright with a temperature rating of 160°F. Also, ensure that the number of sprinkler heads in the design area does not drop below a minimum of 6 sprinklers for K11.2EC and 4 sprinklers for K14.0EC.

**Table 2: Typical Sprinkler Demands for Dry Sprinkler Systems**

<b>Occupancy</b>	<b>Water Demand (gpm/ft<sup>2</sup>)/ ft<sup>2</sup></b>	<b>Minimum K Factor</b>	<b>Hose Demand (gpm)</b>	<b>Duration (mins)</b>
Atriums, Classrooms, Office Areas, Libraries & Gymnasiums (Ceilings up to 30 ft.)	0.10/1500	5.6	250	60
Auditoriums, Theaters, Machine Shops, Power House & Mechanical rooms (Ceilings up to 60 ft.)	0.2/3500	8.0	250	60
Auto Repair Shops (Ceilings up to 30 ft.)	0.3/3500	11.2	500	90

Areas which are not listed above should be provided with protection as per the appropriate Data Sheets.

Quick-response (QR) sprinklers should only be used in wet systems. Automatic sprinklers for dry systems should also have a nominal temperature rating of 280°F.

Sprinkler spacing requirements are provided in Data Sheet 2-0.

Only FM Approved components (valve assemblies, valves, piping, fittings, and sprinklers) should be used.

#### **4.2 Extended Coverage Sprinkler Systems**

Extended Coverage sprinkler systems (EC) are commonly used in school occupancies. Flat, open ceilings should be provided. For example, joists will cause an obstruction and therefore limit the distance the water can travel. Guidelines for installation of EC heads are available in Data Sheet 2-0.

#### **4.3 Automatic Sprinkler Protection for Storage Occupancies**

Although un-common in schools, storage areas such as large library stacks, large file rooms, and stock rooms should be provided with sprinkler protection as per FM Global Data Sheet 8-9. Typically any locations where storage meets or exceeds 6 ft. in height, over an area of more than 200 sq. ft. should be considered storage. If any of these areas are planned within a school, FM Global’s Plan Review department should be contacted in order to determine specific requirements.

## 5.0 Occupancy Hazards

This section discusses typical occupancy hazards commonly found in school locations.

### 5.1 Backup/Emergency Power Systems

Schools which are provided with diesel-fueled backup/emergency power systems typically have a fuel tank and a generator in the same room. This section does not provide guidance for fuel transfer systems (multiple tanks, day tanks, transfer pumps etc).

Locating the generator in a separate building, or outdoors is ideal. If the installation must be inside the main envelope of the building the following items should be considered:

- Fire-rated partitions should be provided
- Room containment should be provided with a volume which can contain the largest foreseeable spill plus 2 inches of freeboard. Containment and curbing should be of non-combustible construction. Design should be in accordance with Data Sheet 7-83.
- Drainage should be provided for this room. Drainage should be to a contained system, or to a safe location outdoors. Design should be in accordance with Data Sheet 7-83.
- Automatic sprinkler protection should be provided within the room.

If the installation has a separate tank and generator (ie. non pre-packaged, stand-alone system) the following should be provided:

- Safety Shut Off Valve (SSOV) should be provided at the base of the diesel fuel tank
- The SSOV should be activated either by fusible link, or interlocked with sprinkler water-flow to the area.

If a diesel transfer system is being installed, other items should be provided in accordance with FM Global standards. Submit plans for all diesel fuel systems to FM Global's Plan Review Department for review.

### 5.2 Boilers and HVAC Systems

Boilers should be provided with proper fuel-train combustion safeguards and safety devices as per FM Global Data Sheets. Data Sheets 6-4, 6-5, 6-12, 6-22 and 6-23 provide information depending on what type of boiler is being used.

### 5.3 Kitchens

Details on vent ducting and special protection systems should be submitted with plans for any formal kitchen areas (cafeteria, culinary class room, etc). Special protection systems should be in accordance with FM Global Data Sheet 4-0 and any other Data Sheets within the 4 series as applicable.

## **5.4 Technological Studies Exposures**

Typical to many schools, technological studies areas introduce various hazards into a school setting. The following sections describe what is typical to find in each location. These hazards should be addressed during the plan review stage by notifying FM Global's Plan Review department of any technological studies areas and their specific occupancy details.

### **5.4.1 Welding**

Designated welding areas or shops should be provided with a cut off room constructed of fire rated walls.

### **5.4.2 Automotive**

Any flammable liquids should be stored in FM Approved Flammable Liquids Cabinets. If drums of oil and/or flammable liquids are planned on being stored or used within an area of the school, detailed information of the liquids, storage arrangement and quantity should be provided to FM Global during the plan review stage of the project.

Designated hot-work or welding areas should be provided with fire rated cut-offs and be identified during the planning stage.

### **5.4.3 Woodworking**

Dust collectors are often present in woodworking shops and/or metal working shops within schools. The equipment for such systems should be located outside of the building and vented to the outdoors. Return-air systems should be avoided. If a return air system is required, details on abort gates and explosion diversion systems (including component specification sheets) should be provided for review. Duct work should be non-combustible. Plans of the dust collection system should be submitted for review. These plans should include, physical dimensions, details on any explosion venting or suppression systems, automatic sprinkler protection. The type of dust should be identified along with plans for the system.

### **5.4.2 Chemical Laboratories**

Although storage amounts are typically small, flammable liquids and gasses are common within chemical laboratories and classrooms within some schools. Any flammable liquids should be stored in FM Approved Flammable Liquids Cabinets. If drums of oil and/or flammable liquids are planned on being stored or used within an area of the school, detailed information of the liquids, storage arrangement and quantity should be provided to FM Global during the plan review stage of the project. Data sheet 7-29 will provide information on storage of flammable liquids in portable containers, while Data sheet 7-50 will provide information on compressed gases.

## 6.0 References and Resources

FM Global Data Sheets are available at: [www.fmglobaldatasheets.com](http://www.fmglobaldatasheets.com) .  
Approval Guide is available at: [www.approvalguide.com](http://www.approvalguide.com)  
RoofNav is available at: [www.RoofNav.com](http://www.RoofNav.com)  
FM Global Website: [www.FMGlobal.com](http://www.FMGlobal.com)

FM Global's Plan Review Service Contact Information:

### FM Global Plan Review Office

Risk Servicing – Toronto  
165 Commerce Valley Drive West, Suite 500  
Thornhill, Ontario L3T 7V8  
Canada  
Plan Review  
T: 905 763 5636  
F: 905 763 5622  
[EngTOROPlanReview@fmglobal.com](mailto:EngTOROPlanReview@fmglobal.com)



Factory Mutual Insurance Company (FM Global) has developed this report for insurance underwriting purposes. The report is provided to you for informational purposes only to reduce the possibility of loss to property by bringing to your attention certain potential hazards or conditions. You must make the decision whether to take any action. FM Global undertakes no duty to any party by providing this report or performing the activities on which it is based. The liability of FM Global is limited to that contained in its insurance policies.

Prepared by: *Thomas Judges & Marc Dumas*  
*Loss Prevention Consultants*

